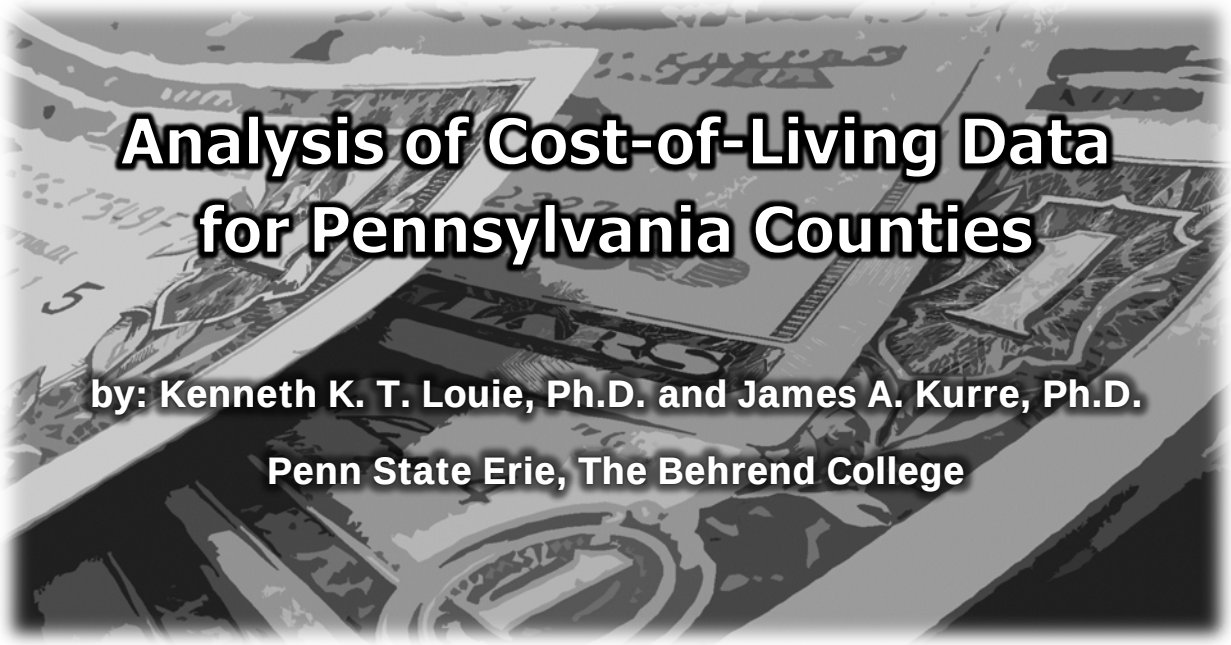

Analysis of Cost-of-Living Data for Pennsylvania Counties

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Executive Summary

In 1992, the Center for Rural Pennsylvania funded a study (Kurre, 1992)[1] to estimate the cost of living in all Pennsylvania counties, and to explore urban-rural cost differentials in the state. The Center subsequently funded an update of the original study (Kurre, 2000)[2], but there have been no updates since.

This study, conducted in 2017, provides new and current data on the cost of living in Pennsylvania's rural and urban areas, and explores several important issues, including whether the rural COL advantage still exists, if it has increased or dwindled, why it exists, and how Pennsylvania compares on the urban-rural cost differential with two other peer states.

Understanding the Cost of Living Index

The Council for Community and Economic Research (C2ER) is the most widely used source of spatial (place-to-place) cost of living data in the country, which are published in its quarterly *Cost of Living Index* (COLI).[3] C2ER uses raw price data collected from approximately 300 urban communities each quarter to compute an index with the base of 100 equaling the average for the communities nationwide. Data are available for the Composite, or overall, cost of living in an urban area, and for six subindexes: groceries, housing, utilities, transportation, health care, and miscellaneous goods and services.

One drawback of the traditional Cost of Living Index, however, was that it provided data for urban areas and larger communities, but not for rural areas. This shortfall of the database is what led the Center for Rural Pennsylvania to fund the earlier studies (Kurre, 1992 and 2000) to estimate COL data for the state's rural (and urban) counties. In those studies, a statistical approach was developed to estimate the cost of living, which eliminated the necessity of actually pricing a broad range of goods and services at outlets in every county of the state. The statistical approach to estimating COL identifies a set of underlying variables that tend to cause the cost of living to be high or low in a place, or at least be associated with high or low COL if not actually causing them. The estimation approach uses basic economic theory to identify a number of variables that might logically lead to higher COLs and results in an equation that allows calculation of an estimated COL level for a county based on readily available data such as the place's population, average income, etc. The estimating equations can then be used to generate estimates of the COLI indexes for all counties.[4]

This study uses the methodology described to determine if the urban-rural COL differential still exists, and if so, whether it has increased or decreased since the last study.[5]

This methodology is also used to address the question of why the cost of living varies from place to place (e.g., why rural costs are typically lower than urban costs) by examining which variables in the estimating equations are statistically significant for each COL subindex.

In addition, this study compares the urban-rural COL patterns in Pennsylvania to those in two other peer states. The selection of peer states is based on an analysis of each of the other 50 states (including the District of Columbia) in terms of their comparability to Pennsylvania along four dimensions: population, mean income, number of counties, and percent of counties that are rural. Based on these four criteria, the two peer states chosen for comparison with Pennsylvania were Florida and Ohio.

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[1] Kurre, James A. *The Cost of Living in Rural Pennsylvania.* Harrisburg PA: The Center for Rural Pennsylvania. June 1992. 81 pages.
[2] Kurre, James A. *Differences in the Cost of Living Across Pennsylvania's 67 Counties.* Harrisburg PA: The Center for Rural Pennsylvania. July 2000. 87 pages.
[3] C2ER was originally named the Association for Chamber of Commerce Researchers, and the publication was the *ACCRA Cost of Living Index.* More information and access to the data are available at: http://coli.org/.
[4] For a more detailed explanation of this methodology, see Kurre, James A. "Is The Cost Of Living Less In Rural Areas?" *International Regional Science Review*, v. 26, #1 (2003), pp. 86-116.
[5] Caution must be exercised when making temporal COL comparisons, because the market basket used by C2ER to price goods as well as the cities that participate in the data collection may change over time.

Study Results

Overall Cost of Living

- On a population-weighted basis (to account for the larger number of people living in higher-cost urban areas), Pennsylvanians, on average, pay about 10.7 percent more overall than other Americans.
- Housing is the key category driving the higher overall COL in the state, since Pennsylvanians pay 26.8 percent more on average for housing than Americans elsewhere. Transportation runs 12.3 percent above average, utilities 11.8 percent above average, miscellaneous goods and services 7.6 percent above average, and groceries 6.5 percent above average. Health care was 6.2 percent lower than the U.S. average cost.
- The overall cost of living tended to be highest among Pennsylvania counties in the southeastern and southwestern parts of the state. For example, Philadelphia's Composite COL Index of 128.8 was the highest in the state, indicating that it costs about 29 percent more to live in Philadelphia than the nation as a whole. Allegheny's Composite COL Index was 113.0.

Rural vs. Urban Cost of Living

- Pennsylvania's rural counties have a lower cost of living than its urban counties, with a 7.9 percent differential in favor of rural counties.
- The urban-rural differential (in favor of rural counties) was typically 2 or 3 percent for the groceries, transportation, health care, and miscellaneous goods and services categories. For the utilities category, urban counties had an advantage of about 1.5 percent.
- For the housing category, the rural advantage was 23.4 percent. The cost of housing is significantly less in rural areas. This is especially important since housing typically makes up about one quarter to one third of a family's budget.
- When population is taken into account, the research indicates that urban residents pay 10.9 percent more, on average, than rural residents for their cost of living. In the housing category, urban residents pay about 32.7 percent more, on average, than rural residents.

Key Causes

- The key factor that causes the cost of living to be higher in some areas than others is income. Higher income in an area tends to result in higher prices in that area.
- Population density also has an impact on the cost of living. Typically, higher density means higher costs. However, this effect only plays a noticeable role when density is very high, such as in Philadelphia and some of its surrounding counties.
- The size of an area, in terms of population, also plays a role in the cost of living. A larger place tends to have a higher cost of living. But, as with density, this effect really only comes into play when population numbers get very large.
- The unemployment rate also tends to affect the cost of living, with a higher unemployment rate tending to cause a lower cost of living.
- While income is a crucial determinant of the cost of living, a change in that income from the previous year does not have a significant effect, except in the housing sector. In that case, it made about a 5 percent difference in housing costs, on average.

Cost of Living Patterns Over Time

- While caution should be used when comparing cost of living patterns over time, broad comparisons may still yield some useful results.
- Overall, the cost of living in Pennsylvania relative to other parts of the country has not changed much over the 20-year period of 1997 to 2017. The cost of utilities in Pennsylvania may have fallen (or risen more slowly) compared to the rest of the nation during this period, although it is still above the national average. The biggest change is in the health care category, which saw a drop of about 10 percent over the period, relative to costs elsewhere.[6]

[6] This does not mean that health care costs in Pennsylvania have fallen. It is more likely that they have risen less here than elsewhere.

- A key finding is that the cost of living continues to be lower in the state's rural areas than in its urban areas. The rural-urban differential appears to have increased a bit overall, and especially in the housing sector where it has risen by approximately 20 percentage points to nearly a 33 percent differential.
- Income, population, and density continue to be important determinants of the cost of living.

Comparison with Peer States

- Both Ohio and Florida are like Pennsylvania in important ways, and were chosen as peer states for comparison. Of the three, Pennsylvania is the highest cost state and Ohio is the lowest.
- A key finding is that rural costs are lower than urban costs in all three of these states.
- In all three states, the housing category is the sector driving the overall cost of living and the urban-rural differential. The urban-rural housing differential ranged from 16 percent in Florida to 29 percent in Ohio to 33 percent in Pennsylvania, after adjusting for population differences across counties.
- In all three states, the utilities index does not follow the general pattern of the other cost of living categories, with urban costs typically being a few tenths of a percent below rural costs.
- Both Florida and Ohio exhibited patterns similar to Pennsylvania's in terms of the causes of cost of living. Income levels played the key role in all three states for the Composite Index and for five of the six subindexes, with utilities being the exception in all three states.
- Growth in income from the previous year consistently added about 5 percent to the housing category across all three states.
- Population and density played similar roles in Florida and Ohio as in Pennsylvania, with relatively small average contributions to the Composite COL Index, but having an important role in places with high population and density levels.
- The unemployment rate consistently reduced the overall cost of living by about 5 percent in all three states.

Policy Considerations

Policies intended to solve other problems may have the unintended consequence of driving up costs in some places, or may result in helping to reduce price pressures in some places. Cost of living effects should enter into the discussion of pros and cons of proposed legislation. For example, policies that attempt to increase the density of development, or have that as a side effect, may have the unintended consequence of increasing housing costs. Given that housing accounts for a large chunk of most households' budgets - even more so for low-income households - this could be a major factor that gets overlooked in some well-intentioned proposals. And to the extent that property taxes are tied to housing values, existing property owners may face significant increases in taxes without corresponding increases in income or services.

It's important to understand that the cost of living is influenced by the national business cycle. Boom times, with their higher incomes and lower unemployment rates, will tend to make costs higher all around, offsetting some of the benefits of the strong economy. Conversely, a recession that brings falling incomes and higher unemployment rates may also engender a bit of a silver lining in the form of reduced price pressures and lower costs of living.

This study documents the fact that housing is the good whose cost varies the most from place to place, and for which the urban-rural differential is largest.

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Acknowledgements: The researchers thank the Council for Community and Economic Research (C2ER) and Mr. Erol Yildirim, Senior Vice President for New Products, who generously shared their *Cost of Living Index* data and the underlying estimating equations for this project. The researchers also thank student research assistants Marissa Baker, Hannah Carlino, Nicholas Findley, and Michael Tyndall.

Introduction

Like other places, rural areas are in constant competition for residents and businesses, and their success in this determines their ability to grow and prosper. They compete sometimes in a formal way, as when local economic development agencies or local governments actively seek new residents and businesses, perhaps through marketing campaigns or attempts to identify and woo targeted firms. But there is also an informal competition in the sense that, at any given time, there are many people and businesses that are looking for a new place to locate, and a place's characteristics and reputation affect how many of those people and businesses are persuaded to relocate there.

In any case, it is important for rural areas to know what their advantages are and to make a point of ensuring that information about their more positive aspects is readily available to those who might be interested.

In this ongoing competition, one disadvantage that is often cited for big cities is their high cost of living (COL). Stories about the shockingly high prices of even tiny apartments in places like Manhattan, Boston, and San Francisco are commonplace. This implies that rural areas may have an advantage in the form of relatively low costs. But documenting that advantage with credible data, rather than just anecdotal information, has typically been difficult. There have traditionally been few, if any, good sources of COL data for rural areas.

In 1992, the Center for Rural Pennsylvania funded a study (Kurre, 1992) to estimate the cost of living in all Pennsylvania counties, and to explore urban-rural cost differentials in the state. The Center subsequently funded an update of the original study in 2000 (Kurre, 2000), but since then, there have been no updates. This study provides new and current data on the cost of living in Pennsylvania's rural and urban areas, and explores several important issues, including whether the rural COL advantage still exists, if it has increased or dwindled, why it exists, and how Pennsylvania compares on the urban-rural cost differential with a couple of peer states.

Goals and Objectives

Goal 1: The Cost of Living Data

The most fundamental goal is to provide cost of living (COL) data for all 67 counties of Pennsylvania, for the overall (Composite) COL Index and also for all six subindexes (groceries, housing, utilities, transportation,

health care, and miscellaneous goods and services) for the most recent period available. To help with understanding the data, the research includes thematic maps of the state's 67 counties, with data for each of the seven indexes, so the reader can get a quick picture of the COL patterns across the state. The maps clearly identify rural counties to help focus on the key urban-rural dichotomy that is at the heart of this study.

Goal 2: Why COL Varies across Counties and the Urban-Rural Differential

The second goal is to identify patterns in the cost of living, especially the differences between the state's rural and urban areas, and then explain why they occur. This starts with calculating the cost of living differential between the state's urban and rural residents, both for overall costs and for each of the six components. The next issue is to ask what really causes costs to be high or low. An explanation of the urban-rural difference is based on the relevant socio-demographic and economic conditions within each county, and parses out the effects each determining variable has on the cost of living. This is done for the overall (Composite) cost of living, but also for each of the six subindexes. While the focus is on the difference between rural and urban costs statewide, the report provides details for each of the 67 counties, for each of the seven COL indexes. Pennsylvania residents are able to see the story for their own county. This section also includes thematic maps of the demographic and economic factors, showing their role in each county.

Goal 3: Has COL Varied through Time?

While the second goal examines the data across the state's counties at one point in time, the third goal is to see how the cost of living has changed through time. The 2000 Center-sponsored study provides data for 1997, and those data are compared with current data to identify changes in COL patterns, focusing especially on the urban-rural differential in cost of living. This part of the project provides thematic, county-level maps of the changes in cost of living for each county, and then explains why the COL has changed by examining changes in the level of the determining variables. Maps are provided showing changes in those underlying demographic and economic variables, to help the reader better understand the patterns and their causes.

Goal 4: Comparison with Peer States

The final goal is to compare Pennsylvania's urban-rural cost of living patterns with those in two other states that are similar to Pennsylvania. This part of the project starts by identifying two peer states using appropriate criteria, and then classifying each county in each state as rural or urban using the Center's definitions of those terms. Using the most recent COL data, the study examines the urban-rural differential in those two states and compares them with those of Pennsylvania; are they in the same direction (for example, rural COL less than urban COL) and of similar magnitude? Differences between Pennsylvania and the peer states are examined in light of the demographic and economic variables discussed previously. Finally, the study examines how the determinants of COL compare and contrast across the three states.

Methodology

Cost of Living Data for Pennsylvania Counties

The Cost of Living Data

The Council for Community and Economic Research (C2ER) is the most widely used source of spatial (place-to-place) cost of living data in the country. C2ER has been publishing its quarterly *Cost of Living Index* (*COLI*) continuously since 1968.[7] C2ER compiles its COL data with the help of participants in urban areas across the country who collect price data for a market basket of approximately 60 goods and services in their areas, using C2ER's detailed pricing methodology. C2ER turns those raw price data into an index with the base of 100 equaling the average for the communities nationwide that participate in that quarter. The number of participants varies over time, but generally includes approximately 300 urban communities each quarter.

The *COLI* publication includes data for the Composite, or overall, cost of living in urban areas, and also data for six subindexes: groceries, housing, utilities, transportation, health care, and miscellaneous goods and services. Details on just what is included in each of these categories are presented in Appendix 1. The basket of goods and services that is priced is based on the Bureau of Labor Statistics' Consumer Expenditure Survey, which is also used for the BLS's widely used Consumer Price Index, which measures price changes over time

[7] C2ER was originally named the Association for Chamber of Commerce Researchers, and the publication used to be named the *ACCRA Cost of Living Index.* More information and access to the data are available at: http://coli.org/.

but not from place to place. C2ER's COLI differs from the CPI's market basket, however, in that it is intended to reflect the purchasing patterns of professional and executive households in the top income quintile.

One drawback of the traditional Cost of Living Index was that it provided data for urban areas and larger communities, but not for rural areas. This shortfall of the database is what led the Center for Rural Pennsylvania to fund the 1992 study (Kurre, 1992) to estimate COL data for the state's rural (and urban) counties. In that study, Kurre used a statistical approach to estimate the cost of living, which eliminated the necessity of physically collecting actual price data for a broad range of goods and services at outlets in every county of the state. The Center also funded an update of that report in 2000 (Kurre, 2000).

The Estimating Equations and Independent Variables

C2ER was well aware of the "no rural data" limitation of the COLI program in part because it often got requests for data from people in non-participating areas, including rural areas. C2ER became aware of Kurre's work for the Center through a 2003 article in the *International Regional Science Review* (Kurre, 2003), and in 2012 C2ER commissioned Dr. Kurre to create a model, based on the technique he had developed for the Center for Rural Pennsylvania, that would allow estimation of the COLI indexes for all 3,114 counties of the country.[8] C2ER has subsequently added the All-County COLI data to the products it distributes through its website, updating them annually. This means it is no longer necessary for the Center to estimate the cost of living data for Pennsylvania counties from scratch; the data (some of them, at least) are available from C2ER.

The statistical approach to estimating COL identifies a set of underlying variables that tend to cause the cost of living to be high or low in a place, or at least are associated with high or low COL, if not actually causing them. For example, places with higher income levels or larger populations might be expected to see greater demands for goods and services, driving up the prices of goods, compared to places with lower incomes or fewer people. The estimation approach uses basic economic theory to identify a number of variables that might logically lead to higher COLs and then uses the existing C2ER COLI data (from hundreds of urban places) to see if the hypothetical relationships actually hold, and, if so, to quantify the relationship between the determinant variables and the cost of living. This results in an equation that allows the calculation of an

[8] This includes county equivalents such as parishes in Louisiana, boroughs and Census Areas in Alaska, and independent towns in New England, Virginia, and other states.

estimated COL level for a county based on readily available data, such as the place's population, average income, etc. This so-called econometric approach allows estimation of COLI values for all 3,000+ counties of the country, based on original COLI price data from about 300 areas.

The econometric estimation approach, technically known as "regression analysis," typically involves identifying a broad range of possible determining variables, and testing various combinations and versions of them to find the most effective estimating equation, the one that fits the existing COLI data best. Of course, this approach provides estimates, not actual price data for the areas, and there is bound to be some inaccuracy involved. But it does provide reasonable COL estimates for places for which the time-intensive and expensive raw price collection technique is not possible.

Dr. Kurre's original version of the All-County COLI for C2ER included estimating equations for the Composite Index and all six subindexes. In more recent years, C2ER has dropped the subindexes from its publication program, but has spent no small effort to refine and improve the estimating equation for the Composite Index. This has led it to test an array of potential driver variables for the model, such as different measures and specifications of local income and its growth rate, the unemployment rate, industry and occupation diversity measures, and a different specification of the so-called regional dummy variables that are different from Kurre's original equations. Some of these have proven useful and have been added to the estimating equations.

To make the current project possible, the head of the *COLI* program at C2ER was kind enough to share the 2017 COLI data for all counties of the nation, along with the current estimating equation for the Composite Index. Moreover, he also updated and respecified the estimating equations for the six subindexes for this project, even though C2ER no longer publishes those data.

C2ER's identification process for each estimating equation involves testing a range of possible independent variables, and selecting those that yield the best estimate of actual *COLI* data for participating areas, for the year of interest, and that fit with economic logic. Each subindex is estimated separately, so different independent variables may appear in the various subindex estimating equations. While C2ER shared the actual equations with this study's authors, they are the confidential proprietary intellectual property of C2ER, so it is not possible to disclose them in detail here. However, it is possible to identify which independent variables were statistically significant, even if we cannot disclose the actual coefficients.

Table 1 identifies the independent (driver or determinant) variables in the 2017 estimating equations, along with the statistical significance and fitting statistics, for the Composite Index and the six subindexes that C2ER shared with this research. The independent variables are defined in the following text

These equations will be interpreted in more depth in the Results section since they are crucial in explaining why the cost of living varies from place to place, but it will be useful to interpret one of these equations here to provide an understanding of how they are used.

The left-most column of Table 1 lists the independent variables, the potential determinants of the cost of living in a place. The "Composite" column presents the sign, positive or negative, of each variable in the estimating equation for the Composite (or Total) Cost of Living Index. Each independent variable that has a coefficient sign is a part of that equation. The sign indicates whether a higher value of the independent variable in a county causes an increase (+) or decrease (-) in the cost of living in that county. This means that for the Composite Index, the estimating equation for Pennsylvania (part of Region 36) is:

$$COLI = -A + B*POP15 + C*POPD15 + D*LIPC15 – E*UNEMP16 + F*Region36$$

where A, B, C, D, E and F are numbers (coefficients) that cannot be disclosed here.

Table 1
2017 Estimating Equations for the Composite Index and All Six Subindexes

Variable	1 COMPOSITE		2 GROCERIES		3 HOUSING		4 UTILITIES		5 TRANS-PORTATION		6 HEALTH CARE		7 MISCELL-ANEOUS G&S	
POP15	+	***			+	***			+	***				
POPD15	+	***	+	***	+	***	+	***	+	***	+	**	+	***
LIPC15	+	***	+	***	+	***					+	***	+	***
UNEMP16	-	**					+	***						
IPCG1					+	*								
LMHI15									+	***				
Constant	-	***	+		-	***	+	***	-		-		-	
Region														
3	-		-		+		-		-		+		-	
4	+	**	+		+	**	-	***	+	**	+	***	-	
5	+	***	+	***	+	***	+		+	***	+	***	+	
6	+		+		+	**	-	***	+		+	***	-	
7	+	***	+	***	+	***	+		+	***	+	***	+	***
8	+		+		+		+		+		+	**	+	
9	+		+		+		-		+	**	+	***	-	
10	-		+		-		-	**	+		+	***	-	
12	-		-		-		-		+		+	***	-	
13	-		-	***	+		-		+	***	+	***	-	
14	+		-		+		-	**	+	**	+	***	-	
15	-	*	-	*	-		-	**	-		+	**	-	*
16	-		-		+		-		-		+	***	-	
17	-		-	**	-		-		+		+		-	
18	+		-		+		-	***	+		+	**	-	
19	+	***	+	**	+	***	+	***	+	**	+	***	+	***
20	+	***	+	***	+	***	+		+		+		+	
21	+	***	+	**	+	***	+	***	+	***	+	***	+	***
22	-	*	-	**	-		-		+		+		-	**
23	+		+		-		-		+		+	***	+	
24	-		-		-		+		-		+	**	-	
25	-		-		-		-	**	+		+		-	
26	+		+		+		-		+	*	+	***	-	
27	-		+		-		-		-		+	***	+	
28	+		+		+		-	**	+		+	***	-	
29	-		-		+		-	*	-		+	*	-	
30	+	***	+		+	**	+		+		+		+	*
31	+	*	+		+		-	*	+	***	+	***	+	
32	+		+		+		-	*	+	***	+	*	+	
33	-		+		-		-	**	+	**	+	*	-	
34	-	*	-	*	-		-	*	-		+		-	
35	+	***	+	***	+	***	-	***	+	***	+	***	+	**
36	+		+		+		+		+	***	+		-	
37	+		+		+		+		-		+	***	+	*
38	+		+		+	**	+		+		+		-	
39	-		-	*	-		-	**	-		+		-	
40	-	*	-	***	+		-	*	-		+	**	-	**
41	+		-		+		-	**	+	***	+		-	
42	+		-		+	**	-		-		+	***	-	
43	+		+		+		-		+	***	+	***	-	
Adj R sq	0.865		0.631		0.844		0.395		0.724		0.594		0.569	
F stat	38.06		11.34		32.19		4.95		16.52		9.84		9.00	
Prob F	0.000		0.000		0.000		0.000		0.000		0.000		0.000	
n	255		255		255		255		255		255		255	

Source: C2ER. Statistical Significance: *10%, **5%, ***1%

This means that the overall (Composite) cost of living in a Pennsylvania county is equal to:

-A, the "constant", if all the other independent variables were zero, theoretically;

plus B times the county's population in 2015;

plus C times the county's population density in 2015;

plus D times the log of the county's income per capita in 2015;

minus E times the county's unemployment rate in 2015-16;

plus F points for being in Region 36 (Pennsylvania and West Virginia) rather than some other region of the country, to account for "all other variables."

Given data for the determinant variables (population, density, income, unemployment rate, and region) for a county, this equation will yield an estimate for the composite COL for that Pennsylvania county.

Some of the coefficients are less than one, with several leading zeroes, and seem quite small, but this is partially the result of the corresponding independent variable being a large number, such as population, which is in the millions for large counties like Philadelphia.

The asterisks after the signs in the table refer to statistical significance. A statistical test called the t-test indicates whether the coefficient is so small that it's not possible to be sure that it isn't zero, or alternatively, that it's possible to be very confident that the coefficient is not zero. If the coefficient is not zero, the conclusion is that this variable does affect the cost of living in an area. The larger the t-statistic, the more confident we can be that the coefficient is not zero and the variable has an effect on COL. A single asterisk means that the level of significance is 10 percent, meaning it's possible to be 90 percent confident that the coefficient is not zero. Two and three asterisks mean 5 percent and 1 percent respectively, and a corresponding confidence of 95 percent and 99 percent that the coefficients are not zero. The more asterisks, the more confidence that the variable in question actually does affect cost of living in a place.

Note also that all the coefficients in the equations in Table 1 are statistically different from zero at least at the 10 percent level of significance, with the exception of some of the Region dummy variables for some subindexes.

The last row of Table 1 shows "n" or sample size; these equations used data on COL and the independent variables for 255 areas. The three rows above that show so-called "fitting statistics" for the equations. These include the adjusted R^2, which gives an estimate of how much of COL variation across counties is explained by the variables in the table. For the Composite index, the adjusted R^2 is 0.865, which means the independent variables in the Composite equation account for 86.5 percent of the variations in COL from county to county in those 255 urban areas; 13.5 percent of the COL differences across areas remains unexplained or due to other factors not in the equation. The F-statistic in the table is a statistical measure similar to the t-statistic mentioned previously, except it measures whether *all* the coefficients in the equation are equal to zero—in other words, whether this equation tells us anything at all about COL. The larger the F statistic the more confident one can be

that the equation does tell about the process underlying COL differences across places. The "prob F" in the table gives the probability for the F statistic, which is the level of statistical significance for the equation. The closer to zero, the closer confidence is to 100 percent that the equation tells something useful about COL. Notice that the "prob F" is zero to four decimal places for all the estimating equations, meaning they all tell something useful about why COL varies from place to place.

After the estimating equations have been specified, they can be used to generate estimates of the *COLI* indexes for all counties. Since C2ER no longer creates *COLI* data for the six subindexes, it was necessary for this research to use the estimating equations and the relevant raw data for the independent variables to generate COL estimates for the 3,114 counties of the country for the subindexes. It was necessary to calculate the estimates for all U.S. counties, rather than just those in Pennsylvania, to rebase each index so that 100.0 represents the average for all counties of the nation. This provides a better understanding of the relationship of the cost of living in Pennsylvania counties to the rest of the nation, and helps to clarify the meaning of the index values.

In the data presented subsequently, the COLI values are typically rebased using the average for all U.S. counties. In a few cases, notably the comparisons with data from 1997, it is necessary to use the raw data values as estimated directly from the equations. These cases will be clearly identified.

The independent variables used in the various estimating equations include:

POP15: population of the county in 2015.
Source: U.S. Census Bureau, midyear population estimates program.

POPD15: population density in 2015, in people per square mile.
Source: calculated from POP15 and geographic area data from the U.S. Census Gazetteer.

LIPC15: natural log of income per capita in 2015.
Source: Calculated from data from the U.S. Bureau of Economic Analysis.

UNEMP16: unemployment rate of the county; average of the not-seasonally-adjusted rate from November 2015 to December 2016.[9]
Source: U.S. Bureau of Labor Statistics, Local Area Unemployment Statistics program.

IPCG1: one-year growth rate of income per capita, from 2014 to 2015, not adjusted for inflation.
Source: Calculated from data from the U.S. Bureau of Economic Analysis.

LMHI15: natural log of median household income in 2015.

[9] C2ER chose to use the not-seasonally-adjusted unemployment rate data in estimating its models. Since the data are averaged over 14 months, the major seasonal impacts are smoothed, much as they would be if the seasonally adjusted data were used. It should be noted that since the averages include data for November and December twice, those months' seasonal effects will carry more weight in this estimation than if a 12-month average had been used.

Source: Calculated from data from the U.S. Census Bureau, American Community Survey, 5-year estimates for 2011-15.

Region: 40 regional dummy variables based on states and aggregations of states.
Source: Assigned. Regions 1 (AK) and 11 (HI) were subsumed into Region 3 with CA. Region 2 (AL) is excluded and used as the basis for comparison. Region 36 includes Pennsylvania and West Virginia.

The economic logic underlying these variables is explained in the Results section.

In two cases, LIPC15 and LMHI15, the raw income data are transformed before being used in the estimating equation. In each case, the natural log of the data values is used rather than the actual data themselves. This is a rather simple mathematical process, and it is called a "level-log" regression form. It has the effect of relating the level of the COL index not just to the level of income, but rather to percentage differences in it.[10]

In the case of these two income variables, income per capita and median household income, the level-log form of the equation gave a better fit, i.e., it characterized or quantified the actual relationship between COL and the income variable better than a simple linear, level-level relationship, and thus allowed a more accurate estimate of the COL values than the simple income variable in dollar form.

Table 2 presents summary descriptive statistics for all the independent (determinant) variables for Pennsylvania and all U.S. counties, and Table 3 presents data on the independent variables for the counties of Pennsylvania that are used in the estimating equations.

[10] To better understand the log-form variables, consider a situation where the coefficient on the income variable in the estimating equation is 1.2. In the (non-log) normal or "level-level" regression equation, if the income variable is measured in thousands of dollars, then the equation would be interpreted as "the COL in a county goes up by 1.2 points for every extra $1,000 of income." In the level-log form, it would be interpreted as "the COL in a county goes up by (1.2/100) or 0.012 points for every 1 *percent* increase in income." On a graph, the relationship between COL (on the vertical axis) and income (on the horizontal axis) would graph as a straight line for the level-level regression form, but as an upward curving line for the level-log form, meaning that the COL rises faster and faster as income rises.

Table 2
Descriptive Statistics for Independent Variables

	Population 2015	Population Density 2015	Income per capita 2015	Growth Rate of Income per Capita 2014-15	Median Houshold Income 2015	Unemployment Rate 2016
	people	people per sq mi	dollars	percent	dollars	percent
All Pennsylvania Counties						
Average	191,082	473.9	42,734	3.67	50,316	5.90
Median	86,966	142.5	40,738	3.85	47,313	5.98
Min	4,732	11.9	25,039	-0.85	35,533	3.90
	Cameron	Cameron	Forest	Warren	Forest	Chester
Max	1,567,442	11,688.5	73,803	7.83	85,976	8.13
	Philadelphia	Philadelphia	Chester	Washington	Chester	Fayette
Range	1,562,710	11,676.6	48,764	8.68	50,443	4.23
Count	67	67	67	67	67	67
All U.S. Counties						
Average	103,217.4	252.6	40,527	2.4	46,799	5.26
Median	25,791.5	44.5	38,167	3.3	45,075	4.96
Min	85	0.038	16,007	-30.3	19,328	1.83
	Kalawao, HI	Yukon-Koyukuk, AK	Wheeler, GA	Sully, SD	McCreary, KY	Baca, CO
Max	10,170,292	70,126.9	194,861	29.9	123,453	22.59
	Los Angeles, CA	New York, NY	Teton, WY	Kearney, NE	Loudon VA	Imperial, CA
Range	10,170,207	70,126.87	178,854	60.2	104,125	20.77
Count	3,114	3,114	3,114	3,114	3,113*	3,114

Source: U.S. Census Bureau, U.S. Bureau of Economic Analysis, U.S. Bureau of Labor Statistics.
*Loving County TX nondisclosed

Table 3
Independent Variables for All Pennsylvania Counties

COUNTY	Rural?	Population 2015	Population Density 2015	Income per capita 2015	Growth Rate of Income per Capita 2014-15	Median Houshold Income 2015	Unemployment Rate 2016
		people	people per sq mi	dollars	percent	dollars	percent
Adams	R	102,295	197.2	$45,023	3.83	$60,356	3.98
Allegheny		1,230,459	1,685.4	54,090	4.07	53,040	5.23
Armstrong	R	67,052	102.7	41,456	3.64	44,942	7.46
Beaver		168,871	388.5	43,355	4.62	50,581	6.23
Bedford	R	48,586	48.0	37,022	4.68	45,930	5.83
Berks		415,271	484.8	44,813	3.86	55,936	4.95
Blair	R	125,593	238.9	40,919	4.56	43,981	5.25
Bradford	R	61,281	53.4	39,329	2.01	48,987	6.33
Bucks		627,367	1,038.2	64,306	4.02	77,568	4.63
Butler	R	186,818	236.9	51,790	4.47	60,934	5.11
Cambria	R	136,411	198.2	38,512	3.67	42,107	6.82
Cameron	R	4,732	11.9	44,865	4.15	39,897	7.39
Carbon	R	63,960	167.7	43,829	4.50	49,973	5.98
Centre	R	160,580	144.7	41,344	2.15	52,186	4.17
Chester		515,939	687.5	73,803	2.90	85,976	3.90
Clarion	R	39,498	65.7	36,426	2.46	42,536	6.25
Clearfield	R	80,994	70.8	39,578	4.06	42,257	7.34
Clinton	R	39,441	44.4	36,586	2.42	45,078	6.93
Columbia	R	66,672	138.0	37,307	4.06	45,374	5.54
Crawford	R	86,484	85.4	36,967	3.18	44,579	5.88
Cumberland		246,338	451.6	50,757	3.49	61,820	4.10
Dauphin		272,983	519.9	46,851	4.17	53,754	4.77
Delaware		563,894	3,067.3	57,756	3.80	65,123	4.90
Elk	R	30,872	37.3	43,625	2.25	46,671	5.63
Erie		278,045	347.9	40,425	4.13	45,971	6.52
Fayette	R	133,628	169.1	38,609	4.88	39,636	8.13
Forest	R	7,410	17.3	25,039	3.57	35,533	8.04
Franklin	R	153,638	199.0	41,768	2.75	53,916	5.02
Fulton	R	14,629	33.4	36,837	2.81	48,311	6.16
Greene	R	37,519	65.1	45,760	2.33	46,661	7.40
Huntingdon	R	45,668	52.2	36,195	4.11	44,396	7.03
Indiana	R	86,966	105.2	36,013	4.36	45,195	7.15
Jefferson	R	44,430	68.1	38,242	2.72	42,903	6.83
Juniata	R	24,737	63.2	38,152	5.32	47,398	5.43
Lackawanna		211,917	461.6	42,662	4.12	46,271	5.73
Lancaster		536,624	568.6	44,995	4.67	57,721	4.18
Lawrence	R	88,082	245.9	39,893	4.33	44,571	6.71
Lebanon		137,067	378.8	43,090	3.55	55,499	4.48
Lehigh		360,685	1,045.0	47,537	3.19	56,117	5.47
Luzerne		318,449	357.7	40,746	4.19	45,897	6.38
Lycoming	R	116,048	94.5	41,171	3.07	47,313	6.58
McKean	R	42,412	43.3	40,291	2.21	43,965	6.60
Mercer	R	114,234	169.8	37,820	3.90	44,156	5.99
Mifflin	R	46,500	113.1	35,139	3.94	41,288	5.69
Monroe	R	166,397	273.6	38,043	4.47	57,365	6.29
Montgomery		819,264	1,696.1	71,306	2.96	80,675	4.15
Montour	R	18,557	142.5	50,859	4.13	54,648	4.29
Northampton		300,813	813.7	47,776	4.03	60,972	5.25
Northumberland	R	93,246	203.4	37,689	3.79	42,406	6.36
Perry	R	45,685	82.8	39,884	3.20	57,177	4.62
Philadelphia		1,567,442	11,688.5	49,701	2.93	38,253	6.78
Pike	R	55,949	102.7	40,738	5.01	60,180	6.37
Potter	R	17,093	15.8	35,208	2.78	40,654	7.78
Schuylkill	R	144,590	185.7	39,539	4.47	45,535	6.21
Snyder	R	40,444	123.0	38,519	4.55	49,917	4.78
Somerset	R	75,522	70.3	36,671	2.99	44,587	7.28
Sullivan	R	6,328	14.1	39,995	3.85	44,189	6.69
Susquehanna	R	41,666	50.6	40,317	3.65	50,477	5.54
Tioga	R	41,877	36.9	35,877	2.33	46,494	7.01
Union	R	44,954	142.3	36,391	3.46	49,803	4.80
Venango	R	53,119	78.8	38,205	2.87	43,644	7.20
Warren	R	40,396	45.7	41,745	-0.85	44,020	5.42
Washington	R	208,261	243.0	53,783	7.83	56,450	6.18
Wayne	R	51,198	70.6	37,447	4.08	49,919	5.83
Westmoreland		357,956	348.4	46,764	4.08	52,247	5.87
Wyoming	R	27,800	70.0	41,369	4.30	51,004	6.19
York		442,867	489.8	44,651	3.60	58,269	4.60
Average		**191,082**	**473.9**	**42,734**	**3.67**	**50,316**	**5.90**
Rural Counties		71,464	109.0	39,746	3.61	47,281	6.20
Urban Counties		493,276	1,395.7	50,283	3.81	57,984	5.16

Source: U.S. Census Bureau, U.S. Bureau of Economic Analysis, U.S. Bureau of Labor Statistics.

Cross-Section Analysis: How and Why COL Varies across Counties

Urban-Rural Differentials

A key finding in the previous Center-sponsored studies of Pennsylvania's cost of living is that urban areas tended to have higher costs than rural areas. This study will determine if the urban-rural differential still exists, and if so, whether it has increased or decreased over the years since the last study.

This study will also examine the differential for each of the six subindexes, with the same goal.

The differential is calculated as the percent by which urban costs exceed rural costs; the difference between urban and rural cost indexes is compared to the rural costs, and is expressed as a percentage of the rural costs. The formula is:

$$\text{Urban-rural differential} = [\ (\text{Urban COL} - \text{Rural COL}) / \text{Rural COL}\ ] * 100$$

The differential is based on a ratio of the "urban to rural," so it makes sense to refer to the difference between the areas as an "urban-rural differential," not a "rural-urban differential."

Why COL Varies across Counties

The question of why COL varies from place to place—and why rural costs are typically lower than urban costs—will be explained by examination of which independent variables are found to be statistically significant for each subindex. This is the typical approach in statistical research.

But beyond that, the relative and practical importance will be estimated for each variable for each subindex, for each Pennsylvania county. The specific methodology will be explained in the Results section using the actual data.

Temporal or Trend Analysis

Data Limitations for Temporal Comparisons

The 2000 study created COL estimates for the Composite and six subindexes, using data for 1997. While this research would like to compare the results of the two studies, it is necessary to be a bit careful about temporal comparisons between data from that study and the current one, for several reasons.

First, the 2000 study estimated the COL values for the 67 counties of the state, but not for the rest of the counties nationwide. As a result, the earlier study did not rebase the estimated index values to a national average of 100. Therefore, any comparisons must use raw, un-rebased data for 2017 to make it comparable with the 1997 data. For that reason, the 2017 data reported in this section are different from those presented earlier in this report.

Table 4 shows the adjustment factors used in the index rebasing process. While most of the components had relatively small adjustment factors, the housing sector's adjustment makes a substantial difference in the values of that index, and thus makes a major difference in temporal comparisons for that subindex.

Table 4
Adjustments for Rebasing

Index	Adjustment Factor
Composite	8.4
Groceries	3.5
Housing	23.0
Utilities	1.9
Transportation	3.7
Health Care	3.0
Miscellaneous	3.2

Source: The authors.

Second, C2ER's goal in publishing its *Cost of Living Index* is to compare costs across space for a particular type of family *at one point in time*. C2ER warns that comparing *COLI* index values through time can be problematic. One reason is that the market basket priced changes over time as C2ER updates it in response to changes in goods and services, and in consumer expenditure patterns. Appendix 1 presents the market baskets for the COLI in 1997 and 2016, and it is clear that there are significant differences over that 20-year span both in the items priced and in the weights placed on them.

Another reason to be cautious with temporal comparisons is that the *COLI* data values for a year depend on the cities that participate in that particular year. The indexes in each issue of the *COLI* are adjusted so that each index's average for that issue is 100.0. But this means that the value of that base changes from issue to issue, depending on whether the issue happens to have a larger group of high- or low-cost places participating. Since there are approximately 300 areas participating in each issue of the *COLI*, the effect may not be large, but it will have some impact on comparisons through time.

Third, while the processes used to estimate the COL index values in the 2000 and current studies are similar, they are far from identical. Each study started with a range of potential independent variables and then tested them to see which combinations gave the best estimates based on the actual *COLI* index data being used as the base for that year's study. Several of the key determinants in the 2017 estimating process also registered as important in the 1997 estimating equations: population or population growth was statistically significant in three of the seven 1997 indexes, population density was significant in four of the seven, and some measure of income was also significant in four of the seven. This suggests that both studies capture the impact of several key factors in the spatial cost-of-living process.

However, the two studies resulted in different estimating equations—sometimes quite different. Aside from the variables mentioned previously, the 1997 estimates also sometimes included other variables, such as government cost per worker, electricity and natural gas rates, and a nine-region dummy variable, instead of the more detailed 41-region version in the 2017 models. And the 2017 study makes use of some different income variables and a level-log estimation form rather than the quadratic form sometimes used in the 1997 estimations. So while each study strives to give the best estimates for its particular year, it is important to realize that the differing techniques themselves may result in more than a little difference in COL values across years.

Despite that, the results of the two studies may be expected to be at least broadly comparable, although it is important not to place too much emphasis on small differences in the data from the two time points.

Given these cautions, this study will consider changes in the COL patterns from 1997 to 2017.

Comparison of COL Patterns through Time

The actual comparisons will take the form of calculation of changes in all the COL indexes between 1997 and 2017, accompanied by maps of the changes. A key question is whether the urban-rural differential has changed through time, and that will be the next topic. Finally, there will be an examination of the determinants of COL from the two time points, with the goal of asking whether the determinants have changed over the 20-year period.

Peer State Comparisons

Methodology for Selection of Peer States

It would help put the data for Pennsylvania in perspective to compare it with data from other states. Specifically, it would be useful to compare and contrast Pennsylvania's data with those of peer states—states that are like Pennsylvania in important ways.

But what does it mean to be "like" Pennsylvania? How can peers be identified? While there are virtually infinite numbers of characteristics that could be considered, it makes sense to focus on the characteristics that are relevant for the current study. Since the focus here is on the cost of living in rural and urban areas, it is appropriate to start with each state's breakdown of rural and urban counties. Using the Center for Rural Pennsylvania's criterion for identifying rural counties[11], the counties of each state were classified as rural or urban. In 2010, 71.6 percent of Pennsylvania's counties were rural, and states "like" Pennsylvania would have a similar value. For example, 76.1 percent of Ohio's counties were rural, so Ohio is "like" Pennsylvania on this criterion. In contrast, all of Alaska's counties were rural while all of Rhode Island's were urban, so neither of them would be "like" Pennsylvania.

A second important criterion for "peerness" is size, measured by population. Pennsylvania's official 2010 population was 12,702,379. States that are about Pennsylvania's size would be more appropriate for peer comparisons; Illinois had a population of 12,830,632, only 1.0 percent different from Pennsylvania's. State population varied from less than 564,000 in Wyoming to over 37 million for California in 2010.

Analysis later in this report makes it clear that income levels tend to be an important determinant of a county's cost of living. So some measure of income might be another appropriate criterion. The average (mean) household income in Pennsylvania was $67,282 in the 2006-2010 period, according the Census Bureau. Arizona's $67,436 mean household income was only 0.2 percent different from Pennsylvania's. Mean income varied from a low of $51,064 in West Virginia to $94,306 in Connecticut.

A fourth criterion is the number of counties or county equivalents in the state. Pennsylvania has 67 counties, as do Alabama and Florida. The number of counties in a state varied from just three in Delaware to 254 in Texas.

[11] The Center for Rural Pennsylvania's definition is a county is rural if its population density is less than 284 people per square miles of land in 2010, which was the average population density for Pennsylvania in 2010.

Table 5 shows the correlations among these four characteristics across the states. The correlation coefficient is a measure of the similarity of two variables, and varies between +1.00 and -1.00. A coefficient of +1.00 between two characteristics means that the two characteristics move together perfectly across the states, so if a state has a high value of one variable, it also has a high value of the other, with the two varying together in lockstep. A negative 1.00 coefficient between two variables also means a lockstep movement, but in opposite directions, so that a high value of one characteristic in a state means a low value of the other characteristic. A coefficient of zero means that variations in the two variables across states are not related at all. The table shows that the four characteristics of peerness are not strongly correlated for the most part. The strongest correlation is -0.72 between mean income and percent of counties that are rural, meaning that states that have a *higher* percentage of counties that are rural tend to have *lower* average incomes. The next highest correlation, +0.44, is between population and number of counties in the state, so that states with larger populations also tend to have a larger number of counties, but this is not an especially close (or surprising) relationship. Low correlations imply that the characteristics are measures of different attributes, which is preferable in this context, rather than simply measuring the same thing several times.

Table 5
Correlations among "Peerness" Characteristics

	Population	Mean Income	Percent Rural	Number of Counties
Population	1.00			
Mean Income	0.21	1.00		
Percent Rural	-0.10	-0.72	1.00	
Number of Counties	0.44	-0.35	0.36	1.00

n = 51 states, including D.C. Source: The authors.

To identify Pennsylvania peers, for each of these characteristics the difference between Pennsylvania's value and that for each of the other 50 states (including the District of Columbia) was calculated. These characteristics varied widely in size and range, so absolute percentage difference from Pennsylvania's value was the metric used to place all the variables on a comparable footing. For example, New York's 2010 population was 19,378,102, which was 52.6 percent more than Pennsylvania's 12,702,379; New Jersey's population was 8,791,894, or 30.8 percent lower than Pennsylvania's. Absolute percent difference was used, ignoring the sign on the difference, since it doesn't matter whether a state has a population that is, say, 30 percent more or 30 percent less than Pennsylvania's; it is the 30 percent part that matters for peerness.

While use of absolute percent differences allows combining the four characteristics, we might expect some of these characteristics to be more important than others and thus should be weighted more heavily. It was finally decided that the population, percent rural counties, and mean income characteristics were all more important than the simple number of counties in a state, so weights of 30 percent were used for each of the first three characteristics, and 10 percent for number of counties.

The weighted sum of these four characteristics is named the Peerness Index for this study, and it gives a measure of degree of difference of each state from Pennsylvania. The Peerness Index scores like golf; a lower value is better in terms of similarity to Pennsylvania. A value of zero for a state on the Peerness Index would mean that the state had values for all the characteristics that were identical to Pennsylvania's. The larger the index, the more *un*like Pennsylvania is that state.

The results of this calculation—identification of the peer states—are presented in the Results section.

Comparison of COL Patterns for Peer States

The comparison of Pennsylvania's cost of living data and patterns to those of peer states will simply make use of the same tools that are used in the initial analysis of the Pennsylvania data. That will include examination of the urban-rural differentials to see if their patterns are similar to Pennsylvania's, and also analysis of the contributions of the independent variables to see if the same basic processes are at work in the peer states as in Pennsylvania.

Results

Cost of Living Data for Pennsylvania Counties

The Cost of Living Data

Table 6 presents the 2017 COL data for all Pennsylvania counties for the Composite Index and all six subindexes. The data reported here are the values from the estimating equations, but rebased to make the average across all U.S. counties equal 100.0, for ease of interpretation.[12] The maps in the next section will present some patterns for each of the indexes.

[12] These COL values vary from the Composite Index values published by C2ER for 2017, which average the rebased values from the equations with the published 2016 data to reduce temporal variability.

Table 6
2017 Cost of Living Indexes for All Pennsylvania Counties
(Rebased: All U.S. Counties = 100.0)

County	Rural?	COMPOSITE	GROCERIES	HOUSING	UTILITIES	TRANSPORTATION	HEALTH CARE	MISCELLANEOUS
PA average		**104.1**	**104.6**	**106.4**	**111.7**	**110.0**	**92.1**	**104.9**
Adams	R	106.4	105.1	108.6	107.2	112.1	92.6	101.1
Allegheny		113.0	107.1	134.3	111.0	113.0	94.6	104.2
Armstrong	R	101.6	104.4	102.7	115.0	108.5	91.9	100.1
Beaver		104.1	104.8	108.8	112.4	110.2	92.4	100.8
Bedford	R	100.8	103.5	96.9	111.3	108.7	90.9	98.7
Berks		106.4	105.1	111.6	109.6	111.8	92.7	101.2
Blair	R	103.6	104.3	104.2	110.1	108.4	91.8	100.0
Bradford	R	101.5	103.9	97.0	112.4	109.5	91.4	99.4
Bucks		114.6	108.3	137.6	109.2	116.2	96.0	105.9
Butler	R	108.1	106.2	118.4	109.8	112.3	93.9	102.8
Cambria	R	101.1	103.8	99.2	113.6	107.9	91.2	99.2
Cameron	R	102.8	105.0	107.2	114.8	107.0	92.6	101.0
Carbon	R	104.0	104.8	107.5	111.7	109.8	92.4	100.8
Centre	R	104.6	104.4	101.2	107.6	110.4	91.9	100.1
Chester		117.0	109.2	141.8	107.3	117.1	97.2	107.4
Clarion	R	100.2	103.3	93.0	112.2	107.8	90.7	98.5
Clearfield	R	100.8	104.0	100.4	114.7	107.8	91.5	99.5
Clinton	R	99.6	103.4	93.1	113.8	108.5	90.8	98.5
Columbia	R	101.4	103.6	97.1	110.7	108.6	91.0	98.8
Crawford	R	100.9	103.5	95.2	111.4	108.4	90.9	98.7
Cumberland		109.1	106.1	117.5	107.6	112.7	93.8	102.7
Dauphin		107.2	105.5	114.1	109.2	111.1	93.1	101.8
Delaware		116.0	108.2	142.4	111.1	114.9	95.6	105.7
Elk	R	103.9	104.8	103.3	110.8	108.9	92.3	100.7
Erie		102.7	104.3	104.3	113.0	109.2	91.7	99.9
Fayette	R	99.9	103.8	100.8	116.6	107.2	91.3	99.3
Forest	R	91.6	100.3	71.7	116.3	105.6	87.4	93.9
Franklin	R	104.2	104.5	102.9	109.6	110.8	92.0	100.2
Fulton	R	100.3	103.4	93.8	112.0	109.2	90.8	98.6
Greene	R	103.3	105.2	106.4	114.8	108.9	92.8	101.2
Huntingdon	R	99.3	103.3	94.8	114.0	108.3	90.7	98.4
Indiana	R	99.3	103.3	95.3	114.3	108.6	90.6	98.4
Jefferson	R	100.6	103.7	96.3	113.5	107.9	91.2	99.1
Juniata	R	101.7	103.7	99.5	110.4	109.1	91.1	99.1
Lackawanna		104.5	104.7	107.8	111.3	109.2	92.2	100.6
Lancaster		107.5	105.2	114.0	107.9	112.4	92.7	101.3
Lawrence	R	101.8	104.1	102.2	113.4	108.5	91.6	99.7
Lebanon		105.5	104.8	106.8	108.4	111.2	92.3	100.7
Lehigh		108.0	105.8	117.2	111.1	112.0	93.3	102.2
Luzerne		103.0	104.3	105.1	112.7	109.3	91.8	100.0
Lycoming	R	102.3	104.3	101.7	113.0	109.2	91.8	100.0
McKean	R	101.7	104.1	98.6	113.0	108.2	91.6	99.7
Mercer	R	101.4	103.7	98.2	111.7	108.4	91.1	99.0
Mifflin	R	100.1	103.1	93.2	111.0	107.5	90.4	98.1
Monroe	R	101.5	103.8	100.2	112.5	111.6	91.2	99.1
Montgomery		118.4	109.3	147.2	108.5	117.2	97.1	107.5
Montour	R	108.1	106.0	115.5	107.9	110.7	93.7	102.6
Northampton		107.7	105.8	117.0	110.5	112.8	93.3	102.2
Northumberland	R	101.0	103.7	97.9	112.6	107.9	91.1	99.0
Perry	R	103.3	104.1	99.5	108.6	111.3	91.5	99.6
Philadelphia		128.8	110.3	187.3	120.8	113.8	96.3	108.6
Pike	R	102.2	104.2	103.4	112.5	111.9	91.7	99.9
Potter	R	98.1	103.0	91.0	115.7	107.2	90.4	98.1
Schuylkill	R	102.1	104.0	101.8	112.2	108.8	91.5	99.5
Snyder	R	102.6	103.8	99.5	109.0	109.7	91.2	99.2
Somerset	R	99.4	103.4	94.3	114.6	108.4	90.8	98.6
Sullivan	R	101.3	104.1	100.0	113.2	108.2	91.5	99.6
Susquehanna	R	102.6	104.1	100.6	110.6	109.8	91.6	99.7
Tioga	R	99.2	103.2	91.8	113.9	108.8	90.6	98.3
Union	R	101.6	103.4	94.8	109.0	109.7	90.7	98.5
Venango	R	100.2	103.7	96.6	114.4	108.1	91.1	99.1
Warren	R	103.3	104.4	96.6	110.4	108.2	91.9	100.1
Washington	R	107.9	106.5	125.3	112.2	111.5	94.2	103.3
Wayne	R	101.1	103.6	96.9	111.3	109.7	91.0	98.8
Westmoreland		106.1	105.4	113.4	111.6	110.8	93.0	101.7
Wyoming	R	102.5	104.4	103.0	112.1	109.9	91.9	100.0
York		106.7	105.1	111.2	108.8	112.3	92.6	101.2

Source: Composite Index from C2ER. Subindexes are estimates calculated by the authors from C2ER estimating equations.
Note: Data are NOT weighted for population, as explained later in the text.

Thematic Maps

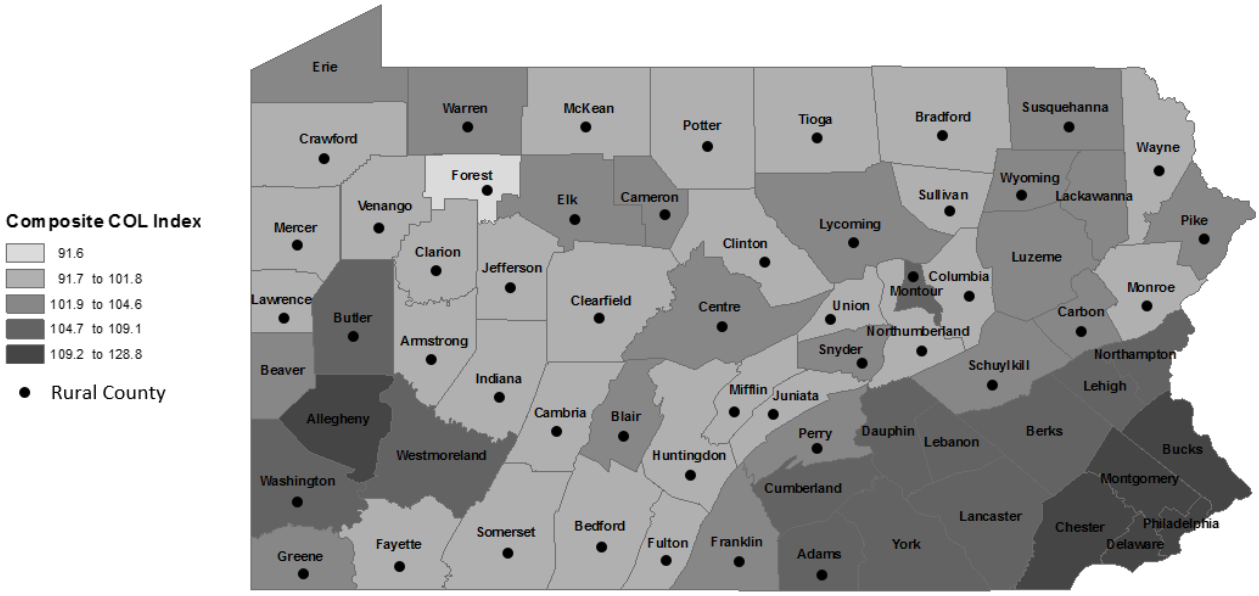
Maps of Cost of Living Indexes

Composite COL Index

Map 1 shows the spatial pattern of the Composite COL Index across Pennsylvania counties. The overall cost of living tended to be highest among counties in the southeastern and southwestern parts of the state.

Philadelphia's Composite Index of 128.8 was the highest in the state, indicating that it costs about 29 percent more to live in Philadelphia compared to the nation as a whole. Of the five other counties with the highest Composite Index, four were in the southeast: Montgomery (118.4), Chester (117.0), Delaware (116.0), and Bucks (114.6). The only other county with a COL that fell within the highest numerical range was Allegheny (113.0) in the western part of the state.

Map 1
Composite COL Index



Source: C2ER. Note: Data are NOT weighted for population, as explained later in the text.

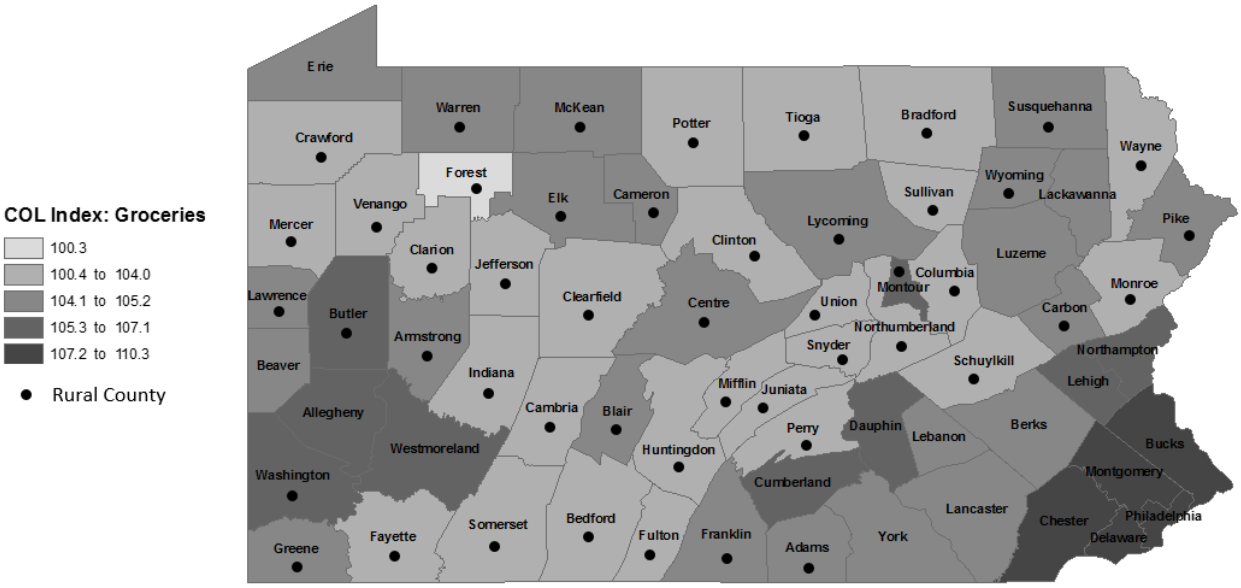
Map 1 also shows that the cost of living tended to be relatively higher in the areas surrounding Philadelphia County in the east and those surrounding Allegheny County in the west. Montour County in the east-central part of the state also had a COL that was comparable to that of the areas surrounding Philadelphia and Allegheny Counties. The northern and southern tiers of the state (except for the western and eastern sections), as well as much of the central part of the state, tended to have a lower COL. The Composite Index was lowest (at 91.6) in Forest County.

Comparing urban versus rural counties, the cost of living tends to be higher in the former. As explained later on in this report, on a population-weighted basis, the cost of living in Pennsylvania's urban counties was, on average, 10.9 percent higher than the state's rural counties.

Groceries Subindex

Map 2 shows that the groceries subindex exhibited the same general spatial pattern as the overall Composite Index. The counties with the highest groceries subindex were also in the southeastern part of the state: Philadelphia (110.3), Montgomery (109.3), Chester (109.2), Bucks (108.3), and Delaware (108.2). This means that grocery costs in Philadelphia, the county with the highest grocery subindex, were about 10 percent higher than counties with the lowest cost groceries in the state.

Map 2
Groceries Subindex



Source: Estimates calculated by the authors from C2ER estimating equations.
Note: Data are NOT weighted for population, as explained later in the text.

In addition to grocery costs being generally higher in the southeastern counties, Allegheny and three of its surrounding counties in the western part of the state, as well as Montour County in the east-central part of the state, also had grocery subindexes that were in the range of 105 to 107.

While there was a sizeable differential in grocery prices between the highest-cost and lowest-cost counties, there was little variation in the groceries subindex among the counties with the lowest grocery costs. For

example, besides Forest County, the 26 lowest-cost counties had grocery subindex numbers that were within a single percentage-point range of 103.0 to 104.0.

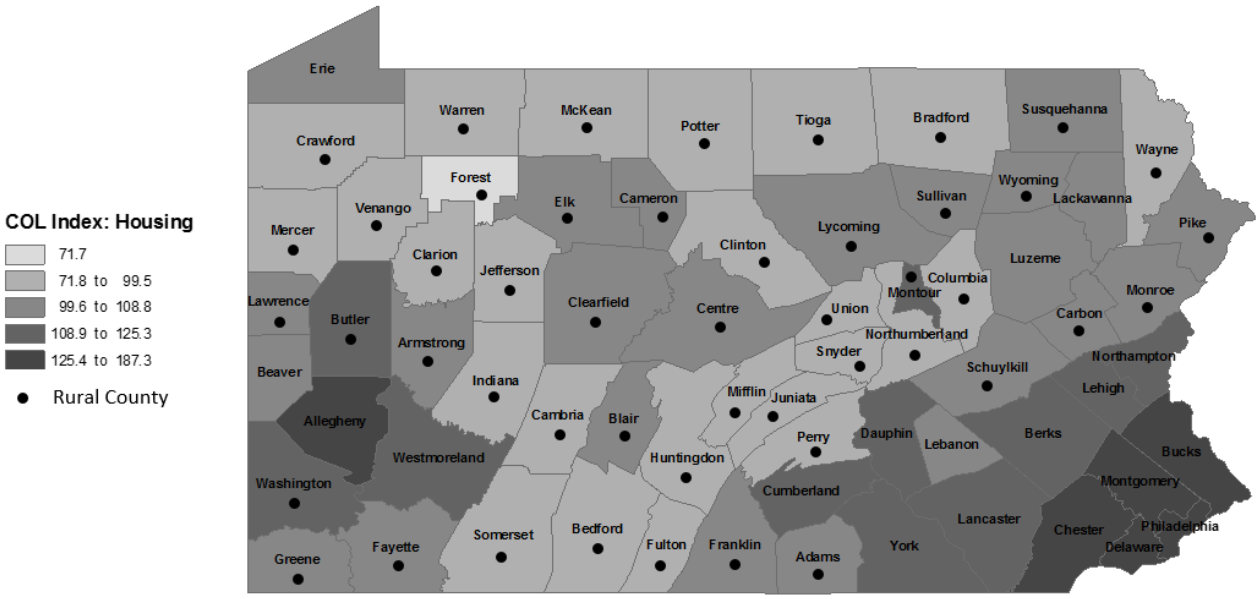
As was true for the Composite Index, urban counties had higher grocery costs compared to rural counties. On a population-weighted basis, grocery costs in urban counties were, on average, almost 3 percent higher than in rural counties.

Housing Subindex

Map 3 shows the spatial pattern of housing costs across Pennsylvania counties. Among the six COL subindexes, the housing subindex showed the greatest range in values, from a low of 71.7 in Forest County to a high of 187.3 in Philadelphia.

Just like the Composite Index and the groceries subindex, the housing subindex was highest in Philadelphia and its four surrounding counties in the southeastern part of the state, along with Allegheny County in the west. The counties beyond the immediate perimeter of Philadelphia and the counties surrounding Allegheny, as well as Montour County in the east-central part of the state, also had relatively higher housing costs.

Map 3
Housing Subindex



Source: Estimates calculated by the authors from C2ER estimating equations.
Note: Data are NOT weighted for population, as explained later in the text.

However, the pattern of relative housing costs seems to have changed in the central part of the state. In the earlier 2000 COL study, Centre County had higher housing costs compared to the surrounding and other nearby counties. The presence of Penn State University in Centre County probably exerts an influence in increasing housing prices there. However, current statistics indicate that housing costs in the nearby counties of Blair, Cameron, Clearfield, Elk, and Lycoming are now comparable to those in Centre County. Indeed, housing costs in four out of these five counties (Blair, Cameron, Elk, and Lycoming) are now *higher* compared to Centre County.

As in the case of the Composite COL and the grocery subindex, urban counties had higher housing costs than rural counties. On a population-weighted basis, housing costs in urban counties were, on average, 32.7 percent higher than in rural counties. In addition to being the category with the highest costs on average (on a population-weighted basis across all of Pennsylvania's counties), housing was also the COL subindex that displayed the biggest urban-rural differential.

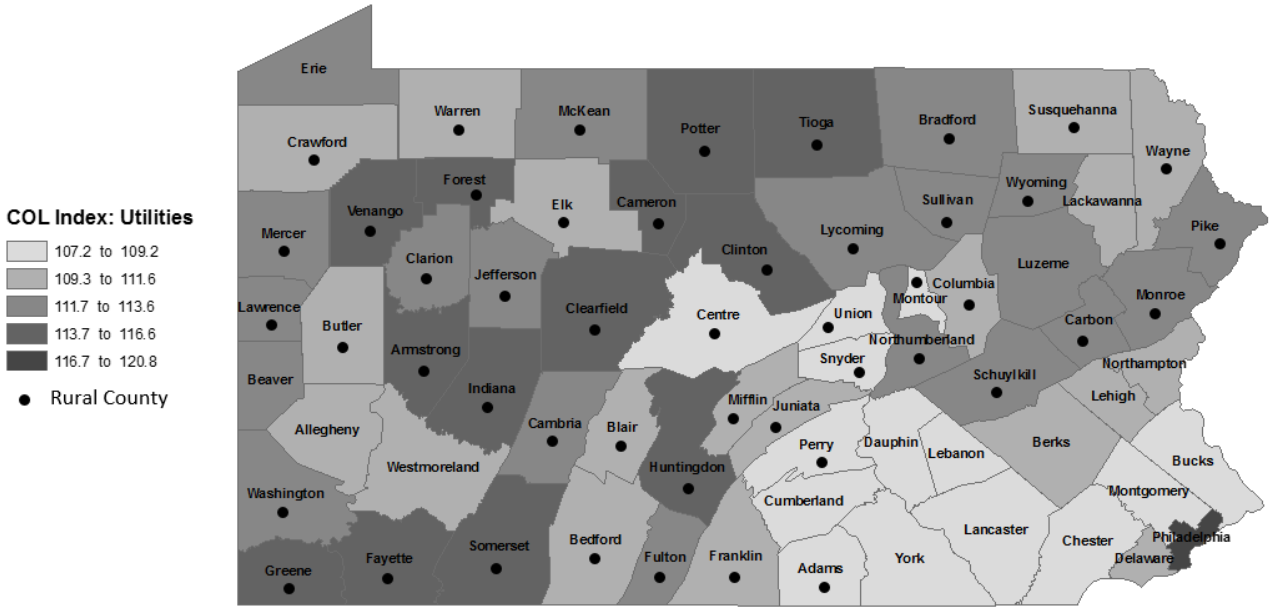
Utilities Subindex

As Map 4 shows, the spatial pattern of utility costs across Pennsylvania counties is quite different compared to the spatial patterns for the other subindex categories. For example, although Philadelphia has the highest cost for utilities, the surrounding and nearby counties had significantly lower costs. Indeed, Chester County had the second-lowest utility costs (after Adams County) among all 67 Pennsylvania counties. Utility costs tended to be lower in the southeastern counties in the state, as well as in some central portions of the state like Centre, Montour, Snyder, and Union Counties.

With the exception of Philadelphia, the areas with relatively higher costs for utilities are in the north, west-central, and southwestern parts of the state.

In contrast to all the other COL subindex categories, average utility costs in urban counties (on a population-weighted basis) were actually slightly lower than in rural counties, by about 0.1 percent.

Map 4
Utilities Subindex

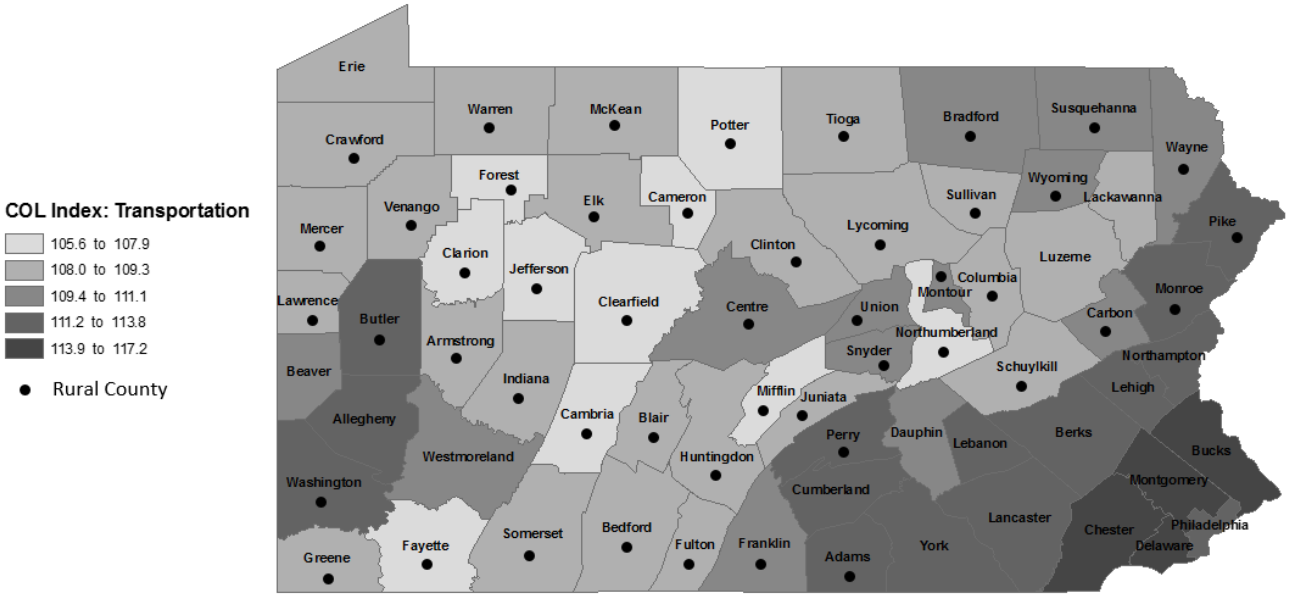


Source: Estimates calculated by the authors from C2ER estimating equations.
Note: Data are NOT weighted for population, as explained later in the text.

Transportation Subindex

Map 5 shows the spatial pattern of transportation costs across Pennsylvania counties. As with most of the other subindex categories, this subindex exhibited the same general pattern of higher costs in the southeastern and southwestern portions of the state.

Map 5
Transportation Subindex



Source: Estimates calculated by the authors from C2ER estimating equations.
Note: Data are NOT weighted for population, as explained later in the text.

Although Philadelphia still had relatively high transportation costs compared to the rest of the state, these costs were even higher in the surrounding counties of Montgomery, Chester, Bucks, and Delaware.

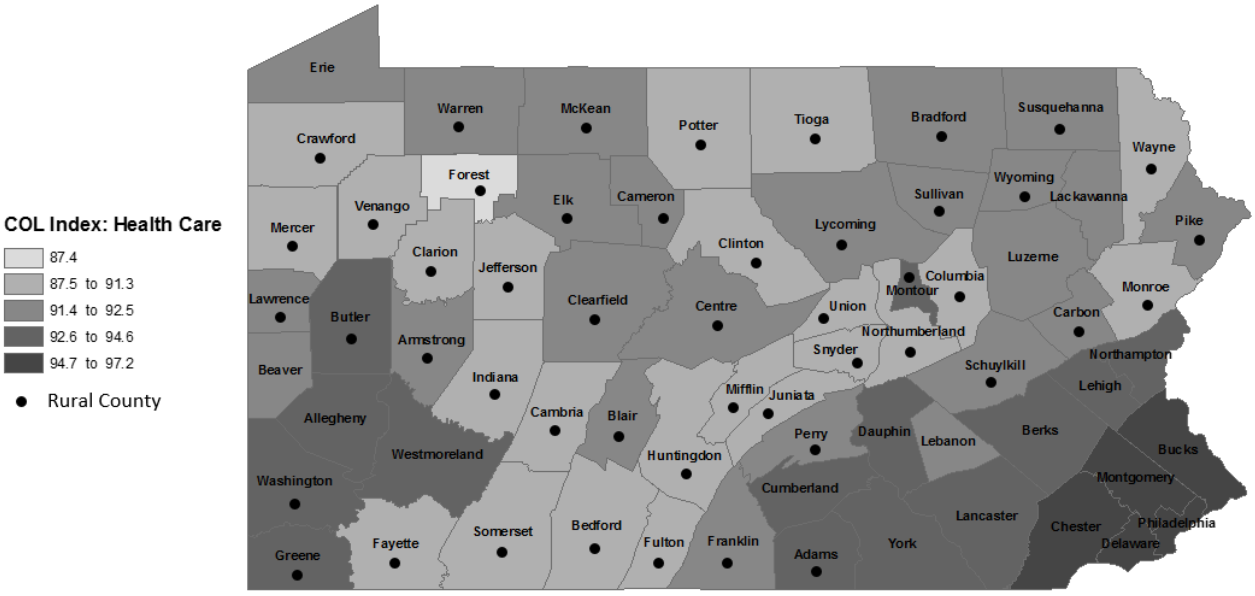
Other areas with relatively higher transportation costs include Allegheny and its bordering counties, as well as other counties in the eastern and southeastern parts of the state.

Transportation costs tend to be higher in urban areas of the state, with average transportation costs in urban counties (on a population-weighted basis) being 3.5 percent higher than in rural counties.

Health Care Subindex

Map 6 shows the spatial pattern of health care costs across Pennsylvania counties. The same general pattern can be seen: health care costs tend to be highest in Philadelphia and its bordering and nearby counties, as well as in Allegheny and its surrounding and nearby counties. Montour County in the east-central part of the state also saw higher health care costs. Other areas with relatively higher health care costs include counties in the north, central, and eastern parts of the state.

Map 6
Health Care Subindex



Source: Estimates calculated by the authors from C2ER estimating equations.
Note: Data are NOT weighted for population, as explained later in the text.

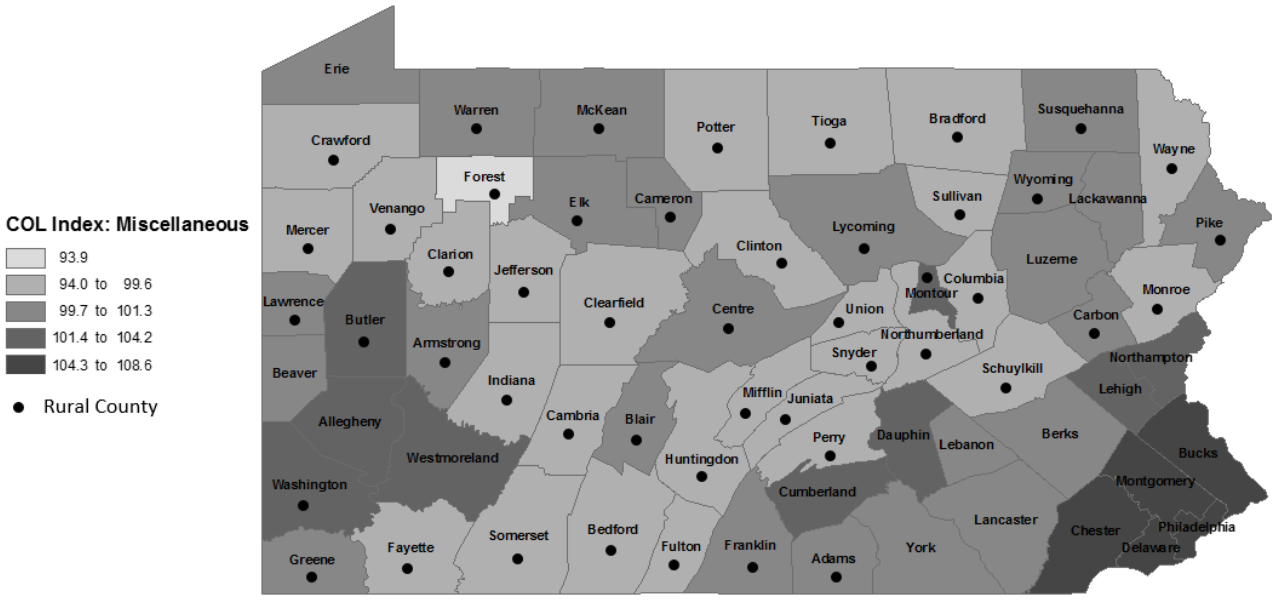
Health care costs in Pennsylvania tend to be higher in urban areas, with average health care costs in urban counties (on a population-weighted basis) being 3.1 percent higher than in rural counties.

Although health care costs vary across the state, the health care category had the lowest costs on average (on a population-weighted basis across all of Pennsylvania's counties), out of all the COL subindex categories. The population-weighted healthcare subindex of 93.8 across all Pennsylvania counties suggests that health care costs in the state are, on average, more than 6 percent lower compared to the rest of the nation. Indeed, all of the state's 67 counties had (unweighted) estimated health care subindexes that were less than the national average.

Miscellaneous Goods and Services Subindex

Map 7 shows the spatial pattern of the costs for miscellaneous goods and services across Pennsylvania counties. The miscellaneous subindex ranged from 93.9 (in Forest County) to 108.6 (in Philadelphia), with an average of 104.9 for the state. Urban areas were 4.3 percent more expensive (on a population-weighted average basis) than rural areas and, in the familiar pattern, Philadelphia and its neighboring counties tended to be most expensive, followed by other counties in the southeast, Allegheny and its surrounding counties in the west, and Montour County in the east-central part of the state.

Map 7
Miscellaneous Goods and Services Subindex



Source: Estimates calculated by the authors from C2ER estimating equations.
Note: Data are NOT weighted for population, as explained later in the text.

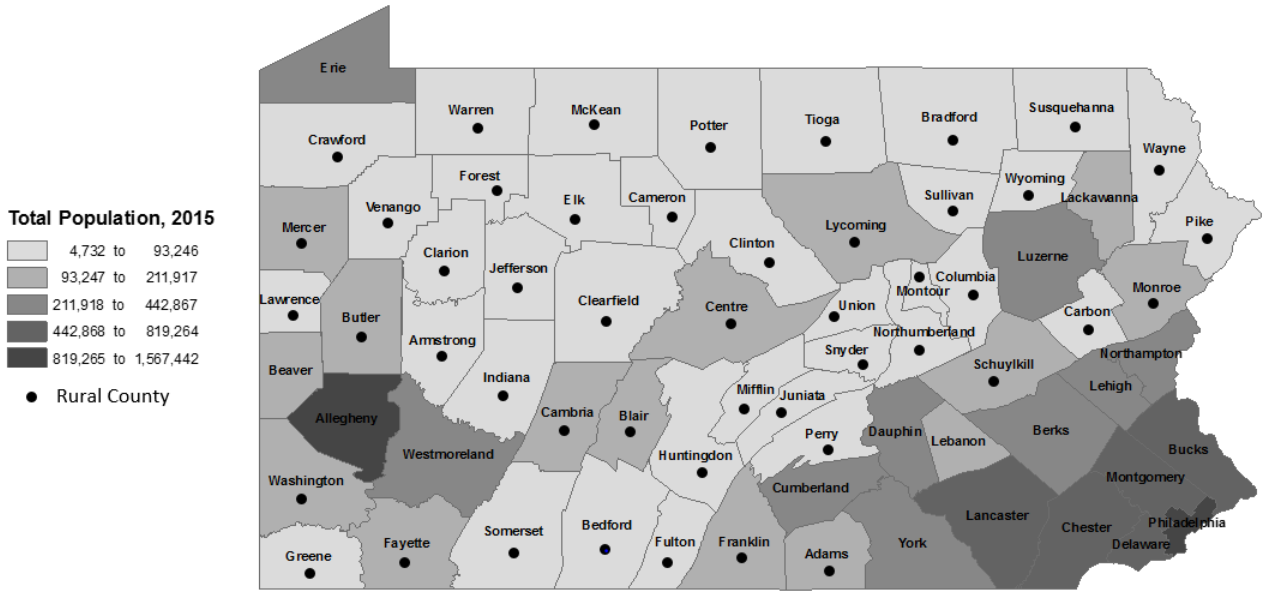
Maps of Independent Variables

Total Population, 2015

Map 8 shows the spatial distribution of population across Pennsylvania counties in 2015. The population centers are clearly in the southeast and southwest portions of the state. The counties with the biggest populations were Philadelphia (1,567,442) and Allegheny (1,230,459), followed by Philadelphia's surrounding and nearby counties, and by Westmoreland County in the southwest. Except for these areas, and Luzerne County in the east, the only other county with a population greater than a quarter million was Erie County in the northwest. The average population per county was 191,082, and the least populous county in the state was Cameron, with 4,732 people in 2015.

The average population of all urban counties in the state was 493,276, while the average population of all rural counties was 71,464.

Map 8
Total Population, 2015



Source: U.S. Census Bureau.

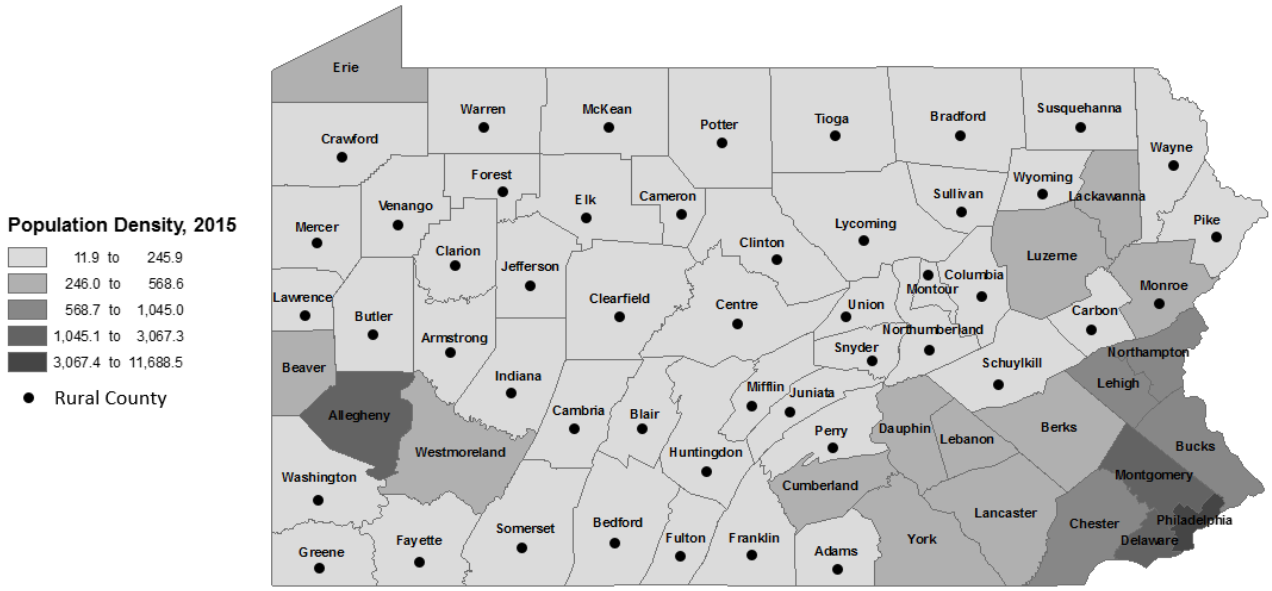
Population Density, 2015

Map 9 shows the spatial patterns of population density across Pennsylvania counties in 2015. The most densely populated county was Philadelphia, with 11,689 people per square mile (ppsm). This was followed by Delaware County (3,067 ppsm) and Montgomery County (1,696 ppsm) outside of Philadelphia, and by

Allegheny County (1,685 ppsm) in the southwestern part of the state. The average population density per county was 473.9 ppsm, with Cameron County having the lowest population density of 11.9 ppsm.

Average population density for all urban counties was 1,396 ppsm, while it was 109 ppsm for all rural counties.

Map 9
Population Density, 2015



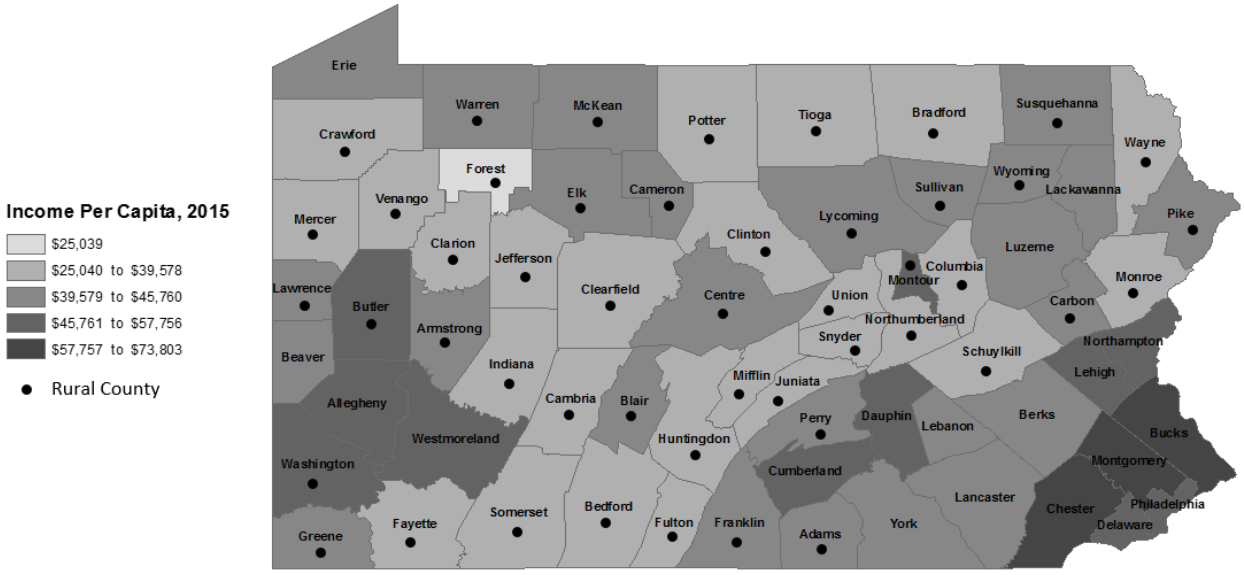
Source: U.S. Census Bureau.

Income Per Capita, 2015

Map 10 shows the spatial patterns of income per capita across Pennsylvania counties in 2015. The counties with the highest per capita incomes were those just outside of Philadelphia: Chester ($73,803), Montgomery ($71,306), Bucks ($64,306), and Delaware ($57,756). This is followed by Allegheny ($54,090) and its surrounding counties, several counties in the southeast including Philadelphia ($49,701), and Montour County ($50,859) in the east-central part of the state. The average per capita income across all counties was $42,734, with Forest County recording the lowest per capita income at $25,039.

Income per capita for all urban counties was, on average, $50,283, while it was $39,746 on average for all rural counties.

Map 10
Income Per Capita, 2015

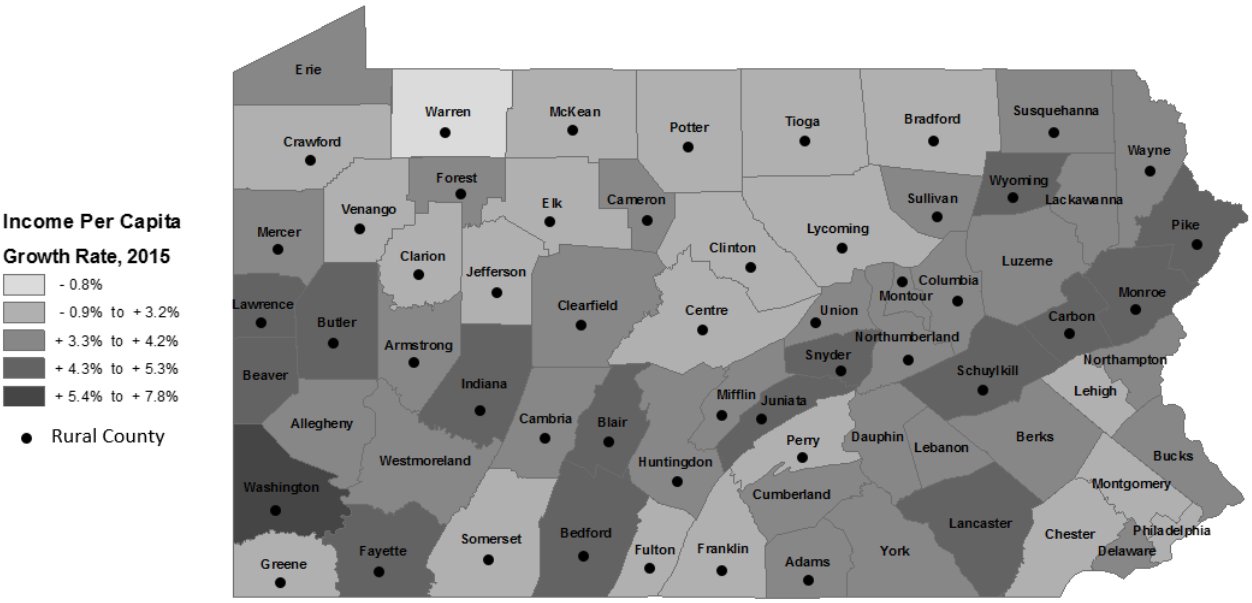


Source: U.S. Bureau of Economic Analysis.

Growth Rate of Income Per Capita, 2014-2015

Map 11 shows the spatial patterns of the one-year (2014-2015) growth rate in income per capita across Pennsylvania counties, not adjusted for inflation. The area registering the highest income per capita growth rate (7.8 percent) was Washington County in the southwest. Other counties with relatively high growth rates were scattered in the southwestern, south-central, and eastern parts of the state. The average growth rate in income

Map 11
Income Per Capita Growth Rate, 2014-15



Source: U.S. Bureau of Economic Analysis.

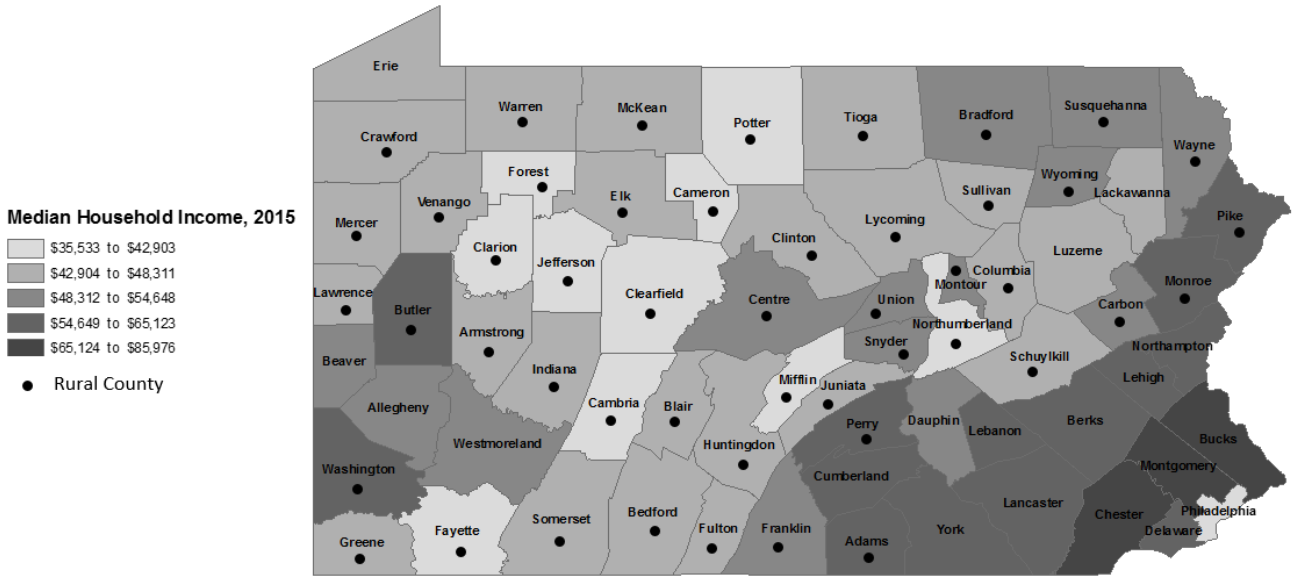
per capita across all Pennsylvania counties in 2014-2015 was 3.7 percent, with Warren County registering a – 0.9 percent growth rate (the only county to experience a negative growth rate during this period).

The average growth rate in income per capita across all urban counties during 2014-2015 was 3.8 percent, slightly higher than the average rural county growth rate of 3.6 percent.

Median Household Income, 2015

Map 12 shows the spatial patterns of median household income across Pennsylvania counties in 2015. As with per capita income, the counties with the highest median household incomes were those just outside of Philadelphia: Chester ($85,976), Montgomery ($80,675), Bucks ($77,568), and Delaware ($65,123). Other counties with relatively high median household incomes were in the southeastern and southwestern parts of the state. Philadelphia registered the *second-lowest* median household income in the state at $38,253, just above Forest County's $35,533. Median household income across all Pennsylvania counties in 2015 was $50,316.

Map 12
Median Household Income, 2015



Source: U.S. Census Bureau.

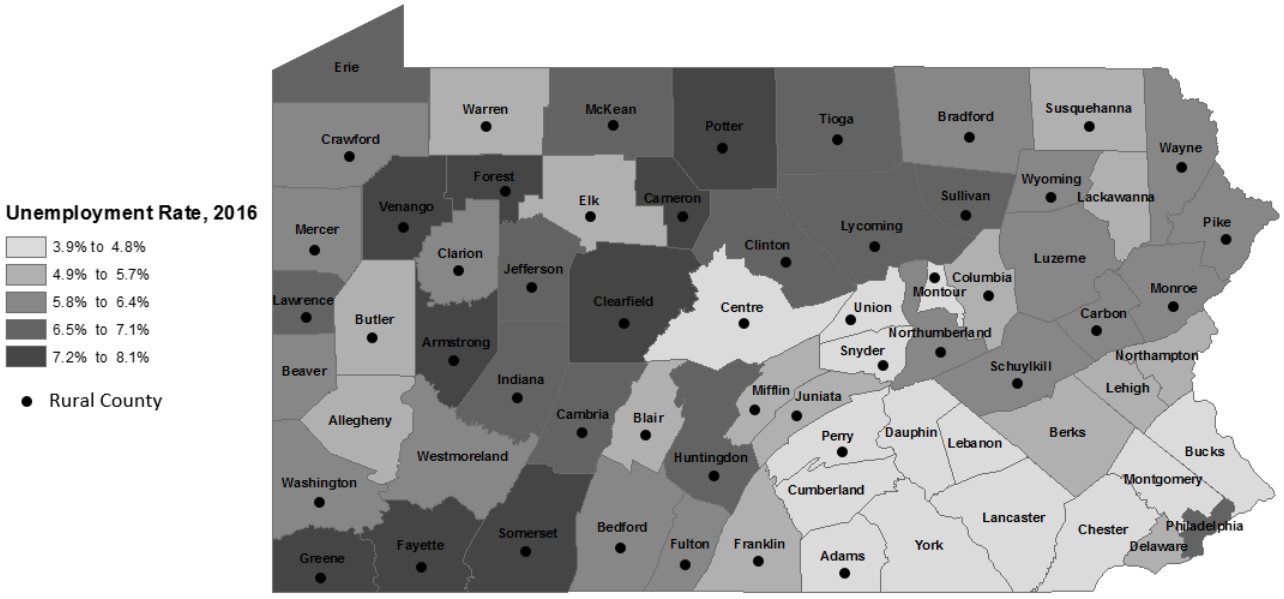
Median household income was $57,984for all urban counties, and $47,281 for all rural counties.

Unemployment Rate, 2016

Map 13 shows the spatial patterns of the average unemployment rate across Pennsylvania counties from November 2015 to December 2016. The counties with the highest average unemployment rates during this period were in the west-central and southwestern parts of the state. Fayette County experienced the highest average unemployment rate (8.1 percent) during this period, while Chester County had the lowest (3.9 percent). Across all Pennsylvania counties, the unemployment rate during this period averaged 5.9 percent, with the lowest rates being registered by counties in the southeast and a few counties in the central part of the state.

The average unemployment rate for all urban counties during this period was 5.2 percent, a percentage-point lower than the 6.2 percent average rate among all rural counties.

Map 13
Unemployment Rate, 2016



Source: U.S. Bureau of Labor Statistics.

Cross-Section Analysis: How and Why COL Varies across Counties

How COL Varies: Urban-Rural Differentials

As Map 1 shows, the cost of living tends to be higher in urban areas and lower in rural areas. The Philadelphia region is especially high cost; the five counties in the Philadelphia area are the five highest cost counties for every one of the COL indexes, except for utilities, which does not follow the general COL pattern, as explained earlier. They are followed by Allegheny County (Pittsburgh) in the number six spot on those same

indexes. Not all rural counties are low cost, though. Rural Butler and Montour counties make it into the top 10 for the Composite Index, with values near 108.

The general pattern for urban versus rural costs of living are given by the statewide average urban-rural differentials, reported in Table 7. Some key conclusions from this table are:

- Once again, in 2017 rural counties tend to be less expensive than urban counties. The average urban county had an overall cost of living that was 7.9 percent more expensive than the average rural county (composite index value of 109.8 vs 101.8).
- This pattern also applied to five of the six subindexes; urban areas tend to more expensive for most goods and services. Utilities was the lone case in which urban costs were a bit lower than rural costs.
- The housing cost differential was especially significant. The average urban county had housing costs that were 23.4 percent higher than costs in the average rural county.
- Urban costs were 2.2 percent to 3.2 percent higher than rural costs for groceries, transportation, health care and miscellaneous goods and services.

Table 7
2017 Urban-Rural Differentials (unweighted)

Index	ALL 67 Counties	RURAL 48 Counties	URBAN 19 Counties	Urban-Rural Differential Index Points	Urban-Rural Differential Percent
Composite	104.1	101.8	109.8	8.0	7.9
Groceries	104.6	104.0	106.3	2.3	2.2
Housing	106.4	99.8	123.1	23.3	23.4
Utilities	111.7	112.2	110.6	-1.5	-1.4
Transportation	110.0	109.0	112.5	3.4	3.2
Health Care	92.1	91.4	93.8	2.3	2.5
Miscellaneous	100.5	99.5	102.9	3.4	3.4

Source: Calculated by the authors from C2ER data and the authors' estimates.

To make statements about the average costs Pennsylvania residents pay, it is necessary to recognize that the higher-cost urban counties typically have significantly more people who are experiencing those higher costs. To take account of this, it is possible to calculate a weighted average cost in each category, in which population is used as the weights. This means that the average urban resident doesn't pay just 23.4 percent more in housing costs, since a disproportionately large percent of urban residents live in Philadelphia where housing costs are 87 percent above the national average, not 23 percent.

To better understand why a weighted average is important, consider a state that has only two urban counties. County A is larger and has 900,000 people and a housing index of 200. County B is smaller and has 100,000

people and a housing index of 100. Calculation of a simple average of the housing indexes of the two urban counties results in an average urban housing index of 150, i.e., (200+100)/2. Yet 90 percent of the urban residents of the state have housing costs that are double the national average, not 50 percent more. To determine what the average urban resident in this state experiences in regard to housing costs, it is necessary to calculate a weighted average, with County A's 200 index getting a weight of 0.9 (900,000 of the total 1,000,000 urbanites), and County B's 100 index getting a weight of 0.1 (100,000 of the 1,000,000 urbanites). That yields an average urban housing cost index of 190, not 150, i.e., (0.9*200 + 0.1*100).

Factoring in population, Table 8 shows population-weighted index values for the state as a whole, and for the average urban and rural resident.[13] Statewide, it says that the average Pennsylvania resident experiences a cost of living that is 10.7 percent higher than the average for American counties, rather than the 4.1 percent that results from a simple unweighted average of all Pennsylvania counties. The higher weighted average reflects the fact that a larger percentage of Pennsylvanians live in urban areas, where costs are higher. The largest difference between the weighted and unweighted averages is in the area of housing. The weighted average tells us that the average Pennsylvania resident experiences housing costs that are 26.8 percent above the national average, rather than the 6.4 percent that obtains from the unweighted county averages.

Table 8
2017 Urban-Rural Differentials (weighted by population)

	ALL	RURAL	URBAN	Urban-Rural Differential	
Index	67 Counties	48 Counties	19 Counties	Index Points	Percent
Composite	110.7	102.6	113.7	11.1	10.9
Groceries	106.5	104.2	107.3	3.0	2.9
Housing	126.8	102.3	135.8	33.4	32.7
Utilities	111.8	111.9	111.7	-0.2	-0.1
Transportation	112.3	109.5	113.3	3.9	3.5
Health Care	93.8	91.7	94.6	2.9	3.1
Miscellaneous	107.6	104.4	108.8	4.5	4.3

Source: Calculated by the authors from C2ER data and the authors' estimates.

The weighted indexes also shed more light on urban-rural cost differentials. The weighted indexes tell us that the average rural resident of the state experiences an overall cost of living that is 2.6 percent above the average for all American counties, while the average urban resident of the state experiences a cost that is 13.7 percent above the national average. So the average urban Pennsylvanian pays a 10.9 percent premium to live in

[13] The statewide averages use each county's percent of total state population as the county's weight. The rural averages use each rural county's percent of total rural population, and the urban averages use each urban county's percent of total urban population.

an urban area. In the housing category, rural residents pay 2.3 percent more than the American average, but urban Pennsylvanians pay 35.8 percent more on average, a differential of 32.7 percent. Notice that the weighted index numbers are higher than the unweighted index, because in each category the counties with the higher costs also tend to be the more populous counties.

Population-weighting the indexes has the effect of increasing the urban-rural differentials for the Composite Index and all subindexes where urban costs are higher than rural costs. The effect of weighting by population is an increase in the urban-rural differential in every category except utilities, where it shrinks from -1.4 percent to just -0.1 percent. The housing category is the one most affected; the weighted differential rises to 32.7 percent from an unweighted differential of 23.4 percent.

How COL Varies: Pennsylvania COL Compared to the U.S.

Compared to the U.S. as a whole, Pennsylvania county costs of living tend to be a bit on the high side—from 4 to 11 percent higher, depending on whether the data are or are not weighted by population. Even the state's rural counties tend to be a bit higher than the overall COL for the nation. In terms of the weighted index, Pennsylvania is especially expensive when it comes to housing (126.8), transportation (112.3), and utilities (111.8). Health care is the only category showing a cost below the national average, at 93.8. And health care is an especially good deal in the state's rural counties where the index was 91.7.

Why COL Varies: the Determinants of Cost of Living

The Independent Variables

Of course, a key question is why the cost of living is higher in some places than others. The estimating equations give us an answer to this. Table 1 presented the estimating equations for all seven of the COL indexes, and in each case there were some independent variables that were discovered to be statistically significant. That is, these are the variables that have been shown statistically to have an impact on the COL in a place, to a high degree of confidence. Table 9 recaps some of the key information from the estimating equations, (omitting the Region dummies and Constant). As has been mentioned previously, all of the coefficients that were retained in the estimating equations are statistically significant at least at the 10 percent level of significance (90 percent level of confidence.)

Table 9
Selected Independent Variables in the Estimating Equations

Variable	1 COMPOSITE	2 GROCERIES	3 HOUSING	4 UTILITIES	5 TRANS-PORTATION	6 HEALTH CARE	7 MISCELL-ANEOUS G&S
Population, 2015	+ ***		+ ***		+ ***		
Population Density, 2015	+ ***	+ ***	+ ***	+ ***	+ ***	+ **	+ ***
Income Per Capita, 2015 (log)	+ ***	+ ***	+ ***			+ ***	+ ***
Unemployment Rate, 2016	- **			+ ***			
Growth Rate of Inc per Cap, 2014-15			+ *				
Median Household Income, 2015 (log)					+ ***		
Adj R sq	0.865	0.631	0.844	0.395	0.724	0.594	0.569
F stat	38.06	11.34	32.19	4.95	16.52	9.84	9.00
Prob F	0.000	0.000	0.000	0.000	0.000	0.000	0.000
n	255	255	255	255	255	255	255

Source: Table 1. Statistical Significance: *10%, **5%, ***1%.

These results tell us that the overall (Composite) cost of living is higher where population, density, and income per capita are higher, and where the unemployment rate is lower.

Do these results fit with economic theory? First the population variable: the larger the population in a place, the more people there are to purchase goods and services. Higher population leads to higher demand for goods and services, which tends to push prices up, at least in the short run. But an alternate hypothesis is also possible: the larger the market in a place, the more room there are for suppliers. Larger places may mean larger numbers of sellers and thus more competition, which tends to push prices down, not up. And larger places may be able to take advantage of economies of scale in production, whereby larger output and sales levels lead to lower cost per unit of production, since production can occur on a larger and more efficient scale. These kinds of economies of scale do not occur for all goods and services, but may occur for some. To the extent that such goods exist, larger population and market size may mean downward pressure on prices. Similarly, larger places may have room for many different kinds of activities, and sometimes this leads to what are called agglomeration economies. These are cost savings that result from the nearby location of complementary activities in an urban area. For example, a large enough place may have room for several different firms in one industry, which leads to more competition. But the larger size may also mean that a supplier for those firms is attracted to the area, resulting in lower input costs for all the firms, and ultimately lower prices overall.

These concepts suggest that either higher or lower prices may be associated with greater population in a place. The previous Center-sponsored research suggests that the effect of population on COL will be positive, that is, a higher population typically results in a higher COL.

In a similar vein, higher consumer incomes can be expected to result in greater demands for all kinds of goods and services, again pushing prices up. The arguments explained earlier for population also apply for income, but the previous Center-sponsored studies have typically found that higher incomes result in higher prices in a place. In the current study, income enters into the estimating equations in two forms: income per capita, and median household income. Both are specified in level-log format, as explained previously. These two variables measure the same economic force, although in slightly different forms, so we would expect them to be highly correlated. Therefore, only one of these two is entered into any one index's estimating equation. But which one should be used? For some of the COL subindexes, the income per capita variable is more appropriate in that it is the one that improves the estimating equation's accuracy more, while for other subindexes the median household income variable is a better fit and therefore is the one used in creating those subindexes' COL estimates.

The growth rate of income per capita can also be a determinant of local cost of living. If the area's income is rising, again we may expect increasing demand for a wide variety of goods and services, pushing prices up. But this effect is especially relevant for goods that cannot easily be shipped into the local area to satisfy the increasing demands. The good for which this is especially true is housing. When the economy of a place grows, either through increases in population or income, demand for housing typically rises. But housing cannot be easily shipped in from other areas, and it takes time for new housing to be created in the local market. In the meantime, housing supply will not keep up with rising demand so housing prices will rise, sometimes dramatically. This means that a higher growth rate typically leads to higher prices locally.

Population density affects the market a bit differently than population itself. Consider two counties, each with the same population of 1 million residents. But if area A has only half the land area of area B for those million people, area A will necessarily be more crowded. The higher density can lead to congestion in transportation of both people and goods, which causes prices to rise. Similarly, if the same amount of demand occurs in both places, the price of land will be higher in the denser county, driving up the price of housing. When land prices are higher, markets typically respond by building up rather than out, so area A might be expected to have more multi-story and high-rise buildings. These are typically more expensive to build per unit than lower density housing due to stronger and more expensive foundations and construction, loss of living area to elevators and stairways, etc. So we might expect higher density to result in higher costs of living.

Finally, the local unemployment rate enters the equation for a couple of the indexes. The unemployment rate may act as a proxy for income in some cases, since more unemployed people will typically mean less income and less demand for goods and services, all other things equal, and that would mean lower costs of living. Note that this is the one variable that is expected to have a negative relationship with COL; a higher value of the unemployment variable in a county is expected to lead to a *lower* value of COL there.

The Region variables (omitted from this table) are often statistically significant, and they are intended to capture "everything else that is different in this region but not in the other variables included already." Some of the Region variables are statistically significant, some positive and some negative, meaning that some regions have higher or lower COLs above and beyond the four variables included in the estimating equation. Pennsylvania is part of Region 36 (along with West Virginia) and it exerts an impact on only the transportation index, and then it acts to increase the cost of transportation.

What does all this mean in practical terms? Specifically, what impact would a higher or lower value of each independent variable have on the cost of living in a county? While the actual coefficients from the equations cannot be disclosed, it is still possible to explain how the driver variables impact the cost of living index values. An example can help to illustrate this. Consider Philadelphia, with a composite index of 128.8, and rural Forest County with an index of just 91.6. The estimating equation indicates that the Composite Index will be significantly higher in Philadelphia than in Forest County because:

- the Population (Pop15) variable has a positive sign, and Philadelphia's 2015 population was 1,567,442, while Forest County's was only 7,410;
- the Population Density (PopD15) variable had a positive sign, and Philadelphia's 2015 density was 11,689 people per square mile while Forest County's was only 17.3 people per square mile;
- the Income Per Capita (LIPC15) variable has a positive sign, and Philadelphia's 2015 income per capita in 2015 was $49,701, while Forest County's was only $25,039; and
- the Unemployment rate (Unemp16) variable has a *negative* sign, and Philadelphia's 2015-16 unemployment rate was 6.78, while Forest County's was higher at 8.04.

Intuitively, these make sense. A county with a larger population and higher incomes may be expected to experience higher demands for goods and services, pushing up prices. A higher unemployment rate has the

opposite effect; more people out of work means reduced demands and lower prices generally. And greater population density typically means increased congestion, which can push overall costs up, and higher housing costs as it is necessary to build up rather than out, which is more expensive.

A review of the (nondisclosed) coefficients in the estimating equations makes it clear that income per capita plays a major role in determining a county's composite cost of living. The other variables contribute to the total effect, but play smaller roles. However, counties that have especially high—or low—values of population, density, and unemployment will feel an impact from those variables.

Tables 9 shows that two to four of the independent variables enter the various equations, along with the constant and Region variables. Population density (PopD15) enters all seven of the index equations, followed by the log of income per capita (LIPC15) in five of the indexes, and population (Pop15) in three. These variables are clearly determinants of the cost of living at the county level in the United States.

An examination of the subindex estimation equations shows that:

- Grocery prices are higher in counties with a higher population density and higher incomes.
- Housing costs are higher in counties with a greater population, higher population density, higher incomes, and greater growth of income in the past year.
- Utility costs are higher in counties with a higher population density and a higher unemployment rate. Note that the effect of the unemployment rate is opposite of what might be expected. The utilities subindex does not fit the generally expected pattern, perhaps because utility prices tend to be heavily regulated by government agencies.
- Transportation prices are higher in counties with a higher population, greater population density, and higher household incomes.
- Health care costs tend to be higher in counties with greater population density and higher per capita incomes.
- The prices of other goods and services tend to be higher where population density is greater and where per capita incomes are larger.

More broadly, population density is statistically significant in all seven of the indexes, with the expected positive sign in every case meaning that higher density leads to higher costs. Income plays a role in six of the

seven, always with a positive effect, with income per capita in five of the indexes and median household income in one. Population size affects three of the seven indexes, always with a positive sign. The growth rate of income affects only one index, housing, and it also has a positive effect. The unemployment rate is statistically significant in two cases, but in one (utilities), it has an unexpected positive sign so that a higher unemployment rate means higher costs.

But statistical significance means only that the impact of an independent variable is not zero. It does not guarantee that the variable's effect is large enough to be of practical importance. As McCloskey and Ziliak (1996) point out, there may be a world of difference between statistical significance and economic or practical significance. McCloskey and Ziliak encourage less focus on statistical significance and more attention to the actual impact of an independent variable on the dependent variable, the variable of interest. In their words (1966, p. 112), there should be "serious attention to the scientific question. The scientific question is ordinarily 'How large is large in the present case?' " In the present case, a study of differences in the cost of living across Pennsylvania counties, this can be interpreted as asking which independent variables contribute most to the cost of living.

Contributions of Independent Variables to All COL Indexes

One way to calculate the contribution of each independent variable to a cost of living index is to use the estimating equations to calculate the index points each variable adds to the total, and then compute that as a percentage of the total COL index value. Table 10 presents this information for the Composite Index. For each of the independent variables (the columns), the table shows the percentage that variable contributes to the total Composite Index for that county. The descriptive statistics at the bottom of the table summarize the impact of each variable across all 67 of the state's counties. Note that the index values are not weighted or rebased; they are the raw data values directly from the estimating equations.

Again looking at Philadelphia as an example, Table 10 tells us that Philadelphia's population of 1,567,442 contributed 1.89 percent of the county's total Composite Cost of Living Index. The county's population density of 11,688.5 people per square mile added another 16.45 percent of the total. The log of Philadelphia's income per capita contributed 152.76 percent of the county total Composite Index, more than offsetting the negative 69.53 percent from the Constant. The county's unemployment rate of 6.78 percent contributed a negative 4.63

percent, reducing the Composite Index, and the fact that Philadelphia is in Region 36 added another 2.89 percent.

Comparing these values for Philadelphia with the averages for all Pennsylvania counties, we see that population and population density played much larger roles in this county than for the other counties in the state, as we might expect since Philadelphia has significantly higher population and density than other counties of the state.

Similar tables showing the contribution of each independent variable to the six subindexes for each Pennsylvania county are presented in Appendix 2.

Table 10
Contributions of Independent Variables to Composite Index

County	Composite Index	Constant	POP15	PopD15	LIPC15	UNEMP16	Region
		%	%	%	%	%	%
Adams	98.2	-84.19	0.15	0.34	183.49	-3.29	3.50
Allegheny	104.3	-79.21	1.69	2.70	175.59	-4.06	3.29
Armstrong	93.7	-88.16	0.10	0.18	190.67	-6.45	3.66
Beaver	96.1	-85.98	0.25	0.68	186.74	-5.25	3.57
Bedford	93.0	-88.83	0.07	0.09	190.06	-5.09	3.69
Berks	98.2	-84.14	0.60	0.83	183.30	-4.09	3.49
Blair	95.6	-86.43	0.19	0.42	186.68	-4.45	3.59
Bradford	93.7	-88.22	0.09	0.10	189.84	-5.48	3.66
Bucks	105.8	-78.12	0.85	1.64	175.94	-3.55	3.24
Butler	99.8	-82.82	0.27	0.40	182.87	-4.15	3.44
Cambria	93.3	-88.60	0.21	0.36	190.28	-5.93	3.68
Cameron	94.9	-87.10	0.01	0.02	189.78	-6.32	3.62
Carbon	96.0	-86.11	0.10	0.29	187.20	-5.06	3.58
Centre	96.6	-85.58	0.24	0.25	185.04	-3.50	3.55
Chester	107.9	-76.56	0.68	1.07	174.57	-2.93	3.18
Clarion	92.4	-89.40	0.06	0.12	190.99	-5.48	3.71
Clearfield	93.0	-88.84	0.12	0.13	191.30	-6.40	3.69
Clinton	91.9	-89.89	0.06	0.08	192.13	-6.11	3.73
Columbia	93.6	-88.31	0.10	0.25	189.10	-4.80	3.67
Crawford	93.1	-88.78	0.13	0.15	189.93	-5.13	3.69
Cumberland	100.7	-82.06	0.35	0.75	180.86	-3.30	3.41
Dauphin	99.0	-83.50	0.39	0.88	182.67	-3.91	3.47
Delaware	107.0	-77.19	0.75	4.79	172.16	-3.71	3.21
Elk	95.9	-86.16	0.05	0.07	187.24	-4.76	3.58
Erie	94.8	-87.18	0.42	0.61	188.11	-5.58	3.62
Fayette	92.2	-89.63	0.21	0.31	192.55	-7.16	3.72
Forest	84.6	-97.73	0.01	0.03	201.34	-7.71	4.06
Franklin	96.1	-85.97	0.23	0.35	186.06	-4.23	3.57
Fulton	92.6	-89.23	0.02	0.06	190.84	-5.39	3.70
Greene	95.3	-86.68	0.06	0.11	189.21	-6.30	3.60
Huntingdon	91.7	-90.13	0.07	0.10	192.43	-6.22	3.74
Indiana	91.6	-90.17	0.14	0.19	192.42	-6.33	3.74
Jefferson	92.8	-89.05	0.07	0.12	191.13	-5.97	3.70
Juniata	93.8	-88.05	0.04	0.11	188.94	-4.70	3.66
Lackawanna	96.4	-85.70	0.31	0.80	185.84	-4.82	3.56
Lancaster	99.2	-83.29	0.77	0.96	181.52	-3.42	3.46
Lawrence	94.0	-87.94	0.13	0.44	189.51	-5.79	3.65
Lebanon	97.4	-84.87	0.20	0.65	184.23	-3.73	3.52
Lehigh	99.6	-82.93	0.52	1.75	181.67	-4.45	3.44
Luzerne	95.1	-86.89	0.48	0.63	187.62	-5.44	3.61
Lycoming	94.4	-87.55	0.18	0.17	189.23	-5.66	3.64
McKean	93.8	-88.08	0.06	0.08	189.99	-5.71	3.66
Mercer	93.6	-88.33	0.17	0.30	189.37	-5.19	3.67
Mifflin	92.4	-89.46	0.07	0.20	190.46	-5.00	3.71
Monroe	93.7	-88.23	0.25	0.49	189.27	-5.45	3.66
Montgomery	109.3	-75.62	1.07	2.60	171.90	-3.08	3.14
Montour	99.7	-82.86	0.03	0.24	182.64	-3.49	3.44
Northampton	99.4	-83.11	0.43	1.37	182.14	-4.28	3.45
Northumberland	93.2	-88.64	0.14	0.36	189.98	-5.53	3.68
Perry	95.3	-86.69	0.07	0.15	186.81	-3.93	3.60
Philadelphia	**118.8**	**-69.53**	**1.89**	**16.45**	**152.94**	**-4.63**	**2.89**
Pike	94.3	-87.62	0.08	0.18	189.19	-5.48	3.64
Potter	90.5	-91.30	0.03	0.03	194.43	-6.98	3.79
Schuylkill	94.2	-87.72	0.22	0.33	188.88	-5.35	3.64
Snyder	94.7	-87.29	0.06	0.22	187.48	-4.09	3.62
Somerset	91.8	-90.04	0.12	0.13	192.49	-6.43	3.74
Sullivan	93.5	-88.37	0.01	0.03	190.47	-5.80	3.67
Susquehanna	94.7	-87.27	0.06	0.09	188.24	-4.75	3.62
Tioga	91.5	-90.29	0.07	0.07	192.62	-6.21	3.75
Union	93.7	-88.16	0.07	0.25	188.33	-4.15	3.66
Venango	92.5	-89.33	0.08	0.14	191.71	-6.31	3.71
Warren	95.4	-86.65	0.06	0.08	187.52	-4.61	3.60
Washington	99.6	-82.98	0.30	0.41	183.86	-5.03	3.45
Wayne	93.3	-88.60	0.08	0.13	189.78	-5.07	3.68
Westmoreland	97.9	-84.43	0.52	0.60	184.67	-4.86	3.51
Wyoming	94.6	-87.34	0.04	0.12	188.86	-5.31	3.63
York	98.5	-83.91	0.64	0.83	182.74	-3.79	3.48
Average	96.0	-86.25	0.27	0.74	186.68	-5.02	3.58
Min	84.6	-97.73	0.01	0.02	152.94	-7.71	2.89
Max	118.8	-69.53	1.89	16.45	201.34	-2.93	4.06

Source: Calculated by the authors from C2ER data.

Table 11 summarizes the contribution averages for all the indexes, averaging across the state's 67 counties. For the Composite Index, the Constant contributes minus 86.25 percent to the index on average, which is more than offset by the contribution of the log of income per capita at 186.68 percent. Population contributes only 0.27 percent and population density just 0.74 percent; together these two variables contribute only about 1 percent, surprisingly. The unemployment rate reduces the index by 5.02 percent on average, and the fact that Pennsylvania is in Region 36 adds 3.58 percent to the overall index.

Table 11
Percentage Contributions of the Independent Variables to all COL Indexes

Variable	Composite	Groceries	Housing	Utilities	Transprtn	Health Care	Misc
Constant	-86.25	15.86	-523.33	84.90	-27.17	-4.80	-24.72
POP15	0.27		0.81		0.28		
PopD15	0.74	0.17	1.99	0.26	0.17	0.12	0.24
LIPC15	186.68	81.30	606.87			103.25	121.83
LMHI15					114.95		
IPCG1			4.65				
UNEMP16	-5.02			11.87			
Region	3.58	2.67	9.00	2.98	11.78	1.43	2.65
Sum	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Constant + Income	100.43	97.16	83.55	84.90	87.78	98.45	97.11

Source: Calculated from Table 10 and Appendix 2 Tables.

One conclusion is that while all of these variables, with the exception of Region, are statistically significant (i.e., not equal to zero) at the 5 percent level of significance or better, some of them are not "practically" significant, in that they add only a very trivial amount to the overall index value, on average. But they still play an important role for places where those variables have very high values, as the density variable did in Philadelphia.

While the numbers in Table 11 make mathematical sense, they are a bit less than intuitive in some respects. Specifically, the large negative contribution of the Constant is a bit difficult to give an intuitive explanation. But paired with that is the large offsetting effect of the (log of) income variables. Perhaps it makes sense to combine the constant and income variables, and consider the combined effect as a kind of "net income" effect. Table 21's last row shows that combined effect.

Considering all seven of the indexes, it is possible to draw some general conclusions. The most important result is that income is the variable that is consistently the most important determinant of the cost of living across all the subindexes, except for utilities. The income variable, either income per capita or median

household income, accounts for 84 to 100 percent of the COL in Pennsylvania counties, on average. Higher incomes in a place mean higher costs of living, clearly.

While income is the key determinant of COL, growth of income in the past year only affected the cost of housing, where it contributed more than 4 percent to the index on average, and more than 8 percent in one county (Washington).

Surprisingly, population size and density play minor roles, together accounting for no more than 3 percent and usually less than 1 percent of COL in Pennsylvania's counties. It is important to note that density, however, does play a more important role in the Philadelphia metro area where it drove up the housing subindex by as much as 55 index points and 36 percent. This suggests that it is not a city's size that leads to high costs of living, but rather its high income.

The unemployment rate has a depressing effect on the overall cost of living, contributing anywhere from -3.2 percent to -6.6 percent across Pennsylvania's counties, with an average contribution of -5.0 percent. Utilities was the only subindex that was individually affected by the unemployment rate, where it curiously had the effect of increasing the COL in counties with higher unemployment rates. As mentioned earlier, the utilities index is "odd man out" in this group, not fitting the standard patterns in several ways. The key contributing variable is the Constant, implying perhaps that there is some key factor other than the independent variables tested by C2ER. The highly regulated nature of utility prices is a likely explanation for this.

How COL Varies: Correlations among the Cost of Living Indexes

Table 12 presents the correlations among the cost of living indexes for all U.S. counties, and Table 13 presents the same data for the counties of Pennsylvania. As might be expected, the cost of living indexes are highly correlated with each other, since the estimating equations tell us that several of the key determinants—population, density, income—exhibit similar patterns across all the indexes. As a result, a county that has a high cost in one component tends to have a high cost in most, or all components. Correlations among the indexes tend to be higher (closer) among Pennsylvania counties than among the counties of the nation. The COL maps presented previously give an excellent visual representation of these relationships.

Table 12
Correlations among COL Indexes: All U.S. Counties
n = 3,113 (excluding Loving County, TX)

	Comp	Groc	Hous	Util	Tran	Heal	Misc
Composite	1.000						
Groceries	0.845	1.000					
Housing	0.960	0.741	1.000				
Utilities	0.321	0.349	0.299	1.000			
Transportation	0.760	0.705	0.706	0.249	1.000		
Health Care	0.622	0.627	0.535	0.015	0.517	1.000	
Miscellaneous	0.884	0.992	0.790	0.315	0.711	0.651	1.000

Source: Calculated by the authors from C2ER data and estimated COL data.

Table 13
Correlations among COL Indexes: All PA Counties
n = 67

	Comp	Groc	Hous	Util	Tran	Heal	Misc
Composite	1.000						
Groceries	0.975	1.000					
Housing	0.984	0.969	1.000				
Utilities	-0.238	-0.237	-0.092	1.000			
Transportation	0.857	0.862	0.808	-0.510	1.000		
Health Care	0.944	0.991	0.930	-0.316	0.875	1.000	
Miscellaneous	0.972	1.000	0.965	-0.248	0.864	0.993	1.000

Source: Calculated by the authors from C2ER data and estimated COL data.

The Composite Index is especially highly correlated with the housing subindex, with a correlation coefficient of 0.96 for all U.S. counties and .98 for Pennsylvania counties. This is not surprising since, of all the goods in the market basket, housing is the one that takes the longest to adjust to changes in demand. If demand in an area rises due to increases in population or income, transportable goods like groceries and clothing can be brought in to meet the demand, helping to keep prices from rising much. But changes in the supply of housing take some time to occur, whether they be in the form of new construction or of subdividing existing housing into smaller units. And most housing cannot be picked up and moved from areas of low demand to areas of high demand. As a result, we might expect housing prices to be higher in larger and growing places. In this regard, notice that the growth rate of income per capita is one of the determinants in the housing cost equation. This means that housing prices will tend to vary more across space than prices of easily transportable goods. This, along with the fact that housing typically accounts for a quarter to a third of a household's budget, makes the housing subindex a key driver of overall cost of living differences across space.

The subindex with the lowest correlation with the others—and negative in the case of Pennsylvania—is utilities. This is also not surprising, given that the prices of several key utilities are typically regulated by state or local governments. That can prevent utility prices from reacting to changes in demand and supply, especially in the short run.

The Cost of Living Indexes through Time: 1997 to 2017

It is appropriate to remind the reader of the caveats explained in the Methodology section about making comparisons of the COL values from 1997 to 2017. Changes discussed here may be an artifact of the differences in procedures in the two studies, or changes in the market baskets priced, or in the determinant variables tested.

Changes in the Cost of Living through Time

First, the levels of the indexes. Table 14 presents data on the population-weighted COL indexes from the 2 years in question. (Note that these data have not been rebased, as explained previously.)

Patterns have changed a bit since the 2000 study, which used 1997 data. Pennsylvanians experienced increases in costs in some categories: transportation increased by 3.9 percent, and miscellaneous goods and services by 3.4 percent. Others decreased: health care and utilities by more than 10 percent each, and housing by 5.7 percent. Overall, the Composite Index decreased by 3.1 percent. Remember that these values are relative to the national average, so a decrease may mean an actual fall in prices or, more likely, it could mean that Pennsylvania's prices rose more slowly than those elsewhere.

Table 14
Change in Weighted Pennsylvania COLs, 1997-2017

Index	1997	2017	Change	
			Points	Percent
Composite	105.5	102.2	-3.3	-3.1
Groceries	102.1	102.8	0.7	0.7
Housing	109.3	103.1	-6.3	-5.7
Utilities	122.0	109.7	-12.3	-10.1
Transportation	104.1	108.2	4.1	3.9
Health Care	102.2	91.1	-11.0	-10.8
Miscellaneous	100.9	104.3	3.4	3.4

Source: Calculated by the authors from C2ER and estimated subindex data.
Note: raw, un-rebased data.

Maps of Changes in Cost of Living

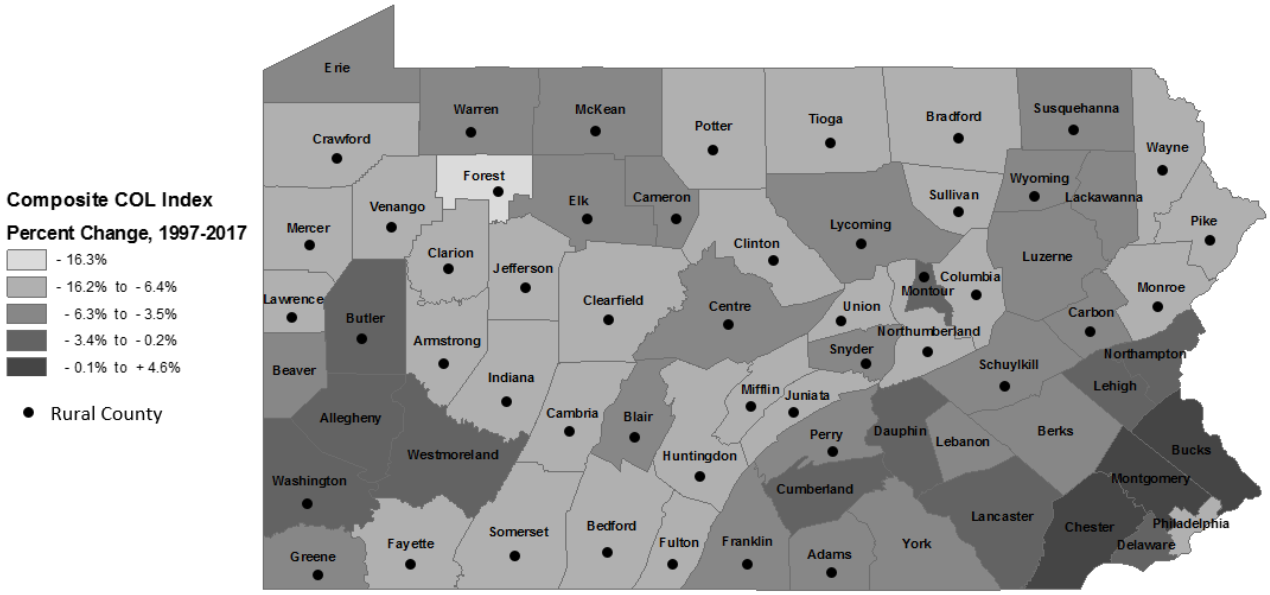
Composite COL Index

Map 14 shows the changes in the Composite COL Index across Pennsylvania counties between 1997 and 2017. Only three counties, all in the southeastern part of the state, experienced an increase in the Composite COL Index during this period: Chester (+4.6 percent), Montgomery (+4.1 percent), and Bucks (+2.2 percent). As seen in Part IV, these counties are among the top five in the state that have the highest overall cost of living in 2017 when compared to the rest of the nation. Although these three counties are all in close proximity to Philadelphia, the Composite COL Index for Philadelphia actually decreased by 6.8 percent during the same period.

All other counties in the state also experienced a decrease in the overall cost of living during this period, with the decrease in the Composite COL Index ranging from –0.3 percent in Allegheny County to –16.3 percent in Forest County.

Comparing urban versus rural counties, the overall cost of living decreased, on average, by a greater amount in rural counties than in urban counties between 1997 and 2017. The Composite COL Index decreased, on average, by 6.6 percent in rural counties and by 2.4 percent in urban counties.

Map 14
Percent Change in Composite COL Index, 1997-2017



Source: Calculated by the authors from C2ER data.

Groceries Subindex

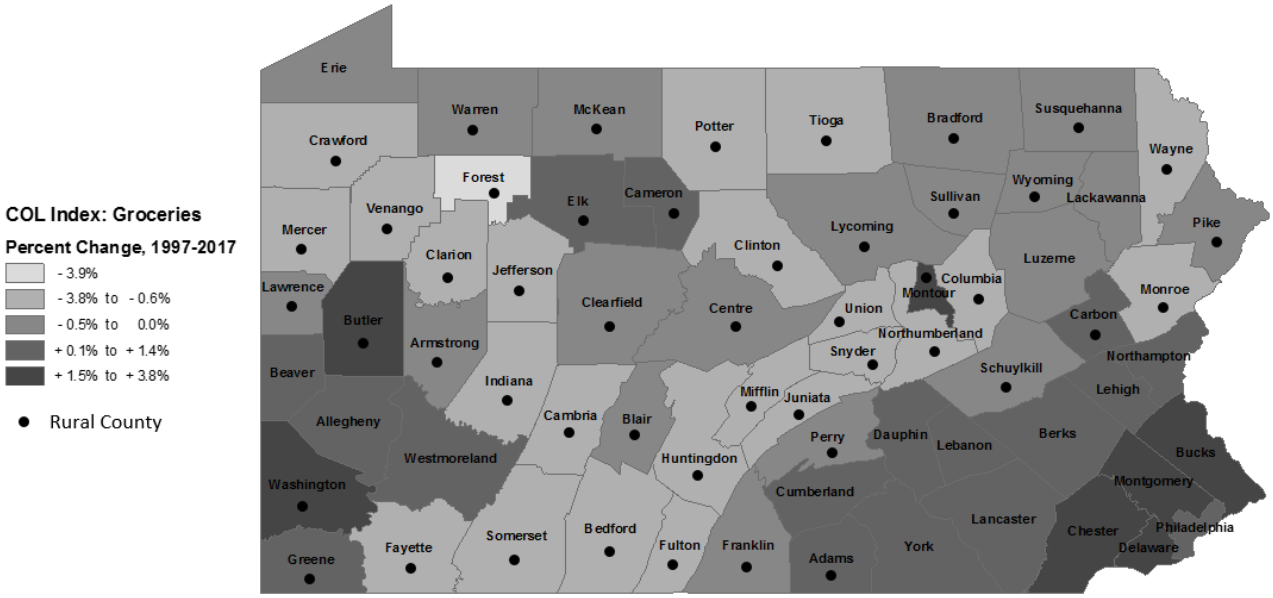
Map 15 shows the changes in the groceries subindex across Pennsylvania counties between 1997 and 2017. The cost of groceries increased in 24 counties, decreased in 42 counties, and remained unchanged in one county (Lackawanna) during this period. The counties in which the groceries subindex increased by the greatest amount are the four that surround Philadelphia: Chester (+ 3.8 percent), Montgomery (+ 3.1 percent), Bucks (+ 2.7 percent), and Delaware (+ 1.8 percent). As seen previously, the first three of these four counties also experienced the biggest increase in the *overall* cost of living during this period.

Although Philadelphia had the highest grocery costs in 2017 (with a groceries subindex of 110.3) among Pennsylvania counties when compared to the nation as a whole, the groceries subindex there increased by only 0.3 percent between 1997 and 2017.

Other counties that experienced an increase in the groceries subindex by more than 0.5 percent during this period include Allegheny and three of its surrounding counties (Butler, Westmoreland, and Washington); several counties in the southcentral part of the state (Adams, Cumberland, Dauphin, Lehigh, Northampton); as well as Cameron, Greene, and Montour Counties. In contrast, Forest County experienced the largest *decrease* in grocery costs, with its groceries subindex falling by 3.9 percent during this period.

Comparing urban versus rural counties, the cost of groceries increased by 0.9 percent, on average, in urban counties but decreased by 0.5 percent, on average, in rural counties.

Map 15
Percent Change in Groceries COL Subindex, 1997-2017



Source: Calculated by the authors from C2ER and estimated subindex data.

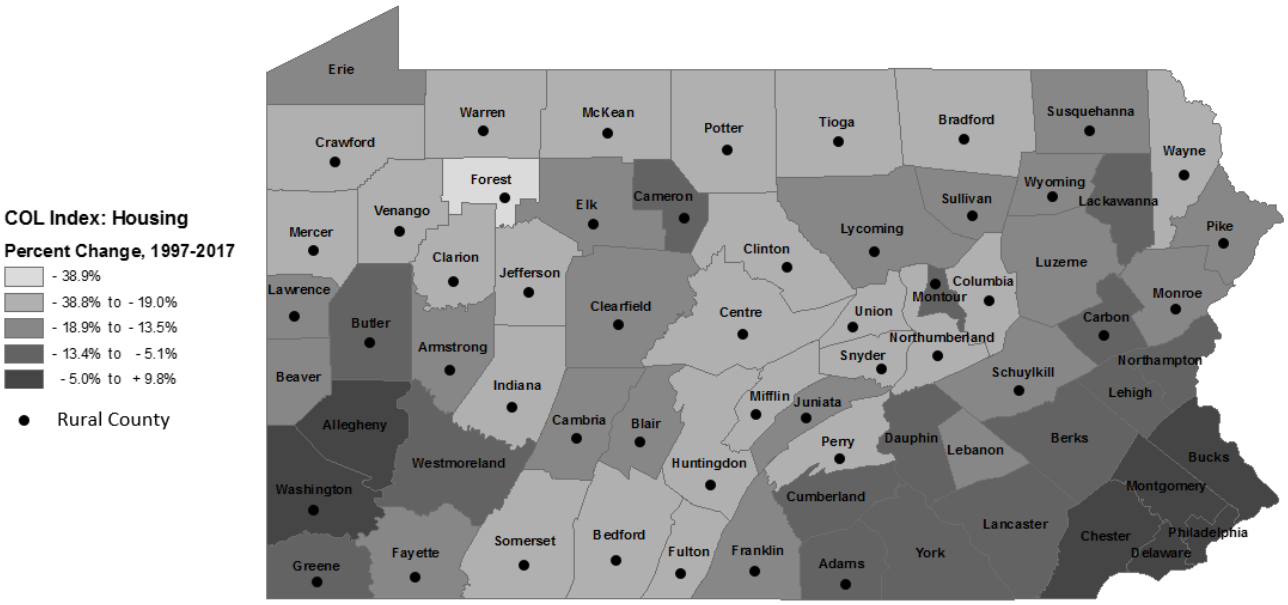
Housing Subindex

Map 16 shows the changes in the housing subindex across Pennsylvania counties between 1997 and 2017. Only six counties experienced an increase in the cost of housing during this period: Chester (+9.8 percent), Montgomery (+9.8 percent), Bucks (+5.7 percent), Philadelphia (+2.4 percent), Washington (+0.8 percent), and Delaware (+0.3 percent). All six, except Washington County, are urban counties. As seen earlier, the first three of these six counties also experienced the biggest increase in the *overall* cost of living during this period.

All other counties in the state experienced a decrease in the cost of housing during this period, with the decrease in the housing subindex ranging from -0.3 percent in Allegheny County to -38.8 percent in Forest County.

Comparing urban versus rural counties, the cost of housing decreased, on average, by a greater amount in rural counties than in urban counties between 1997 and 2017. The housing subindex decreased, on average, by 18.2 percent in rural counties and by 6.7 percent in urban counties.

Map 16
Percent Change in Housing COL Subindex, 1997-2017



Source: Calculated by the authors from C2ER and estimated subindex data.

Utilities Subindex

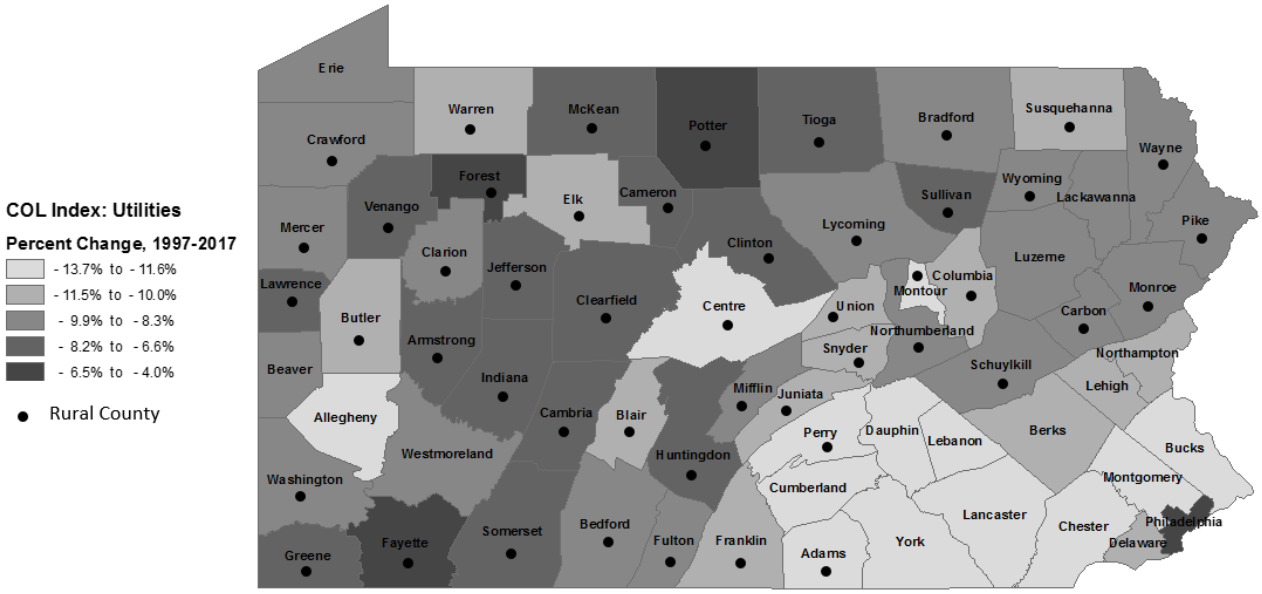
Map 17 shows the changes in the cost of utilities across Pennsylvania counties between 1997 and 2017. All counties in Pennsylvania experienced a decrease in the utilities subindex during this period, ranging from -4.0 percent in Philadelphia to -13.7 percent in Chester County. (Note: In the discussion that follows, the decrease in the utilities subindex does not necessarily mean that the cost of utilities has fallen in Pennsylvania; more likely is that the cost of utilities has risen less here than elsewhere.)

Among the places that experienced the greatest decrease in the utilities subindex during this period are the Philadelphia-area counties of Chester (-13.7 percent), Montgomery (-13.5 percent), and Bucks (-12.3 percent); the southcentral counties of Adams (-13.0 percent), Lancaster (-13,0 percent), Cumberland (-12.9 percent), York (-12.1 percent), Lebanon (-12.0 percent), Dauphin (-11.7 percent), and Perry (-11.8 percent); as well as the counties of Centre (-12.7 percent), Allegheny (-12.1 percent), and Montour (-12.3 percent).

Interestingly, Philadelphia experienced the smallest decline in the utilities subindex during this period, with the subindex falling by 4.0 percent, compared to the average decline in the subindex of 9.5 percent across all Pennsylvania counties.

Also interestingly, in comparing urban versus rural counties, the utilities subindex decreased, on average, by a greater amount in *urban* counties than in rural counties between 1997 and 2017. The utilities subindex decreased, on average, by 10.9 percent in urban counties and by 8.9 percent in rural counties.

Map 17
Percent Change in Utilities COL Subindex, 1997-2017



Source: Calculated by the authors from C2ER and estimated subindex data.

Transportation Subindex

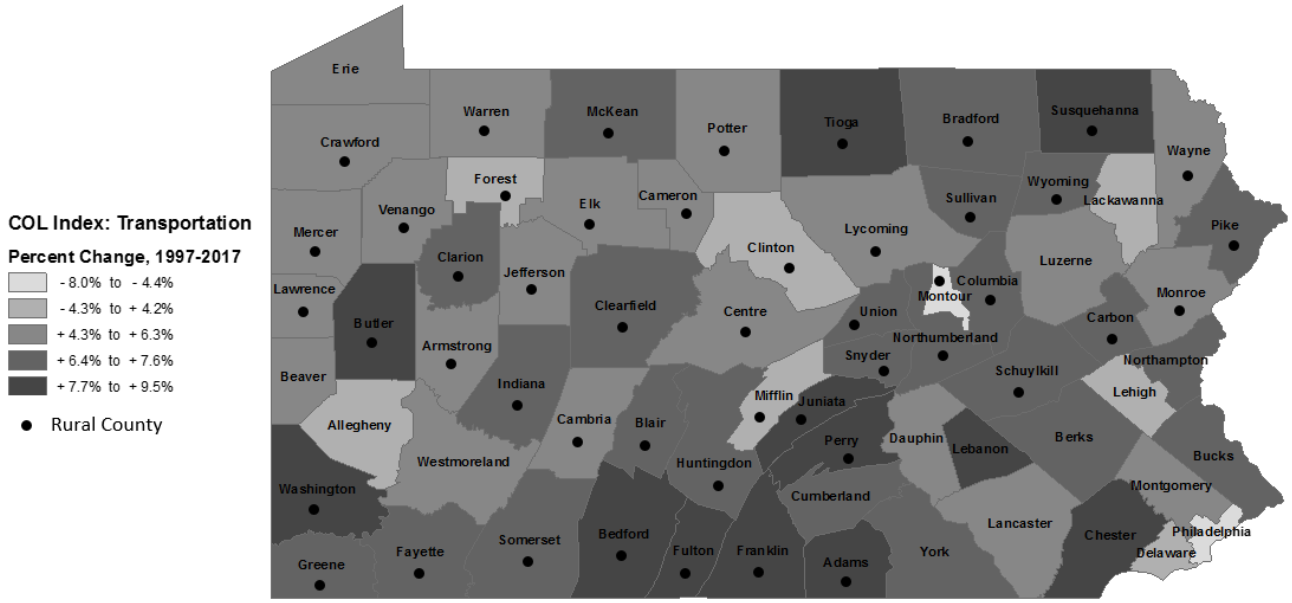
Map 18 shows the changes in the cost of transportation across Pennsylvania counties between 1997 and 2017. All but two counties experienced an increase in the transportation subindex during this period, ranging from +2.0 percent in Delaware County to +9.5 percent in Perry County. The two exceptions were Montour and Philadelphia counties, which experienced declines in their transportation subindex of 4.5 percent and 8.0 percent, respectively.

In contrast to the other subindexes, the counties that experienced the biggest increases in the transportation subindex during this period are more dispersed throughout the state: Tioga (+8.5 percent) and Susquehanna (+9.3 percent) in the north; Chester (+8.1 percent) in the southeast; Perry (+9.5 percent), Fulton (+9.2 percent), Juniata (+8.9 percent), Franklin (+8.6 percent), Bedford (+8.2 percent), Lebanon (+8.1 percent), and Adams

(+8.0 percent) in the southcentral part of the state; and Butler (+8.1 percent) and Washington (+8.1 percent) in the southwestern part of the state.

Comparing urban versus rural counties, the cost of transportation increased, on average, by a greater amount in rural counties than in urban counties between 1997 and 2017. The transportation subindex increased, on average, by 6.6 percent in rural counties and by 4.9 percent in urban counties.

Map 18
Percent Change in Transportation COL Subindex, 1997-2017



Source: Calculated by the authors from C2ER and estimated subindex data.

Health Care Subindex

Map 19 shows the changes in the cost of health care across Pennsylvania counties between 1997 and 2017. All counties in Pennsylvania experienced a decrease in the health care subindex during this period, ranging from -2.1 percent in Greene County to -22.5 percent in Montgomery County.

This does not mean that health care costs have fallen in Pennsylvania. The federal government's Consumer Price Index indicates that the cost of medical care has risen by 102.6 percent in the U.S. between 1997 and 2017, nearly double the 52.6 percent rate of increase for the overall basket of goods and services that consumers buy.[14]

It is important to remember that the Cost of Living Index compares the cost in Pennsylvania counties to the cost in other counties at one point in time. If health care costs did not increase as much in Pennsylvania than in

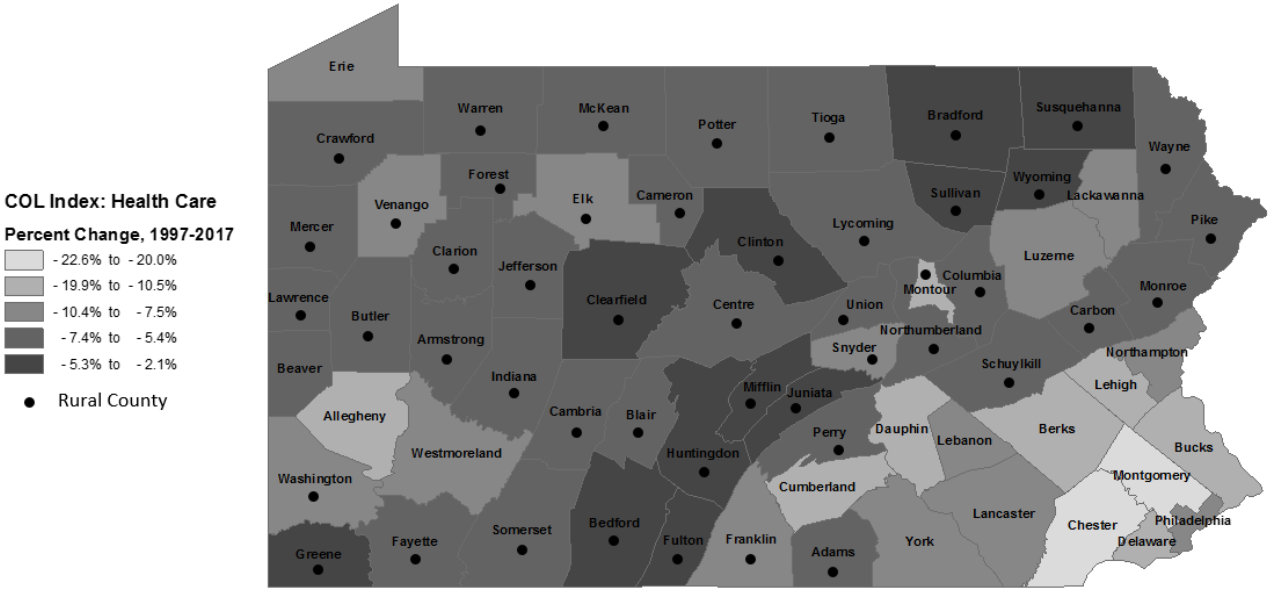
[14] Data are available for the Consumer Price Index from the U.S. Bureau of Labor Statistics, at https://www.bls.gov/cpi/data.htm. Data cited are for the U.S. City Average for All Urban Consumers.

other parts of the country during the 20 years of this study period, that would result in a drop in the (spatial) health care Cost of Living Index for Pennsylvania counties since these costs are now lower than they are in other places—even though the costs are now much higher in both places than they were 20 years ago.

The places that experienced the greatest decrease in the health care subindex relative to other parts of the country during this period are the Philadelphia-area counties of Montgomery (-22.6 percent), Chester (-20.1 percent), Bucks (-13.3 percent), and Delaware (-13.3 percent), as well as Allegheny County (-15.0 percent). Philadelphia experienced a decrease of 8.0 percent in its health care subindex during this period.

Comparing urban versus rural counties, the health care subindex decreased, on average, by a greater amount in urban counties than in rural counties between 1997 and 2017. The health care subindex decreased, on average, by 11.3 percent in urban counties and by 6.0 percent in rural counties.

Map 19
Percent Change in Health Care COL Subindex, 1997-2017



Source: Calculated by the authors from C2ER and estimated subindex data.

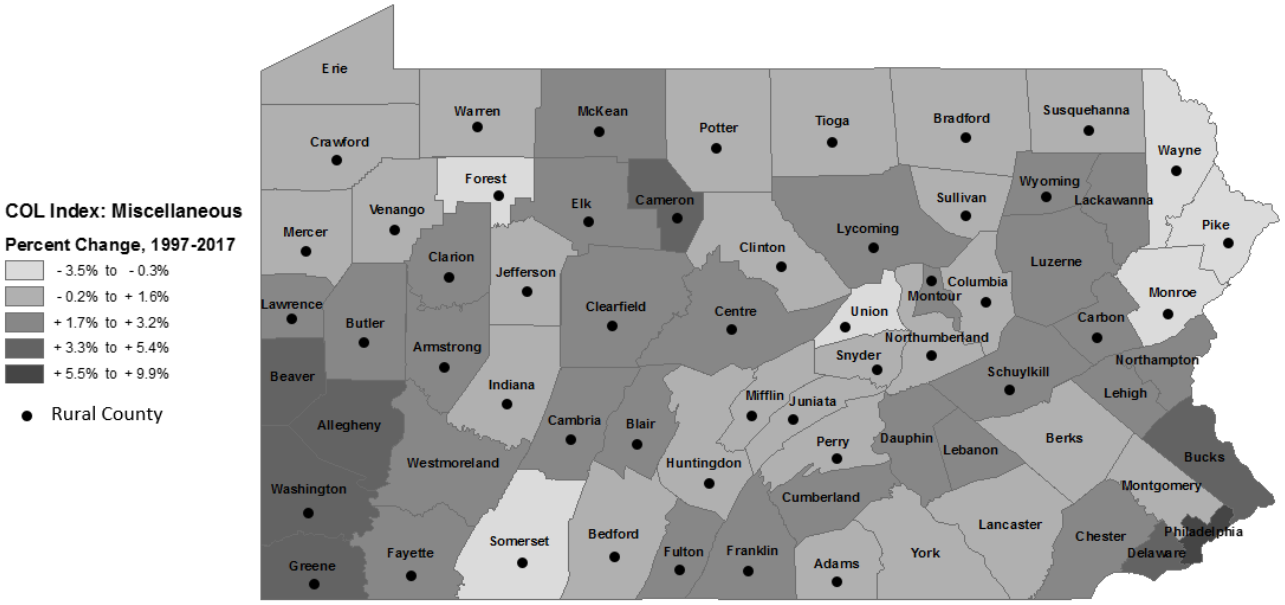
Miscellaneous Goods and Services Subindex

Map 20 shows the changes in the cost of miscellaneous goods and services across Pennsylvania counties between 1997 and 2017. The cost of miscellaneous goods and services increased in 61 counties and fell in the remaining six counties.

Among the counties that experienced the biggest increase in the cost of miscellaneous goods and services during this period are Philadelphia (+9.9 percent), Washington (+5.4 percent), Delaware (+4.6 percent), Bucks (+4.5 percent), Cameron (+4.1 percent), Allegheny (+3.9 percent), Greene (+3.8 percent), and Beaver (+3.5 percent). Across all 67 Pennsylvania counties, the cost of miscellaneous goods and services increased, on average, by 1.8 percent between 1997 and 2017.

Comparing urban versus rural counties, the cost of miscellaneous goods and services increased, on average, by a greater amount in urban counties than in rural counties between 1997 and 2017. The miscellaneous goods and services subindex increased, on average, by 2.9 percent in urban counties and by 1.4 percent in rural counties.

Map 20
Percent Change in Miscellaneous Goods and Services COL Subindex, 1997-2017



Source: Calculated by the authors from C2ER and estimated subindex data.

Changes in Urban-Rural Differentials

Have the urban-rural differentials changed through time? Table 15 presents the population-weighted index numbers for 1997 data from the 2000 study, and Table 16 presents the differentials from the two studies side by side.[15] Note that in the earlier study there were only 42 rural counties, compared with the 48 currently.

[15] Since these differentials are in percentage terms, the issue of rebasing doesn't apply.

Table 15
1997 Urban-Rural Differentials (weighted by population)

Index	ALL 67 Counties	RURAL 42 Counties	URBAN 25 Counties	Urban-Rural Differential Index Points	Urban-Rural Differential Percent
Composite	105.5	100.7	106.7	6.0	6.0
Groceries	102.1	100.9	102.4	1.5	1.5
Housing	109.3	99.4	112.0	12.6	12.7
Utilities	122.0	120.9	122.3	1.4	1.1
Transportation	104.1	98.6	105.6	7.0	7.1
Health Care	102.2	94.7	104.1	9.4	9.9
Miscellaneous	100.9	99.5	101.2	1.7	1.7

Source: Calculated by the authors from C2ER and estimated subindex data.

Table 16
Changes in Weighted Urban-Rural Differentials, 1997-2017

Index	Urban-Rural Differential (%) 1997	2017	Change, 1997-2017 Percentage Points
Composite	6.0	10.9	4.9
Groceries	1.5	2.9	1.4
Housing	12.7	32.7	20.0
Utilities	1.1	-0.1	-1.3
Transportation	7.1	3.5	-3.5
Health Care	9.9	3.1	-6.8
Miscellaneous	1.7	4.5	2.8

Source: Calculated by the authors from C2ER and estimated subindex data.

The latter table shows that the overall urban-rural differential has increased over the period from 6.0 percent to 10.9 percent, making rural areas a better bargain now compared to urban areas than they were in 1997. A major part of this effect is apparently due to housing; the differential for the housing subindex has increased by a whopping 20.0 percentage points. The differential also increased for the groceries and miscellaneous subindexes, but only by 1.4 and 2.8 percentage points, respectively. In contrast, the differentials actually fell for utilities (-1.3), transportation (-3.5), and health care (-6.8). So while the urban cost penalty has decreased in Pennsylvania for some portions of the consumer's budget, overall it has risen in the last 20 years, and has increased significantly for the housing component.

Appendix 3 presents data on the composite and all six subindexes for both 1997 and 2017 for all 67 counties.

Changes in the Determinants through Time

As explained in the Methodology section, the estimating equations for the two time periods were sometimes quite different. Table 17 shows the statistically significant independent or driver variables for each index for each of the two studies (ignoring the Constant and Regional dummy variables.) As in previous tables, a sign in a cell means that this driver was statistically significant in that index's equation. The sign tells the impact of the variable on COL, either positive or negative. A "+/-" indicates that there was a quadratic (nonlinear) formulation in 1997, such that higher values of the independent variable led to higher values of COL but at a decreasing rate. On a graph with the independent variable on the X-axis and the COL index on the Y-axis, the line would rise but at a slower and slower rate, possibly even reaching a peak and falling eventually.

Table 17
Changes in the Determinants of COL, 1997-2017

	COMPOSITE		GROCERIES		HOUSING		UTILITIES		TRANSPORTATION		HEALTH CARE		MISCELLANEOUS	
Determinant	1997	2017	1997	2017	1997	2017	1997	2017	1997	2017	1997	2017	1997	2017
Population		+				+				+	+/-			
Population growth	+												+	
Density	+/-	+	+	+	+	+		+	+/-	+		+		+
Income per capita or Mean household income		+		+		+				+	+	+	+/-	+
Income per cap growth						+							-	
Aggregate income			+				+							
Unemployment rate		-			-			+						
Gov't cost per worker	+				+				+/-					
Electric rate	+		+				+		+				+	
Gas rate							+/-				+			
Adjusted R-squared	0.787	0.865	0.570	0.631	0.765	0.844	0.606	0.395	0.434	0.724	0.688	0.594	0.341	0.569
F-statistic	87	38	37	11	91	32	40	5	19	17	56	10	14	9
Probability (F-statistic)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
n (Sample size)	303	255	303	255	303	255	303	255	303	255	303	255	303	255

Source: Calculated by the authors.

It will be noted that density was a determinant in four of the seven indexes in 1997, and in all seven indexes in 2017, and always with the expected positive effect on COL. Density shows up as a key variable consistently leading to an increase in the cost of living in a county. One of the income variables was significant in four of the seven indexes in 1997 and in six of the seven in 2017, and always with the expected positive effect on COL. Therefore, higher income is also a consistent cause of higher cost of living in a place. Sheer population size affected only one index in 1997, and three in 2017, all with positive effects. Population growth tended to increase COL in two indexes in 1997, and income growth had a similar effect on the housing index in 2017. However, income growth tended to mean a lower COL in the miscellaneous goods and services category in 1997, unexpectedly. Similarly, the unemployment rate had a positive impact on the Utilities index in 2017, meaning that counties with higher unemployment rates tended to have higher COLs, contrary to expectations.

As mentioned earlier, the 1997 equations also included independent variables for aggregate county income, government efficiency as measured by the cost per government worker, and electric and gas rates. All of these played a role in at least some of the COL indexes in 1997, but were not considered in 2017. Still, the goodness of fit, measured by the adjusted R-squared, rose in five of the seven indexes for the 2017 study as C2ER improved the estimating equations.

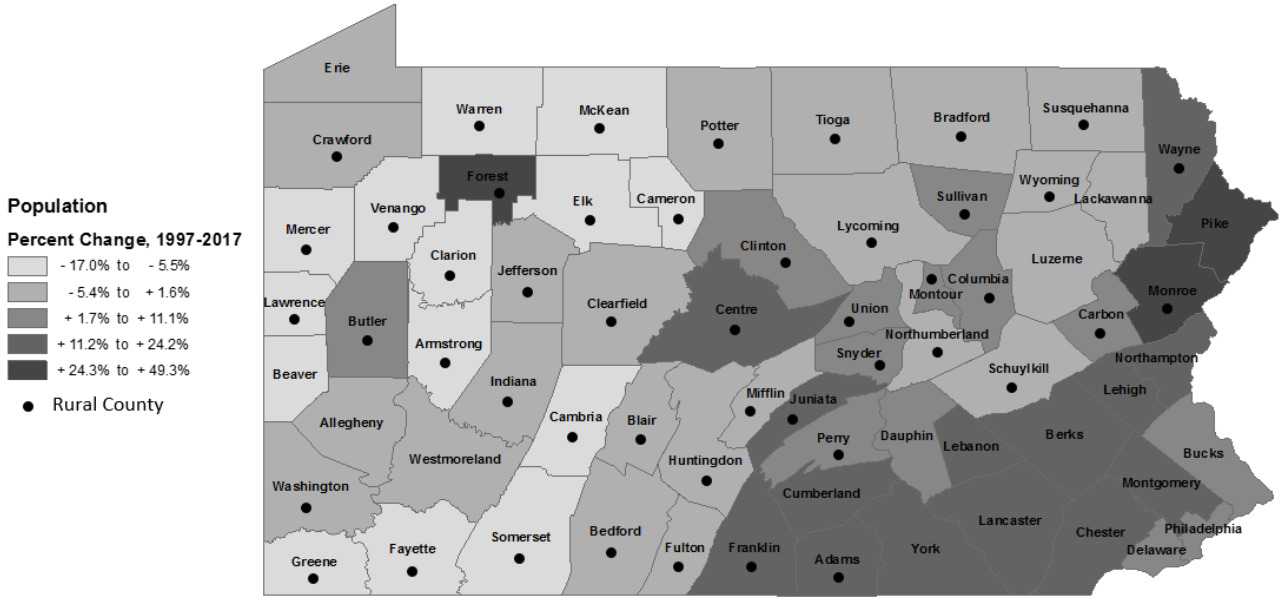
It might be concluded that although the driver variables have changed a bit between 1997 and 2017, income, population and density have continued to cause higher COLs over the years, although more so for some subindexes than for others.

Maps of Changes in Independent Variables

Total Population

Map 21 shows the change in population across Pennsylvania counties between 1997 and 2017. Counties with smaller population sizes appear to have experienced the biggest changes in population during this period. For example, Forest County, the county with the third-smallest population in the state, experienced the biggest increase in population (+49.2 percent) during this period, presumably due in part to the opening of a new state prison, SCI Forest, in 2004 that employs more than 650 full-time. In contrast, Cameron County, the county with the smallest population in the state, experienced the biggest decrease in population (-16.7 percent) during this period.

Map 21
Percent Change in Population, 1997-2017



Source: U.S. Census Bureau.

Across all 67 Pennsylvania counties, population increased, on average, by 4.6 percent between 1997 and 2017.

Comparing urban versus rural counties, population growth was, on average, higher in urban counties (+ 9.6 percent) than in rural counties (+ 2.6 percent) between 1997 and 2017.

Population Density

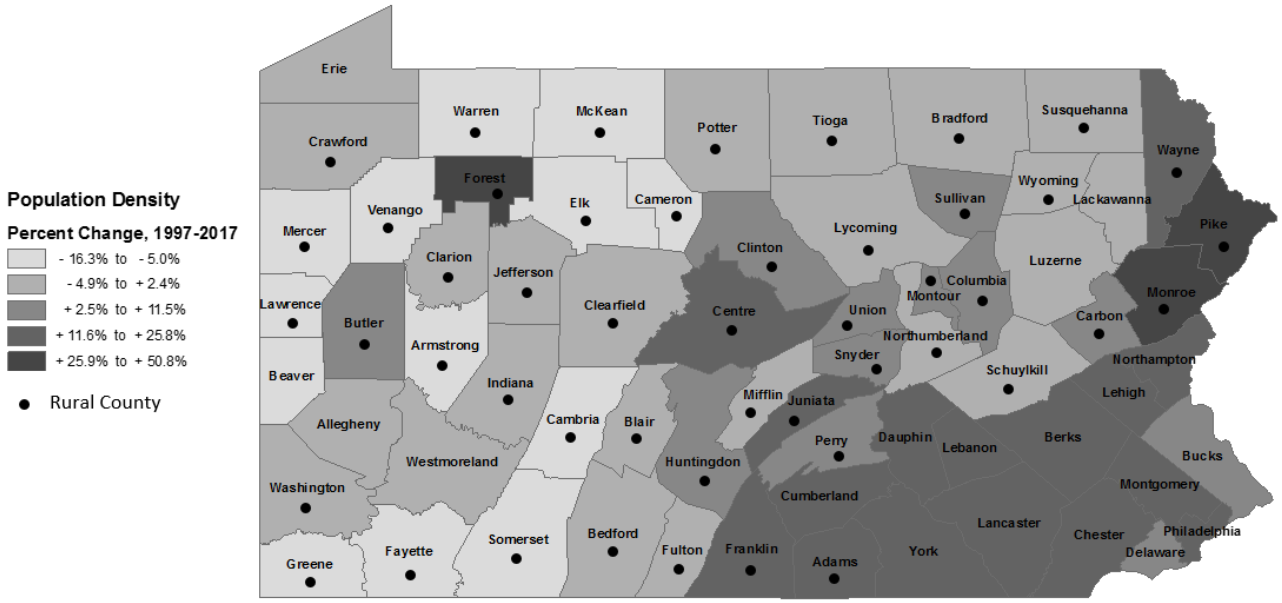
Map 22 shows the change in population density across Pennsylvania counties between 1997 and 2017. Forest County, the county with the third-smallest population in the state but the biggest increase in population during this period, also experienced the biggest increase in population density (+ 50.7 percent).

Pike and Monroe counties also experienced relatively big increases in population density of 48.7 percent and 37.3 percent, respectively. In contrast, Cameron County, the county with the smallest population in the state and also the biggest decrease in population during this period, experienced the biggest decrease in population density (-16.2 percent).

Across all 67 Pennsylvania counties, population density increased, on average, by 6.0 percent between 1997 and 2017.

Comparing urban versus rural counties, population density increased by a greater amount, on average, in urban counties (+11.8 percent) than in rural counties (+3.7 percent) between 1997 and 2017.

Map 22
Percent Change in Population Density, 1997-2017



Source: U.S. Census Bureau.

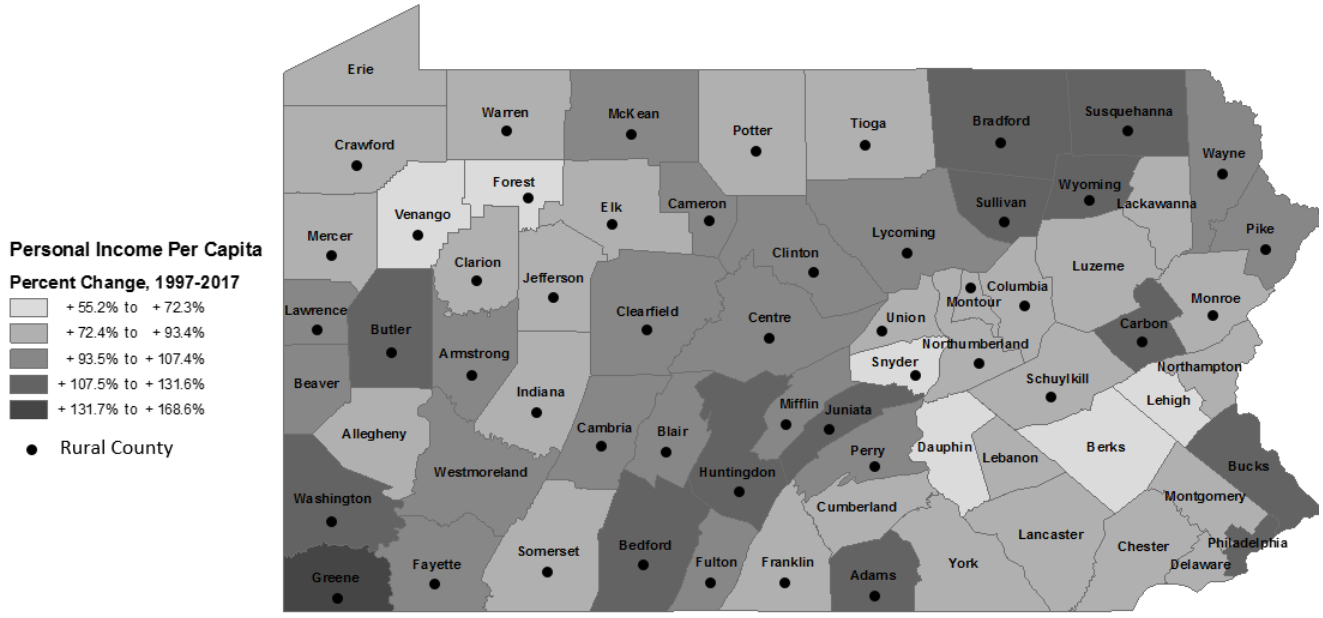
Income Per Capita

Map 23 shows the change in income per capita across Pennsylvania counties between 1997 and 2017. All 67 counties experienced an increase in income per capita during this period, ranging from +55.3 percent in Forest County to 168.6 percent in Greene County.

Across all 67 Pennsylvania counties, income per capita increased, on average, by 95.8 percent between 1997 and 2017.

Comparing urban versus rural counties, growth in income per capita was, on average, higher in rural counties (+99.0 percent) than in urban counties (+87.8 percent) between 1997 and 2017.

Map 23
Percent Change in Personal Income Per Capita, 1997-2017



Source: U.S. Bureau of Economic Analysis.

Median Household Income

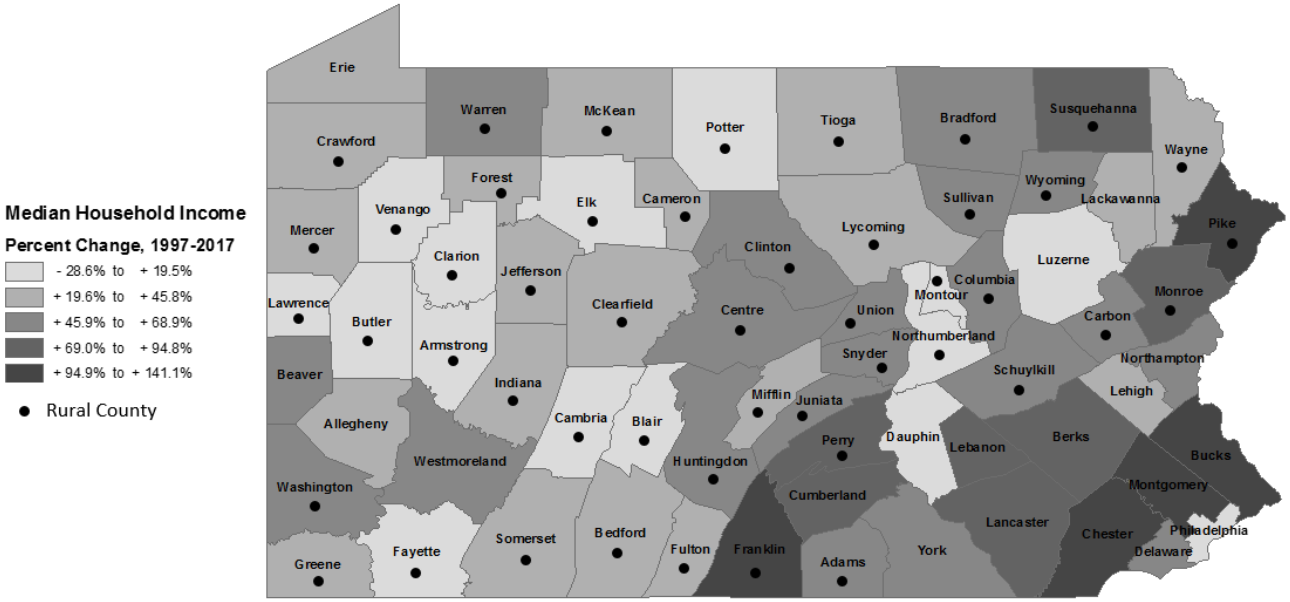
Map 24 shows the change in median household income across Pennsylvania counties between 1997 and 2017. All but four counties experienced an increase in median household income during this period, ranging from +2.2 percent in Potter County to +141.0 percent in Bucks County.

Four counties experienced a decrease in median household income during this period: Montour (– 1.7 percent), Northumberland (-2.4 percent), Philadelphia (-2.7 percent), and Clarion (-28.6 percent).

Across all 67 Pennsylvania counties, median household income increased, on average, by 47.1 percent between 1997 and 2017.

Comparing urban versus rural counties, growth in median household income was, on average, higher in urban counties (+62.8 percent) than in rural counties (+40.9 percent) between 1997 and 2017.

Map 24
Percent Change in Median Household Income, 1997-2017



Source: U.S. Census Bureau.

Unemployment Rate

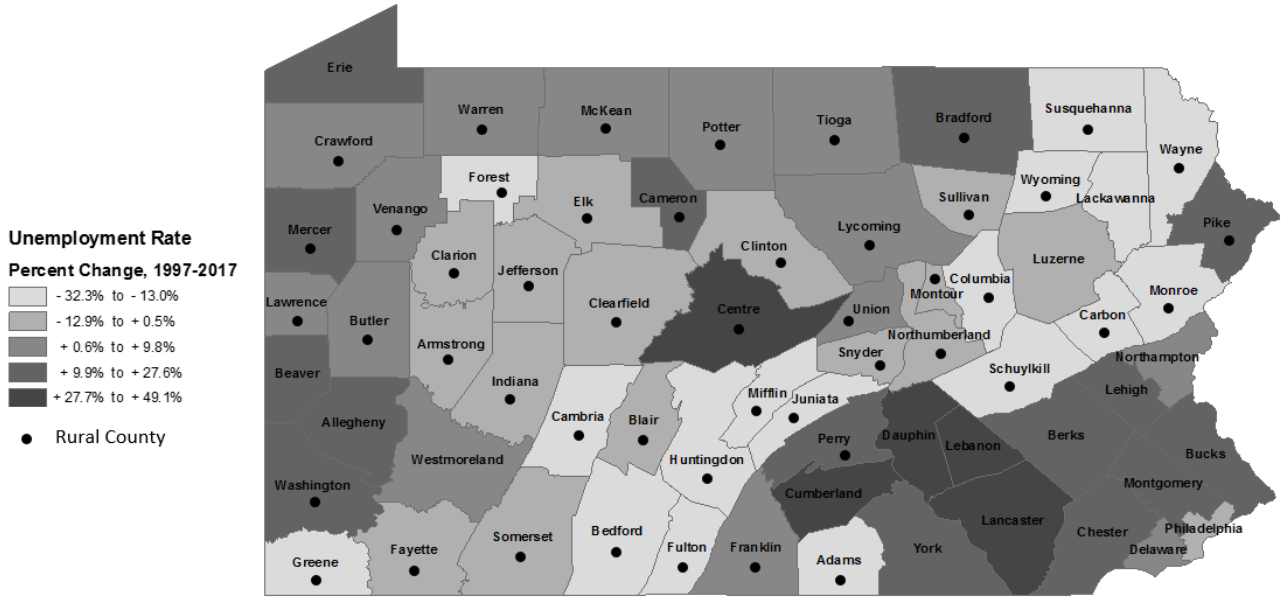
Map 25 shows the change in the unemployment rate across Pennsylvania counties between 1997 and 2017. Among the counties that experienced the biggest increase in the unemployment rate during this period were Cumberland (+49.1 percent), Lancaster (+43.2 percent), Dauphin (+41.4 percent), Centre (+40.9 percent), and Lebanon (+38.0 percent).

Among the counties that experienced the biggest decrease in the unemployment rate during this period were Huntingdon (-32.2 percent), Juniata (-30.3 percent), Wayne (-29.0 percent), Wyoming, (-24.6 percent), and Susquehanna (-21.6 percent).

Across all 67 Pennsylvania counties, the unemployment rate increased, on average, by 2.7 percent between 1997 and 2017.

Comparing urban versus rural counties, the unemployment rate increased, on average, by 18.1 percent in urban counties but decreased by 3.5 percent in rural counties between 1997 and 2017.

Map 25
Percent Change in Unemployment Rate, 1997-2017



Source: U.S. Bureau of Labor Statistics.

Peer State Comparisons

Peer States

The peer state selection technique described in the Methodology section resulted in the following rank-ordering of the 51 states (including the District of Columbia). Unsurprisingly, six of the peer states in the top 10 are other Great Lakes states, with Ohio and Illinois leading the list as the closest peers. This makes Ohio and Illinois the obvious choices for peer states.

Table 18
Peerness Index for All States

Rank	State	Peerness Index	Rank	State	Peerness Index
1	**Pennsylvania**	**0.0**			
2	Ohio	10.0	27	Arkansas	41.9
3	Illinois	16.0	28	Kentucky	42.1
4	Florida	16.7	29	Nebraska	42.1
5	Michigan	17.0	30	Nevada	42.7
6	North Carolina	20.0	31	Mississippi	42.7
7	New York	23.3	32	Delaware	42.8
8	Wisconsin	24.9	33	Idaho	43.2
9	Indiana	25.7	34	South Dakota	43.5
10	Washington	25.8	35	West Virginia	43.5
11	Georgia	25.9	36	New Mexico	44.4
12	Colorado	28.8	37	North Dakota	45.4
13	Tennessee	29.4	38	Montana	45.8
14	Louisiana	30.9	39	Vermont	45.9
15	Virginia	31.4	40	Maryland	46.1
16	Arizona	31.8	41	Hawaii	46.6
17	Minnesota	32.2	42	Maine	47.0
18	South Carolina	32.3	43	Wyoming	47.6
19	Alabama	32.4	44	Massachusetts	48.8
20	Missouri	35.0	45	Alaska	52.5
21	Oregon	36.3	46	New Jersey	55.8
22	Oklahoma	37.0	47	Connecticut	61.9
23	Utah	38.1	48	Texas	66.3
24	Kansas	40.2	49	California	67.0
25	Iowa	40.6	50	Rhode Island	68.8
26	New Hampshire	41.4	51	District of Columbia	79.4

Source: Calculated by the authors.

But Florida ranks #4 on the list, surprisingly, and that presents an intriguing opportunity. Table 19 shows that on three of the four characteristics Florida is quite similar to Pennsylvania, although Florida's 2010 population was 48 percent greater than Pennsylvania's.

Table 19
Comparison Data for Pennsylvania and the Top Three Peer State Candidates

Peer		2010 Population		% of Counties Rural		Mean Hshld Income		Number of Counties	
Rank	State	Data	Abs % Diff	Data	Abs % Diff	Data	Abs % Diff	Data	Abs % Diff
1	Pennsylvania	12,702,379	0.0	71.6	0.0	67,282	0.0	67	0.0
2	Ohio	11,536,504	9.2	76.1	6.3	62,205	7.5	88	31.3
3	Illinois	12,830,632	1.0	88.2	23.2	75,140	11.7	102	52.2
4	Florida	18,801,310	48.0	67.2	6.1	66,323	1.4	67	0.0

Source: Calculated by the authors.

The fact that Florida happens to be a fast-growth southern state makes it interesting as a potential for comparison. Between 2010 and 2015, Florida had population growth of 7.68 percent, making it the sixth fastest-growing state in the nation. Florida's growth was significantly greater than Pennsylvania's 0.70 percent, Ohio's

0.59 percent, Illinois's 0.07 percent, and 3.94 percent for the nation as a whole.[16] If population growth has an impact on cost of living, it might be interesting to include Florida as one of the peers, to explore the contrasts that might show up. Will the same rural versus urban cost of living patterns occur in fast-growth Florida, or will there be differences in the relationships? Given this, it was decided to choose Ohio and Florida as the peers for comparison in this study.

Basic Cost of Living Data for Peer States

Table 20 presents the unweighted COL data for all seven indexes, as well as the weighted average data. Of these three states, Ohio is the low-cost state, with an unweighted composite index of just 95.1, about 5 percent below national average.

The weighted data say that Pennsylvanians pay about 10.7 percent more than the national average to live in the Keystone state, while Floridians pay about 7.1 percent more than the national average, and Buckeyes pay on average about a half point less than the national average.

The housing index is especially interesting. The average Ohioan pays nearly 7 percent less than the national average for housing, while Floridians pay about 16.2 percent more than the national average, and Pennsylvanians pay about 26.8 percent more.

Table 20
2017 COLI Data for Peer States and Pennsylvania

	Unweighted Average			Weighted Average		
Index	**Florida**	**Ohio**	**Pennsylvania**	**Florida**	**Ohio**	**Pennsylvania**
Composite	101.3	95.1	104.1	107.1	99.5	110.7
Groceries	103.7	103.1	104.6	105.4	104.3	106.5
Housing	98.0	80.1	106.4	116.2	93.3	126.8
Utilities	106.2	93.8	111.7	106.1	93.3	111.8
Transportation	102.0	104.0	110.0	104.5	105.3	112.3
Health Care	98.3	96.1	92.1	100.0	97.3	93.8
Miscellaneous	103.4	103.0	104.9	105.9	104.8	107.6

Source: Calculated by the authors from C2ER and estimated subindex data.

[16] Growth rates were calculated by the authors from Census Bureau population data, using the official 2010 Census counts, and the Census's Population Estimates for the 2015 data.

Urban-Rural Differentials

The following tables present the urban-rural differentials for Florida and Ohio, in the same format as presented for Pennsylvania in Tables 7 and 8 previously. Pennsylvania's data are repeated here also, to make comparisons easier.

Table 21
2017 Urban-Rural Differentials (unweighted)

FLORIDA	ALL	RURAL	URBAN	Urban-Rural Differential	
Index	67 Counties	45 Counties	22 Counties	Index Points	Percent
Composite	101.3	98.9	106.1	7.1	7.2
Groceries	103.7	103.0	105.1	2.2	2.1
Housing	98.0	90.9	112.5	21.6	23.7
Utilities	106.2	106.3	105.9	-0.5	-0.5
Transportation	102.0	100.9	104.2	3.3	3.3
Health Care	98.3	97.5	99.8	2.3	2.4
Miscellaneous	103.4	102.3	105.5	3.3	3.2

OHIO	ALL	RURAL	URBAN	Urban-Rural Differential	
Index	88 Counties	67 Counties	21 Counties	Index Points	Percent
Composite	95.1	93.7	99.8	6.1	6.5
Groceries	103.1	102.6	104.5	1.9	1.8
Housing	80.1	75.7	94.4	18.7	24.7
Utilities	93.8	94.1	93.0	-1.1	-1.2
Transportation	104.0	103.4	106.0	2.5	2.4
Health Care	96.1	95.6	97.6	2.0	2.1
Miscellaneous	103.0	102.3	105.2	2.8	2.7

PENNSYLVANIA	ALL	RURAL	URBAN	Urban-Rural Differential	
Index	67 Counties	48 Counties	19 Counties	Index Points	Percent
Composite	104.1	101.8	109.8	8.0	7.9
Groceries	104.6	104.0	106.3	2.3	2.2
Housing	106.4	99.8	123.1	23.3	23.4
Utilities	111.7	112.2	110.6	-1.5	-1.4
Transportation	110.0	109.0	112.5	3.4	3.2
Health Care	92.1	91.4	93.8	2.3	2.5
Miscellaneous	104.9	104.0	107.4	3.4	3.3

Source: Calculated by the authors from C2ER and estimated subindex data.

Table 22
2017 Urban-Rural Differentials (weighted by population)

FLORIDA	ALL	RURAL	URBAN	Urban-Rural Differential	
Index	67 Counties	45 Counties	22 Counties	Index Points	Percent
Composite	107.1	102.8	108.1	5.3	5.2
Groceries	105.4	104.5	105.6	1.0	1.0
Housing	116.2	102.7	119.3	16.5	16.1
Utilities	106.1	106.3	106.1	-0.2	-0.2
Transportation	104.5	102.1	105.0	2.9	2.8
Health Care	100.0	99.2	100.2	1.0	1.0
Miscellaneous	105.9	104.6	106.1	1.5	1.5

OHIO	ALL	RURAL	URBAN	Urban-Rural Differential	
Index	88 Counties	67 Counties	21 Counties	Index Points	Percent
Composite	99.5	94.5	101.7	7.2	7.7
Groceries	104.3	102.9	104.9	2.0	2.0
Housing	93.3	77.9	100.1	22.2	28.5
Utilities	93.3	93.6	93.2	-0.4	-0.4
Transportation	105.3	103.7	106.1	2.4	2.3
Health Care	97.3	95.9	97.9	2.0	2.1
Miscellaneous	104.8	102.7	105.7	3.0	2.9

PENNSYLVANIA	ALL	RURAL	URBAN	Urban-Rural Differential	
Index	67 Counties	48 Counties	19 Counties	Index Points	Percent
Composite	110.7	102.6	113.7	11.1	10.9
Groceries	106.5	104.2	107.3	3.0	2.9
Housing	126.8	102.3	135.8	33.4	32.7
Utilities	111.8	111.9	111.7	-0.2	-0.1
Transportation	112.3	109.5	113.3	3.9	3.5
Health Care	93.8	91.7	94.6	2.9	3.1
Miscellaneous	107.6	104.4	108.8	4.5	4.3

Source: Calculated by the authors from C2ER and estimated subindex data.

Table 23
2017 Urban-Rural Differentials: Summary

	UNWEIGHTED			WEIGHTED		
Index	Florida	Ohio	Pennsylvania	Florida	Ohio	Pennsylvania
Composite	7.2	6.5	6.5	5.2	7.7	10.9
Groceries	2.1	1.8	1.8	1.0	2.0	2.9
Housing	23.7	24.7	24.7	16.1	28.5	32.7
Utilities	-0.5	-1.2	-1.2	-0.2	-0.4	-0.1
Transportation	3.3	2.4	2.4	2.8	2.3	3.5
Health Care	2.4	2.1	2.1	1.0	2.1	3.1
Miscellaneous	3.2	2.7	2.7	1.5	2.9	4.3

Source: Calculated by the authors from preceding tables.

A number of conclusions are worth noting from these tables:

- The most fundamental issue is that urban costs are greater than rural costs in all three states.
- The patterns that Pennsylvania exhibits in terms of urban-rural differentials across the subindexes are mostly shared by both Florida and Ohio.
- The subindex with the largest urban-rural differentials is the housing subindex, consistently across all three states. This is in accordance with the logic of housing being a good with a slow supply-reaction time to changes in demand. Clearly, housing cost differences drive the Composite Index cost of living.

- In all three states, the utilities subindex does *not* follow the general pattern. Utility costs are very similar in rural and urban counties, and are actually a bit lower in urban counties in all three states.

One interesting difference to note concerns Florida. In both Ohio and Pennsylvania, the population-weighted differentials are larger than the unweighted differentials, but in Florida this pattern is reversed. This may be a result of the relatively rapid growth that Florida has experienced. Increasing population may be pushing out of urban counties into neighboring rural counties, driving up housing costs there while not yet reaching density levels to reclassify the county as "urban." In 2016 there were rural counties of Florida with housing indexes of 140.4 (Collier), 135.5 (Martin) and 132.9 (Indian River), all of which were high growth counties.

Contributions of Independent Variables to All COL Indexes

Table 24 presents the contributions of the independent variables to each subindex for Florida and Ohio, with Pennsylvania data repeated here for comparison. These values are the averages across all counties in each state. The key point to note is that the peer states exhibit the same patterns as Pennsylvania in regard to the practical importance of the independent variables. Income is clearly the key determinant of the cost of living across all the subindexes, with the exception of the utilities subindex. The income variables, combined with the typically offsetting Constant, account for 80 to 108 percent of the COL across the subindexes and across these three states.

Growth in per-capita income plays a role only in the housing subindex, and it consistently contributes about 5 percent on average to housing costs across these three states.

Table 24
Percentage Contributions of the Independent Variables to all COL Indexes for Peer States

FLORIDA

Variable	Comp	Groc	Hous	Util	Tran	Heal	Misc
Constant	-88.77	16.02	-581.49	89.30	-29.32	-4.50	-25.12
Population	0.44		1.37		0.47		
Population Density	0.62	0.13	1.85	0.22	0.14	0.09	0.19
Income per Capita	189.22	80.89	662.33			95.41	121.97
Mean Hshld Income					122.49		
IPC Growth			5.45				
Unemployment Rate	-4.44			10.74			
Region	2.94	2.96	10.49	-0.26	6.21	9.00	2.96
Sum	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Constant+ Income	100.45	96.91	80.83	89.30	93.18	90.91	96.85

OHIO

Variable	Comp	Groc	Hous	Util	Tran	Heal	Misc
Constant	-94.31	16.10	-695.97	101.14	-28.73	-4.59	-25.18
Population	0.21		0.75		0.20		
Population Density	0.53	0.11	1.85	0.20	0.11	0.07	0.15
Income per Capita	202.42	81.83	800.28			98.13	123.06
Mean Hshld Income					121.10		
IPC Growth			5.21				
Unemployment Rate	-5.05			12.89			
Region	-3.80	1.96	-12.13	-14.23	7.31	6.39	1.96
Sum	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Constant+ Income	108.11	97.93	104.32	101.14	92.37	93.54	97.89

PENNSYLVANIA

Variable	Composite	Groceries	Housing	Utilities	Transprtn	Health Care	Misc
Constant	-86.25	15.86	-523.33	84.90	-27.17	-4.80	-24.72
Population	0.27		0.81		0.28		
Population Density	0.74	0.17	1.99	0.26	0.17	0.12	0.24
Income per Capita	186.68	81.30	606.87			103.25	121.83
Mean Hshld Income					114.95		
IPC Growth			4.65				
Unemployment Rate	-5.02			11.87			
Region	3.58	2.67	9.00	2.98	11.78	1.43	2.65
Sum	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Constant + Income	100.43	97.16	83.55	84.90	87.78	98.45	97.11

Source: Calculated by the authors.

Population size and density play a role in the Composite, housing, and transportation indexes, but together never account for more than about 3 percent of the COL. Density separately enters into all seven of the subindexes' estimating equations, but never contributes more than 2 percent by itself. But it is important to remember that, while the average contribution of these variables may be small, they can make an important difference for those counties that have large populations and high densities; these variables help ensure that those high-cost counties' COL values are estimated correctly. So while they may not add a lot, on average, they are crucial to the accuracy of the estimates for the largest counties.

The unemployment rate contributes a deduction of about 5 percent to the Composite Index, reducing COL in places with high unemployment rates. And it plays the odd role of increasing the cost of utilities by about 11

percent across these three states. But again, the utilities subindex is the one that is least explainable by the independent variables in this study.

Conclusions

Basic Cost of Living Data

Overall, the cost of living is higher in Pennsylvania than in the rest of the country. The average across Pennsylvania's 67 counties for the overall (Composite) cost of living is 104.1, meaning that it is about 4.1 percent higher than the U.S. county average in 2017.

Of the six cost of living subindexes, utilities averaged 11.7 percent above the U.S. county average, followed by transportation at 10.0 percent, and housing at 6.4 percent. Grocery prices were 4.6 percent above the U.S. average and miscellaneous goods and services were 4.9 percent above. The health care index was actually 7.9 percent below the U.S. county average. These data are simply averages of the indexes for the 67 counties of the state, not weighted for population differences among the counties.

If population is factored in (reflecting the fact that more people live in higher cost urban areas), the average Pennsylvanian pays about 10.7 percent more overall than other Americans, not 4.1 percent. Housing is the key category driving this cost, since the average Pennsylvanian pays 26.8 percent more for housing than Americans elsewhere. Transportation runs 12.3 percent above average, utilities 11.8 percent, miscellaneous goods and services 7.6 percent, and groceries 6.5 percent. Health care was 6.2 percent lower cost than the U.S. average.

Rural vs. Urban Issues

Most fundamentally, Pennsylvania's rural counties have a lower cost of living than its urban counties.

The average rural county in Pennsylvania has an overall (Composite) cost of living that is about 1.8 percent higher than the average of all U.S. counties for 2017, while the average urban county in Pennsylvania has a cost of living that is about 9.8 percent higher than the U.S. county average. That is a 7.9 percent differential in favor of rural counties.

The urban-rural differential (in favor of rural counties) was typically 2 or 3 percent for the groceries, transportation, health care, and miscellaneous goods and services categories. For the utilities category, urban counties had an advantage of about 1.5 percent.

But for the housing index, the rural advantage was 23.4 percent. The cost of housing is significantly less in rural areas. This is especially important since housing typically makes up a quarter to a third of a family's budget. Less expensive housing is clearly an advantage for rural areas. Unfortunately, this is largely offset by the fact that incomes tend to be lower in rural areas; in 2015 Pennsylvania's rural counties had income per capita that was 21.0 percent less than urban counties, on average.

Urban counties have a lot more people than rural counties, of course. If that is factored in, then the average urban resident pays 10.9 percent more than rural residents for their cost of living, and this is a more accurate way of comparing the cost differential for Pennsylvanians in rural vs. urban areas. In the housing category, the average urban resident pays about 32.7 percent more than the average rural resident—nearly a third more. This represents a significant advantage for rural areas.

Causation

The key factor that causes cost of living to be higher in some areas than others is income. Higher income in an area tends to result in higher prices in that area. This one factor accounts for the overwhelming majority of the causation for COL differences between places. This was true for most of the COL subindexes, too, with the exception of utilities.

Population density also has an impact on cost of living. Higher density means higher costs, typically. But this effect only plays a noticeable role when density is very high, such as in Philadelphia and some of its surrounding counties. The average impact of density on cost of living was less than 1 percent for Pennsylvania counties, but density caused Philadelphia's COL to be more than 16 percent higher and Delaware County's COL to be nearly 5 percent higher. Density also played a similar role in every one of the six subindexes.

The size of a place, in terms of population, also plays a role in cost of living. A larger place tends to have a higher cost of living. But this is a relatively minor effect, averaging about a quarter of 1 percent for Pennsylvania counties. As with density, this effect really only comes into play when population numbers get

very large. Population added about 1.9 percent to Philadelphia's COL, and 1.7 percent to Allegheny County's. Aside from the Composite Index, the housing and transportation indexes also were affected by population size.

The unemployment rate also tends to affect COL, with a higher unemployment rate tending to cause a lower cost of living. This averaged about a 5 percent effect in 2017 in Pennsylvania, although it caused a 7.7 percent lower COL in high-unemployment Forest County.

While income is a crucial determinant of cost of living, a change in that income from the previous year does not have a significant effect, except in the housing sector. In that case, it made about a 5 percent difference in housing costs, on average, ranging from 8.3 percent in the county with the fastest income growth (Washington) to a 1.2 percent reduction in the county with a drop in income (Warren).

COL Patterns through Time

Making comparisons of the 2017 data with 1997 data from the previous study is difficult because the two studies focused on different determinants of the cost of living in their estimating equations, and the market basket that was priced changed over that period. This means that precise comparisons are not possible. But broad comparisons may still yield some useful results.

Overall, the cost of living in Pennsylvania relative to other parts of the country has not changed much over this 20-year period. The cost of utilities in Pennsylvania may have fallen (or risen more slowly) in that period, although it is still above the national average. The biggest change is in the health care index, which saw a drop of about 10 percent over the period, relative to costs elsewhere. (Reminder: as explained with Map 19, this does not mean that health care costs have fallen in Pennsylvania, just that they have risen less rapidly in many of the state's counties than elsewhere in the nation.)

A key finding is that the cost of living continues to be lower in the state's rural areas than in its urban areas. In fact, the rural-urban differential appears to have increased overall, and especially in the housing sector where it has risen by approximately 20 percentage points to nearly a 33 percent differential. Pennsylvania's rural areas are clearly a bargain in the housing sector, compared to the state's urban areas.

Comparison of the determinants of cost of living through time is difficult because of the different estimation techniques of the two studies, but it can be noted that income, population, and density have continued to play important roles.

Comparison with Peer States

Both Ohio and Florida are like Pennsylvania in important ways, and were chosen as peer states for Pennsylvania, although Florida's population is nearly half again as large as Pennsylvania's.

Of these three, Pennsylvania is the highest cost state and Ohio is the lowest.

A key finding is that rural costs are lower than urban costs in all three of these states; Pennsylvania's experience in that regard is shared with these two states.

In all three states, the housing subindex is the sector driving the overall cost of living and the urban-rural differential. The housing urban-rural differential ranged from 16 percent in Florida to 29 percent in Ohio to 33 percent in Pennsylvania, after adjusting for population differences across counties.

In all three states, the utilities index does not follow the general pattern of the other COL subindexes, with urban costs typically being a few tenths of a percent below rural costs.

Florida has been one of the faster growing states in the nation recently, and this may account partially for the fact that its weighted cost of living index numbers were less than its unweighted values. This may be attributable to spillover growth from urban counties into rural counties, muddying the waters between those two categories in this state.

Both Florida and Ohio exhibited patterns similar to Pennsylvania's in terms of the causes of cost of living. Income levels played the key role in all three states for the Composite Index and for five of the six subindexes, with utilities being the exception in all three states.

Growth in income from the previous year consistently added about 5 percent to the housing subindex across all three states.

Population and density played similar roles in Florida and Ohio as in Pennsylvania, with relatively small average contributions to the Composite COL Index, but having an important role in places with high population and density levels.

The unemployment rate consistently reduced the overall cost of living by about 5 percent in all three states.

Policy Considerations

How might this research be useful in a practical sense? Specifically, how might legislators and other government officials and agencies use it to create–or better evaluate–policies?

First, and broadest, legislators should be aware that proposed laws or regulations may have effects on the cost of living, both statewide and in selected areas of the state. Policies intended to solve other problems may have the unintended consequence of driving up costs in some places, or may result in helping to reduce price pressures in some places. While other issues may be more pressing and necessarily have higher priority than cost of living issues, it is wise to be cognizant that actions intended to deal with other issues may nevertheless affect COL, for good or ill. Cost of living effects should enter into the discussion of the pros and cons of proposed legislation.

For example, policies that attempt to increase the density of development, or have that as a side effect, may have the unintended consequence of increasing housing costs. Given that housing accounts for a large chunk of most households' budgets—even more so for low-income households—this could be a major factor that gets overlooked in some well-intentioned proposals. And to the extent that property taxes are tied to housing values, existing property owners may face significant increases in taxes without a corresponding increase in income or services.

Understanding that income and the unemployment rate are determinants of the cost of living in the state and its communities is also important when contemplating the national business cycle. Boom times, with their higher incomes and lower unemployment rates, will tend to make costs higher all around, offsetting some of the benefits of the strong economy. Conversely, a recession that brings falling incomes and higher unemployment rates may also engender a bit of a silver lining in the form of reduced price pressures and lower costs of living.

Most fundamentally, a low cost of living is an advantage for a place and a high cost of living is a drawback, other things equal. Rural areas tend to have lower costs of living than urban areas, and this is a plus that rural areas may sometimes overlook when marketing to outsiders, and one that they can market to help attract residents and businesses.

For households, moving to a low-COL place can mean an immediate increase in "real" (price-adjusted) income or standard of living. A family moving from high-cost Philadelphia, with its Composite COL value of 128.8, to low-cost Forest County with an index of 91.6 would have an immediate increase in purchasing power of nearly 29 percent! How many people might consider relocation, given the equivalent of an offer of a 29 percent raise?

Of course, there are other factors to consider; Philadelphia and Forest County are quite different in many ways and the family's quality of life would certainly be affected. So the question becomes "who would be attracted to the amenities that a rural area offers over those of an urban area?" No doubt rural leaders can list a broad range of ways in which they consider rural life to be superior to urban life, and that list can help point out potential recruits to rural areas.

Alternatively, if rural leaders are concerned about their recent graduates moving to the big city, it might be wise to acquaint them with the facts of life in regard to housing costs. Philadelphia's housing index of 187.3 is more than double the cost of some of the state's rural counties. The lure of a fast-paced city life may be restrained a bit when the young potential emigrant learns that s/he will need to share a tiny single-bathroom apartment with three roommates, and still give up a huge chunk of her/his take-home pay. While this may not completely offset the fact that jobs tend to be scarcer in rural areas and unemployment rates higher, for some young people it may be enough to make them think twice about the appeal of the urban lifestyle—or perhaps set the stage for a return to the rural area after giving the city a try.

This study documents the fact that housing is the good whose cost varies the most from place to place, and for which the urban-rural differential is largest. This suggests that likely candidates for attraction to rural areas would be those who prefer more housing, including simply more square footage, more land, and/or lower density and a greater distance from the nearest neighbor. This group may include larger families, or those expecting to raise a large family. It may also include those who prefer to have multi-generational families under one roof. Given the aging of the baby boomer generation and their parents, this is becoming a more important issue to more and more people. And there may be a cultural aspect to it; some religious and ethnic groups and some foreign-born Americans tend to favor multi-generational households more than other groups. All of these might be the focus of marketing campaigns to foster growth through attraction to Pennsylvania's rural areas.

On the business side, a lower cost of living means that a given wage or salary provides greater purchasing power to a worker. This means that rural areas could be attractive places for business and industry since it would take higher wages in urban areas to provide the same standard of living. In fact, corporate human resource managers could use the low cost of living as one factor helping them to recruit good candidates. Recruiters might tell potential employees: “Housing prices in our rural location are so reasonable that you can afford a nice starter house immediately upon coming to work for us, rather than wasting your money on rent for years, trying to save up a down payment for an outrageously expensive small place in the city.”

Of course, rural areas near urban areas might be especially attractive. Workers who are willing to spend a bit more time commuting might find a very attractive option in taking a job in the higher-paying urban area yet residing in the lower-cost rural area. This is one reason why it’s sometimes said that the best place to live is a small town near a big city. This is certainly not a new idea; it explains why the cost of living maps clearly show darker (high cost) shading in urban areas like Philadelphia and Pittsburgh, gradually lightening with greater distance from those areas. The wise housing shopper will seek to identify areas that offer a good tradeoff between low housing costs and length of commute. And communities in those sweet spots need to be aware of their situation, and expect more rapid growth.

All of this suggests that elected officials need to be aware of the attractiveness of places just beyond the urban frontier. Growth tends to move out centrifugally, and communities just outside the current boundaries of urbanization are those most likely to experience growth, and perhaps too-rapid growth. This kind of spillover growth can result in a rapid increase in housing costs in a community, and overwhelmingly fast growth in demand for public services such as roads, schools, health care, and police and public safety workers. A rapid increase in housing costs might even make local housing unaffordable for long-time residents, prompting possible problems of long-time residents versus newcomers.

On the other hand, some workers do not need to commute; they can do their work at home and interact electronically with their clients and supervisors. These kinds of footloose workers would seem to be prime candidates for rural area marketing campaigns. Of course, the rural area will need to be able to offer high-speed connectivity for these high-tech workers, and perhaps highways and/or airports that allow for necessary business trips.

Another possible way to bring new income and residents to the area might be through those who are interested in a second or vacation home. The lower housing costs could certainly be attractive to this group, and the difference in culture and amenities between the rural area and their urban home might serve as a powerful advantage to this group. They would bring their income and purchasing power to the rural area during their visits along with their property taxes, but would not add to the demands on local governments for schools, police, and social services.

An interesting fact that emerges from this study is the relatively low cost of health care. The statewide average across the 67 counties was just 92.1, or nearly 8 percent below the national average for all counties. This has some interesting implications. Given the rising importance of health care costs, Pennsylvania may find low health care costs to be an important advantage to several groups, including employers who wish to curtail the rise in this increasingly expensive part of their costs of production. Similarly, senior citizens tend to spend a larger than average—and increasing—portion of their budgets on health care and might be interested in exploring locations with low health care costs.[17] And given that many seniors have fixed retirement incomes, lower costs of living generally would allow them to have a higher standard of living. So rural areas, especially, may wish to consider marketing campaigns that tout lower costs of living to golden-agers.

[17] There needs to be a caution here. The COLI market basket for the health care index consists of five items: visits to a doctor, dentist, and optometrist, and the prices of ibuprofen and insulin pens. It would be wise to explore data on health care costs more widely before pursuing such a campaign.

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Appendix 1
Components of the C2ER Cost of Living Index (Market Baskets), 1997 and 2016

These brief descriptions are not the precise item definitions; exact definitions are given in the COLI Pricing Manuals to ensure uniformity in pricing methods across areas. *Italics* identify significant changes in items. The 2016 COLI Market Basket is listed here since the 2016 data served as the basis for the estimating equations that resulted in the 2017 COLI county data. Weights are percentages of the total market basket.

Table A1
C2ER Market Baskets, 1997 and 2017

1997 COLI Market Basket			2016 COLI Market Basket		
Weight			Weight		
Category	Item	Item	Category	Item	Item
16.00		**GROCERY ITEMS**	**13.24**		**GROCERY ITEMS**
	0.5840	T-bone steak, price per pound		0.3336	Steak, price per pound, *rib-eye cu*t steak
	0.5840	Ground beef or hamburger, price per pound, lowest price		0.3336	Ground beef or hamburger, price per pound, lowest price, *min 80% lean*
	0.7600	Sausage, price per pound, Jimmy Dean brand, 100% pork		0.5164	Sausage, price per pound; Jimmy Dean or Owens brand, 100% pork
	0.7584	Frying chicken, price per pound, whole fryer		0.5188	Frying chicken, price per pound, whole fryer
	0.5648	Tuna, 6.0-6.125 oz. can, chunk light, Starkist or Chicken of the Sea		0.4488	Chunk light tuna, 5.0 or 6.0 oz. can, Starkist or Chicken of the Sea
	0.6176	Whole milk, half-gallon carton		0.4250	Whole milk, half-gallon carton
	0.1280	Eggs, one dozen grade A large		0.1627	Eggs, one dozen, Grade A, large
	0.4720	Margarine, one pound cubes, Blue Bonnet or Parkay		0.0534	Margarine, one pound, cubes, Blue Bonnet or Parkay
	0.4720	Parmesan cheese, 8 oz., grated, Kraft		0.9213	Parmesan cheese, grated, 8 oz. canister, Kraft brand
	0.3472	Potatoes, 10 lb. sack, white or red		0.4200	Potatoes, *5 lb.*, white or red
	0.7056	Bananas, price per pound		0.9439	Bananas, price per pound
	0.3472	Iceberg lettuce, approx. 1.25 pound head		0.3790	Iceberg lettuce, head, approximately 1.25 pounds
	1.4608	White bread, 24 oz. loaf or 24-oz. equivalent, lowest price		1.0958	Bread, whole wheat, 24 oz. loaf, *Arnold, Orowheat, Brownberry, or Nature's Own Brand*
	1.0768	*Cigarettes, carton, king size (85 mm.), Winston*			
	1.1024	Coffee, 13 oz. can, vacuum packed, Maxwell House, Hills Brothers		0.7146	Coffee, vacuum-packed, 11-11.5 oz. can, Maxwell House, Hills
	0.5328	Sugar, 4 lb., cane or beet, lowest price		0.4476	Sugar, 4 pound sack, cane or beet, lowest price
	0.7328	Corn flakes, 18 oz., Kellogg's or Post Toasties		0.5378	Corn flakes, 18 oz., Kellogg's or Post Toasties
	0.0928	Sweet peas, 15-17 oz. can, Del Monte or Green Giant		0.1995	Sweet peas, 15-15.25 oz. can, Del Monte or Green Giant
	0.0928	*Tomatoes, 14.5 oz. can, Hunt's or Del Monte*			
	0.2752	Peaches, 29 oz. can, halves or slices, Hunt's, Del Monte or Libby's		0.1800	Peaches, *15 oz*. can, Hunt's, Del Monte, Libby's or Lady Alberta
	0.6048	Facial tissues, 175-count box, Kleenex brand		0.5990	Facial tissues, 160 count box, Kleenex brand
	0.6656	Dishwashing powder, 50 oz., Cascade		0.5990	Dishwashing powder, 75 oz. Cascade dishwashing powder
	0.3456	Shortening, 3 lb. can, all vegetable, Crisco		0.2945	Cooking Oil, 15.5 - 18 oz olive oil store brand bottle
	0.8304	Frozen orange juice, 12 oz. can, Minute Maid		0.1607	*Fresh Orange Juice, 59 or 64 oz. Tropicana or Florida Natural brand*
	0.1840	Frozen corn, 16 oz., whole kernel, lowest price		0.1995	Frozen corn, 12 oz. whole kernel, lowest price
	1.1024	*Baby food, 4.0-4.5 oz. jar, strained vegetables, lowest price*			
	0.5600	Soft drink, 2 liter, Coca Cola, excluding any deposit		0.4144	Soft drink, 2 liter Coca Cola, excluding any deposit
				1.1047	*Potato chips, 10 oz. plain regular potato chips*
				1.2365	*Frozen meal, 8-10 oz. frozen chicken entrée, Healthy Choice*
28.00		**HOUSING**	**28.04**		**HOUSING**
	5.3816	Apartment, monthly rent; two bedroom, unfurnished, excluding all utilities except water, 1½ or 2 baths, approx. 950 sq. ft.		8.1372	Apartment, monthly rent, two bedroom, unfurnished, excluding all utilities except water, 1½ or 2 baths, 950 sq. ft.
	22.6184	Home purchase, consisting of monthly principal and interest payment on a 30 year first mortgage, based on 75% loan with current conventional fixed rate mortgage, on 1,800 sq. ft. living area new house, with approximately 8,000 sq. ft. lot, in appropriate urban area with all utilities		19.9028	Monthly payment, principal and interest, using mortgage rate for *2,400 sq. ft.* living area new house, 8,000 sq. ft. lot, 4 bedrooms, 2 baths and assuming 25% down payment
8.00		**UTILITIES**	**10.31**		**UTILITIES**
	6.9280	Total energy costs at current rates for average monthly consumption of all types of energy during the previous 12 months for the type of home specified above		6.0579	Total home energy cost at current rates, for average monthly consumption of all types of energy during the previous 12 months for the type of home specified above
	1.0720	Telephone, private residential line, customer owns instruments. Price includes: basic monthly rate; additional local user charges, if any, for a family of four; touch tone fee; all other mandatory monthly charges, such as long distance access fee and 911 fee; and all taxes on foregoing.		4.2520	Telephone, Private residential line; customer owns instruments. price includes: basic monthly rate; additional local use charges, if any, incurred by a family of four; TouchTone fee; all other mandatory monthly charges, such as long distance access fee and 911 fee; and all taxes on the foregoing.

Continued…

1997 COLI Market Basket			2016 COLI Market Basket		
Weight			Weight		
Category	Item	Item	Category	Item	Item
10.00		**TRANSPORTATION**	**11.16**		**TRANSPORTATION**
	1.0700	*Commuting fare, typical one way, up to 10 miles*			
	3.7000	Auto maintenance, average price for computer or spin balance of one front wheel		3.0811	Auto maintenance, average price to computer- or spin-balance four wheels
	5.2300	Gasoline, one gallon, unleaded regular, national brand, cash price at self-service pump, including all taxes		8.0789	Gasoline, one gallon regular unleaded, including all taxes; cash price at self-service pump if available
5.00		**HEALTH CARE**	**4.36**		**HEALTH CARE**
	0.8750	*Hospital room, semi-private, average cost per day*			
	1.7545	Doctor, office visit, general practitioner's routine exam of established patient, average charge		1.1554	Office visit, doctor, AMA procedure 99213 (general practitioner's routine examination of established patient)
	1.7545	Dentist, office visit, adult teeth cleaning and periodic oral exam		1.5810	Office visit, dentist, ADA procedure D1110 (adult teeth cleaning)
	0.6160	Antibiotic ointment, ½ oz. tube, Polysporin		0.3973	*Ibuprofen, 200 mg. 100 tablets, Advil brand*
				1.0240	*Prescription Drug, 1 carrton, 5 pens, Insulin Glargine, Lantus Solostar brand*
				0.2023	*Office visit, optometrist, Full vision eye exam for established adult patient*
33.00		**MISCELLANEOUS GOODS AND SERVICES**	**32.89**		**MISCELLANEOUS GOODS & SERVICES**
	3.0822	Hamburger sandwich, quarter pound patty with cheese, McDonald's		3.8438	Hamburger sandwich, ¼-pound patty with cheese, pickle, onion, mustard, and catsup. McDonald's Quarter-Pounder with cheese, where available
	3.0822	Pizza, 11-12" thin crust cheese pizza, Pizza Hut or Pizza Inn		3.8438	Pizza, 11"-12" thin crust cheese pizza. Pizza Hut or Pizza Inn where available
	3.0822	Fried chicken, thigh and drumstick, Kentucky Fried Chicken or Church's		3.8438	Fried chicken, thigh and drumstick, with or without extras, whichever is less expensive, Kentucky Fried Chicken or Church's where available
	0.6171	Man's barbershop haircut, no styling		1.0942	Haircut, man's barbershop haircut, no styling
	0.6171	Woman's beauty salon visit, including shampoo, trim and blow-dry		1.0942	Beauty salon, woman's shampoo, trim, and blow-dry
	0.6171	Toothpaste, 6-7 oz. tube, Crest or Colgate		0.1119	Toothpaste, 6 oz.-6.4 oz. tube, Crest or Colgate
	0.6171	Shampoo, 15 oz. bottle, Alberto VO5		0.2424	Shampoo, 15 oz. bottle, Alberto VO5 brand
	0.6171	Dry cleaning, man's two-piece suit		1.1805	Dry cleaning, man's two-piece suit
	4.3131	Man's dress shirt, 100% cotton pinpoint Oxford, long sleeves		1.3751	Men's dress shirt, cotton/polyester, pinpoint weave, long sleeves
	1.3629	*Boy's underwear, three briefs, size 10-14, cotton, lowest price*			
	4.3131	Man's denim jeans, Levi's brand, 501 or 505, rinsed or washed or bleached, size 28/30-34/36		0.3951	*Boy's* jeans, blue denim jeans, regular, relaxed or loose fit, sizes 8-20
				2.2424	*Women's slacks, at least 95% cotton, twill khakis, misses 4-14*
	1.5873	Major appliance repair, home service call, washing machine, minimum labor charge excluding parts		3.3114	Major appliance repair, home service call, clothes washing machine; minimum labor charge, excluding parts
	0.9438	Newspaper subscription, daily and Sunday home delivery of large city paper, monthly rate		0.4069	Monthly newspaper subscription, daily and Sunday home delivery, large-city newspaper
	1.3365	Movie, first run, indoor, evening, no discount		1.7441	Movie, First-run, indoor, evening, no discount
	1.3365	Bowling, average price per game, evening rate		1.7441	Bowling, price per line (game). Saturday evening non-league rate
	2.2638	Tennis balls, can of three extra-duty, yellow, Wilson or Penn brand		1.8379	Tennis balls, can of three extra-duty, yellow, Wilson or Penn brand
	1.5213	*Child's game, "Monopoly", No. 9 edition*			
	0.5643	*Liquor, J&B Scotch, 750 ml. bottle*			
	0.5610	Beer, 6-pack of 12 oz. containers, Miller Lite or Budweiser, excluding deposit		1.0726	Beer, *Heineken's*, 6-pack, 12-oz. containers, excluding any deposit
	0.5643	Wine, 1.5 liter bottle Chablis blanc, Gallo		1.0726	Wine, 1.5-liter bottle, Chablis, Chenin Blanc *or any white table wine*
				2.4334	*Veterinary Services, Annual exam, 4-year-old dog*
100.00	**100.0000**	**TOTAL**	**100.00**	**99.9999**	**TOTAL**

Appendix 2
Contributions of Independent Variables to Each Subindex for Each Pennsylvania County

Table A2-1
Contributions of Independent Variables to the Groceries Subindex

COUNTY	Groceries Subindex	Constant	PopD15	LIPC15	Region
	%	%	%	%	%
Adams	101.5	15.80	0.07	81.48	2.65
Allegheny	103.5	15.49	0.61	81.29	2.60
Armstrong	100.8	15.90	0.04	81.39	2.67
Beaver	101.3	15.83	0.14	81.37	2.66
Bedford	99.9	16.04	0.02	81.24	2.70
Berks	101.6	15.78	0.18	81.38	2.65
Blair	100.8	15.91	0.09	81.33	2.67
Bradford	100.4	15.97	0.02	81.33	2.68
Bucks	104.6	15.33	0.37	81.72	2.58
Butler	102.6	15.63	0.09	81.66	2.63
Cambria	100.3	15.98	0.07	81.25	2.69
Cameron	101.4	15.81	0.00	81.53	2.66
Carbon	101.3	15.83	0.06	81.45	2.66
Centre	100.8	15.90	0.05	81.37	2.67
Chester	105.5	15.20	0.24	82.01	2.55
Clarion	99.8	16.06	0.02	81.21	2.70
Clearfield	100.4	15.96	0.03	81.33	2.68
Clinton	99.8	16.06	0.02	81.23	2.70
Columbia	100.0	16.03	0.05	81.23	2.69
Crawford	99.9	16.04	0.03	81.23	2.70
Cumberland	102.5	15.64	0.17	81.57	2.63
Dauphin	101.9	15.73	0.19	81.44	2.64
Delaware	104.5	15.34	1.10	80.98	2.58
Elk	101.2	15.84	0.01	81.48	2.66
Erie	100.7	15.92	0.13	81.28	2.67
Fayette	100.3	15.98	0.06	81.27	2.69
Forest	96.9	16.54	0.01	80.67	2.78
Franklin	100.9	15.89	0.07	81.37	2.67
Fulton	99.9	16.05	0.01	81.24	2.70
Greene	101.6	15.78	0.02	81.54	2.65
Huntingdon	99.8	16.07	0.02	81.21	2.70
Indiana	99.7	16.07	0.04	81.19	2.70
Jefferson	100.2	16.00	0.03	81.28	2.69
Juniata	100.2	16.00	0.02	81.28	2.69
Lackawanna	101.2	15.84	0.17	81.32	2.66
Lancaster	101.6	15.77	0.21	81.37	2.65
Lawrence	100.6	15.94	0.09	81.29	2.68
Lebanon	101.2	15.84	0.14	81.36	2.66
Lehigh	102.2	15.68	0.38	81.30	2.64
Luzerne	100.8	15.91	0.13	81.29	2.67
Lycoming	100.8	15.91	0.04	81.38	2.67
McKean	100.6	15.94	0.02	81.37	2.68
Mercer	100.1	16.01	0.06	81.24	2.69
Mifflin	99.5	16.10	0.04	81.15	2.71
Monroe	100.2	16.00	0.10	81.21	2.69
Montgomery	105.6	15.18	0.60	81.67	2.55
Montour	102.4	15.65	0.05	81.66	2.63
Northampton	102.2	15.69	0.30	81.38	2.64
Northumberland	100.1	16.01	0.08	81.22	2.69
Perry	100.5	15.95	0.03	81.34	2.68
Philadelphia	106.6	15.04	4.11	78.32	2.53
Pike	100.7	15.92	0.04	81.36	2.68
Potter	99.5	16.11	0.01	81.18	2.71
Schuylkill	100.5	15.95	0.07	81.30	2.68
Snyder	100.3	15.99	0.05	81.28	2.69
Somerset	99.9	16.05	0.03	81.22	2.70
Sullivan	100.5	15.95	0.01	81.36	2.68
Susquehanna	100.6	15.94	0.02	81.37	2.68
Tioga	99.7	16.08	0.01	81.20	2.70
Union	99.8	16.06	0.05	81.19	2.70
Venango	100.2	16.00	0.03	81.28	2.69
Warren	100.9	15.90	0.02	81.42	2.67
Washington	102.9	15.58	0.09	81.71	2.62
Wayne	100.0	16.03	0.03	81.25	2.69
Westmoreland	101.8	15.74	0.13	81.49	2.65
Wyoming	100.8	15.90	0.03	81.40	2.67
York	101.5	15.79	0.18	81.38	2.65
Average	101.1	15.86	0.17	81.30	2.67
Min	96.9	15.04	0.00	78.32	2.53
Max	106.6	16.54	4.11	82.01	2.78

Variables:
POP15: population of the county in 2015
POPD15: population density in 2015, in people per square mile
LIPC15: log of income per capita in 2015
UNEMP16: unemployment rate of the county; avg 11/15-12/16
IPCG1: one-year growth rate of income per capita
LMHI15: log of median household income in 2015
Region: 40 regional dummy variables based on states

Source: Calculated by the authors.

Table A2-2
Contributions of Independent Variables to the Housing Subindex

COUNTY	Housing Subindex	Constant	POP15	PopD15	LIPC15	IPCG1	Region
		%	%	%	%	%	%
Adams	88.2	-503.20	0.49	1.05	588.30	4.71	8.65
Allegheny	109.1	-406.92	4.74	7.26	483.89	4.04	6.99
Armstrong	83.4	-532.15	0.34	0.58	617.36	4.73	9.15
Beaver	88.4	-502.02	0.80	2.06	584.86	5.67	8.63
Bedford	78.8	-563.80	0.26	0.29	647.12	6.44	9.69
Berks	90.7	-489.49	1.92	2.51	572.03	4.61	8.41
Blair	84.7	-524.28	0.62	1.33	607.48	5.84	9.01
Bradford	78.9	-563.01	0.33	0.32	649.93	2.76	9.68
Bucks	111.9	-396.89	2.36	4.36	479.46	3.90	6.82
Butler	96.2	-461.31	0.82	1.16	546.38	5.03	7.93
Cambria	80.6	-550.63	0.71	1.15	634.37	4.93	9.46
Cameron	87.1	-509.59	0.02	0.06	595.58	5.16	8.76
Carbon	87.4	-508.27	0.31	0.90	592.74	5.58	8.74
Centre	82.3	-539.61	0.82	0.83	625.85	2.83	9.27
Chester	115.2	-385.40	1.88	2.80	471.36	2.73	6.62
Clarion	75.6	-587.33	0.22	0.41	673.09	3.52	10.10
Clearfield	81.6	-544.39	0.42	0.41	628.81	5.40	9.36
Clinton	75.7	-586.80	0.22	0.28	672.76	3.46	10.09
Columbia	78.9	-562.42	0.35	0.82	646.00	5.57	9.67
Crawford	77.4	-573.76	0.47	0.52	658.46	4.45	9.86
Cumberland	95.5	-465.05	1.08	2.22	549.79	3.96	7.99
Dauphin	92.8	-478.62	1.24	2.63	561.65	4.88	8.23
Delaware	115.7	-383.77	2.05	12.46	459.10	3.56	6.60
Elk	83.9	-528.98	0.15	0.21	616.62	2.90	9.09
Erie	84.8	-523.70	1.38	1.93	606.12	5.28	9.00
Fayette	81.9	-541.97	0.69	0.97	624.55	6.45	9.32
Forest	58.3	-761.76	0.05	0.14	841.83	6.65	13.09
Franklin	83.6	-530.80	0.77	1.12	616.22	3.56	9.12
Fulton	76.3	-582.13	0.08	0.21	667.84	4.00	10.01
Greene	86.5	-513.31	0.18	0.35	601.03	2.92	8.82
Huntingdon	77.0	-576.30	0.25	0.32	660.04	5.78	9.91
Indiana	77.5	-573.00	0.47	0.64	655.95	6.09	9.85
Jefferson	78.3	-567.23	0.24	0.41	653.06	3.77	9.75
Juniata	80.9	-549.04	0.13	0.37	631.97	7.13	9.44
Lackawanna	87.6	-506.63	1.02	2.48	589.34	5.09	8.71
Lancaster	92.7	-479.08	2.43	2.88	560.07	5.46	8.23
Lawrence	83.1	-534.42	0.45	1.39	617.75	5.65	9.19
Lebanon	86.8	-511.51	0.66	2.05	595.57	4.43	8.79
Lehigh	95.2	-466.21	1.59	5.16	547.82	3.63	8.01
Luzerne	85.5	-519.58	1.57	1.97	601.80	5.32	8.93
Lycoming	82.7	-537.19	0.59	0.54	622.80	4.03	9.23
McKean	80.1	-554.14	0.22	0.25	641.14	2.99	9.52
Mercer	79.8	-556.54	0.60	1.00	640.08	5.29	9.57
Mifflin	75.7	-586.39	0.26	0.70	669.70	5.64	10.08
Monroe	81.4	-545.50	0.86	1.58	627.73	5.95	9.38
Montgomery	119.6	-371.17	2.88	6.66	452.57	2.68	6.38
Montour	93.9	-473.09	0.08	0.71	559.40	4.77	8.13
Northampton	95.1	-467.12	1.33	4.02	549.15	4.59	8.03
Northumberland	79.6	-558.01	0.49	1.20	641.56	5.17	9.59
Perry	80.9	-548.82	0.24	0.48	634.38	4.28	9.43
Philadelphia	152.2	-291.72	4.33	36.09	344.21	2.09	5.01
Pike	84.0	-528.37	0.28	0.57	611.97	6.47	9.08
Potter	74.0	-600.27	0.10	0.10	685.68	4.07	10.32
Schuylkill	82.8	-536.52	0.73	1.05	619.66	5.85	9.22
Snyder	80.8	-549.22	0.21	0.72	632.76	6.10	9.44
Somerset	76.7	-579.05	0.41	0.43	664.02	4.23	9.95
Sullivan	81.3	-546.41	0.03	0.08	631.77	5.14	9.39
Susquehanna	81.7	-543.18	0.21	0.29	628.51	4.83	9.34
Tioga	74.6	-595.16	0.24	0.23	681.07	3.39	10.23
Union	77.0	-576.49	0.25	0.87	660.61	4.87	9.91
Venango	78.5	-565.79	0.28	0.47	651.35	3.96	9.72
Warren	78.5	-565.40	0.22	0.27	656.37	-1.17	9.72
Washington	101.8	-435.97	0.86	1.12	518.16	8.33	7.49
Wayne	78.8	-563.66	0.27	0.42	647.66	5.62	9.69
Westmoreland	92.1	-481.95	1.63	1.78	565.46	4.80	8.28
Wyoming	83.7	-530.26	0.14	0.39	615.05	5.57	9.11
York	90.4	-491.22	2.06	2.55	573.85	4.32	8.44
Average	86.5	-523.33	0.81	1.99	606.87	4.65	9.00
Min	58.3	-761.76	0.02	0.06	344.21	-1.17	5.01
Max	152.2	-291.72	4.74	36.09	841.83	8.33	13.09

Source: Calculated by the authors.

Table A2-3
Contributions of Independent Variables to the Utilities Subindex

COUNTY	Utilities Subindex	Constant	PopD15	UNEMP16	Region
		%	%	%	%
Adams	105.2	88.43	0.12	8.35	3.10
Allegheny	108.9	85.44	0.96	10.61	3.00
Armstrong	112.9	82.44	0.06	14.61	2.89
Beaver	110.3	84.35	0.22	12.48	2.96
Bedford	109.2	85.18	0.03	11.81	2.99
Berks	107.5	86.51	0.28	10.18	3.03
Blair	108.1	86.10	0.14	10.74	3.02
Bradford	110.3	84.34	0.03	12.68	2.96
Bucks	107.2	86.81	0.60	9.54	3.04
Butler	107.7	86.35	0.14	10.48	3.03
Cambria	111.5	83.45	0.11	13.52	2.93
Cameron	112.7	82.59	0.01	14.51	2.90
Carbon	109.6	84.86	0.09	12.07	2.98
Centre	105.6	88.10	0.08	8.72	3.09
Chester	105.4	88.31	0.40	8.19	3.10
Clarion	110.2	84.46	0.04	12.55	2.96
Clearfield	112.6	82.64	0.04	14.42	2.90
Clinton	111.6	83.34	0.02	13.72	2.92
Columbia	108.6	85.64	0.08	11.28	3.00
Crawford	109.4	85.07	0.05	11.90	2.98
Cumberland	105.6	88.07	0.26	8.58	3.09
Dauphin	107.2	86.82	0.30	9.84	3.04
Delaware	109.0	85.33	1.74	9.94	2.99
Elk	108.8	85.53	0.02	11.45	3.00
Erie	110.9	83.87	0.19	12.99	2.94
Fayette	114.4	81.33	0.09	15.72	2.85
Forest	114.1	81.55	0.01	15.59	2.86
Franklin	107.5	86.53	0.11	10.32	3.03
Fulton	109.9	84.63	0.02	12.39	2.97
Greene	112.7	82.55	0.04	14.52	2.89
Huntingdon	111.9	83.17	0.03	13.89	2.92
Indiana	112.2	82.94	0.06	14.09	2.91
Jefferson	111.4	83.49	0.04	13.54	2.93
Juniata	108.4	85.87	0.04	11.09	3.01
Lackawanna	109.2	85.16	0.26	11.59	2.99
Lancaster	105.9	87.85	0.33	8.73	3.08
Lawrence	111.3	83.60	0.14	13.33	2.93
Lebanon	106.4	87.42	0.22	9.30	3.07
Lehigh	109.0	85.33	0.59	11.09	2.99
Luzerne	110.6	84.09	0.20	12.76	2.95
Lycoming	110.9	83.88	0.05	13.12	2.94
McKean	110.9	83.88	0.02	13.16	2.94
Mercer	109.7	84.85	0.10	12.08	2.98
Mifflin	109.0	85.39	0.06	11.55	2.99
Monroe	110.4	84.29	0.15	12.60	2.96
Montgomery	106.5	87.34	0.99	8.61	3.06
Montour	105.9	87.87	0.08	8.96	3.08
Northampton	108.4	85.82	0.47	10.71	3.01
Northumberland	110.5	84.21	0.11	12.72	2.95
Perry	106.6	87.31	0.05	9.58	3.06
Philadelphia	118.5	78.49	6.11	12.65	2.75
Pike	110.4	84.24	0.06	12.75	2.95
Potter	113.5	81.96	0.01	15.16	2.87
Schuylkill	110.1	84.47	0.10	12.46	2.96
Snyder	106.9	87.00	0.07	9.87	3.05
Somerset	112.4	82.75	0.04	14.31	2.90
Sullivan	111.1	83.74	0.01	13.32	2.94
Susquehanna	108.6	85.68	0.03	11.28	3.00
Tioga	111.8	83.20	0.02	13.86	2.92
Union	107.0	86.95	0.08	9.92	3.05
Venango	112.3	82.87	0.04	14.18	2.91
Warren	108.3	85.90	0.03	11.06	3.01
Washington	110.1	84.50	0.14	12.40	2.96
Wayne	109.2	85.18	0.04	11.79	2.99
Westmoreland	109.5	84.98	0.20	11.85	2.98
Wyoming	110.0	84.55	0.04	12.44	2.96
York	106.8	87.13	0.28	9.53	3.06
Average	109.7	84.90	0.26	11.87	2.98
Min	105.2	78.49	0.01	8.19	2.75
Max	118.5	88.43	6.11	15.72	3.10

Source: Calculated by the authors.

Table A2-4
Contributions of Independent Variables to the Transportation Subindex

COUNTY	Transportation Subindex	Constant %	POP15 %	PopD15 %	LMHI15 %	Region %
Adams	108.0	-26.66	0.15	0.07	114.89	11.56
Allegheny	108.9	-26.45	1.76	0.60	112.62	11.46
Armstrong	104.6	-27.53	0.10	0.04	115.46	11.93
Beaver	106.2	-27.12	0.25	0.14	114.97	11.75
Bedford	104.8	-27.48	0.07	0.02	115.48	11.91
Berks	107.8	-26.73	0.60	0.18	114.37	11.58
Blair	104.5	-27.56	0.19	0.09	115.34	11.95
Bradford	105.5	-27.29	0.09	0.02	115.35	11.83
Bucks	112.0	-25.72	0.87	0.36	113.33	11.15
Butler	108.3	-26.60	0.27	0.09	114.72	11.53
Cambria	104.0	-27.69	0.20	0.07	115.41	12.00
Cameron	103.1	-27.93	0.01	0.00	115.81	12.10
Carbon	105.8	-27.22	0.09	0.06	115.26	11.80
Centre	106.4	-27.06	0.24	0.05	115.04	11.73
Chester	112.8	-25.52	0.71	0.24	113.51	11.06
Clarion	103.9	-27.71	0.06	0.02	115.62	12.01
Clearfield	103.9	-27.72	0.12	0.03	115.55	12.01
Clinton	104.6	-27.54	0.06	0.02	115.53	11.94
Columbia	104.7	-27.50	0.10	0.05	115.43	11.92
Crawford	104.5	-27.55	0.13	0.03	115.45	11.94
Cumberland	108.6	-26.52	0.35	0.16	114.51	11.49
Dauphin	107.1	-26.89	0.40	0.19	114.65	11.65
Delaware	110.7	-26.01	0.79	1.08	112.86	11.27
Elk	104.9	-27.44	0.05	0.01	115.49	11.89
Erie	105.3	-27.36	0.41	0.13	114.96	11.86
Fayette	103.3	-27.88	0.20	0.06	115.53	12.08
Forest	101.8	-28.28	0.01	0.01	116.01	12.26
Franklin	106.8	-26.96	0.22	0.07	114.98	11.69
Fulton	105.3	-27.35	0.02	0.01	115.46	11.85
Greene	105.0	-27.44	0.06	0.02	115.47	11.89
Huntingdon	104.4	-27.58	0.07	0.02	115.54	11.96
Indiana	104.7	-27.51	0.13	0.04	115.42	11.92
Jefferson	104.0	-27.69	0.07	0.03	115.59	12.00
Juniata	105.1	-27.40	0.04	0.02	115.46	11.87
Lackawanna	105.3	-27.35	0.31	0.17	115.01	11.85
Lancaster	108.3	-26.58	0.77	0.21	114.08	11.52
Lawrence	104.6	-27.54	0.13	0.09	115.38	11.93
Lebanon	107.2	-26.87	0.20	0.14	114.88	11.64
Lehigh	107.9	-26.68	0.52	0.38	114.22	11.57
Luzerne	105.3	-27.34	0.47	0.13	114.89	11.85
Lycoming	105.3	-27.36	0.17	0.04	115.30	11.86
McKean	104.3	-27.62	0.06	0.02	115.57	11.97
Mercer	104.5	-27.56	0.17	0.06	115.38	11.95
Mifflin	103.6	-27.80	0.07	0.04	115.64	12.05
Monroe	107.6	-26.77	0.24	0.10	114.83	11.60
Montgomery	113.0	-25.49	1.13	0.59	112.72	11.05
Montour	106.7	-26.98	0.03	0.05	115.21	11.69
Northampton	108.7	-26.50	0.43	0.29	114.29	11.49
Northumberland	104.0	-27.69	0.14	0.08	115.47	12.00
Perry	107.3	-26.85	0.07	0.03	115.11	11.64
Philadelphia	109.7	-26.27	2.23	4.17	108.48	11.38
Pike	107.9	-26.70	0.08	0.04	115.01	11.57
Potter	103.4	-27.86	0.03	0.01	115.76	12.08
Schuylkill	104.9	-27.45	0.22	0.07	115.27	11.90
Snyder	105.8	-27.23	0.06	0.05	115.33	11.80
Somerset	104.5	-27.56	0.11	0.03	115.47	11.94
Sullivan	104.3	-27.62	0.01	0.01	115.63	11.97
Susquehanna	105.8	-27.21	0.06	0.02	115.34	11.79
Tioga	104.9	-27.45	0.06	0.01	115.48	11.90
Union	105.7	-27.24	0.07	0.05	115.31	11.81
Venango	104.2	-27.63	0.08	0.03	115.55	11.98
Warren	104.3	-27.61	0.06	0.02	115.57	11.97
Washington	107.4	-26.80	0.30	0.09	114.80	11.62
Wayne	105.7	-27.24	0.08	0.03	115.33	11.80
Westmoreland	106.8	-26.95	0.52	0.13	114.62	11.68
Wyoming	106.0	-27.18	0.04	0.03	115.33	11.78
York	108.3	-26.60	0.64	0.18	114.26	11.53
Average	106.0	-27.17	0.28	0.17	114.95	11.78
Min	101.8	-28.28	0.01	0.00	108.48	11.05
Max	113.0	-25.49	2.23	4.17	116.01	12.26

Source: Calculated by the authors.

Table A2-5
Contributions of Independent Variables to the Health Care Subindex

COUNTY	Health Care Subindex	Constant	PopD15	LIPC15	Region
		%	%	%	%
Adams	90.0	-4.77	0.05	103.30	1.42
Allegheny	91.9	-4.67	0.43	102.85	1.39
Armstrong	89.2	-4.81	0.03	103.35	1.43
Beaver	89.7	-4.79	0.10	103.26	1.42
Bedford	88.2	-4.86	0.01	103.40	1.45
Berks	90.0	-4.77	0.13	103.22	1.42
Blair	89.2	-4.81	0.06	103.32	1.43
Bradford	88.8	-4.84	0.01	103.38	1.44
Bucks	93.3	-4.60	0.26	102.97	1.37
Butler	91.2	-4.71	0.06	103.24	1.40
Cambria	88.6	-4.84	0.05	103.35	1.44
Cameron	89.9	-4.77	0.00	103.35	1.42
Carbon	89.7	-4.78	0.04	103.32	1.42
Centre	89.2	-4.81	0.04	103.34	1.43
Chester	94.4	-4.55	0.17	103.02	1.35
Clarion	88.1	-4.87	0.02	103.40	1.45
Clearfield	88.8	-4.83	0.02	103.37	1.44
Clinton	88.1	-4.87	0.01	103.41	1.45
Columbia	88.3	-4.86	0.04	103.38	1.45
Crawford	88.2	-4.86	0.02	103.39	1.45
Cumberland	91.1	-4.71	0.12	103.19	1.40
Dauphin	90.4	-4.75	0.13	103.20	1.41
Delaware	92.8	-4.62	0.77	102.48	1.38
Elk	89.7	-4.79	0.01	103.35	1.43
Erie	89.1	-4.82	0.09	103.29	1.43
Fayette	88.6	-4.84	0.04	103.36	1.44
Forest	84.8	-5.06	0.00	103.55	1.51
Franklin	89.3	-4.81	0.05	103.32	1.43
Fulton	88.2	-4.87	0.01	103.41	1.45
Greene	90.1	-4.76	0.02	103.33	1.42
Huntingdon	88.0	-4.87	0.01	103.41	1.45
Indiana	88.0	-4.88	0.03	103.40	1.45
Jefferson	88.5	-4.85	0.02	103.39	1.44
Juniata	88.5	-4.85	0.02	103.39	1.44
Lackawanna	89.6	-4.79	0.12	103.24	1.43
Lancaster	90.1	-4.77	0.15	103.20	1.42
Lawrence	88.9	-4.83	0.06	103.32	1.44
Lebanon	89.6	-4.79	0.10	103.26	1.43
Lehigh	90.6	-4.74	0.27	103.06	1.41
Luzerne	89.1	-4.81	0.09	103.29	1.43
Lycoming	89.2	-4.81	0.02	103.36	1.43
McKean	89.0	-4.82	0.01	103.38	1.44
Mercer	88.5	-4.85	0.04	103.36	1.44
Mifflin	87.8	-4.89	0.03	103.40	1.46
Monroe	88.5	-4.85	0.07	103.33	1.44
Montgomery	94.3	-4.55	0.42	102.78	1.35
Montour	91.0	-4.72	0.04	103.27	1.40
Northampton	90.6	-4.74	0.21	103.12	1.41
Northumberland	88.4	-4.85	0.05	103.35	1.45
Perry	88.9	-4.83	0.02	103.37	1.44
Philadelphia	93.5	-4.59	2.92	100.30	1.37
Pike	89.1	-4.82	0.03	103.36	1.43
Potter	87.8	-4.89	0.00	103.43	1.46
Schuylkill	88.8	-4.83	0.05	103.34	1.44
Snyder	88.6	-4.84	0.03	103.37	1.44
Somerset	88.2	-4.87	0.02	103.40	1.45
Sullivan	88.9	-4.83	0.00	103.39	1.44
Susquehanna	89.0	-4.82	0.01	103.37	1.44
Tioga	88.0	-4.88	0.01	103.42	1.45
Union	88.1	-4.87	0.04	103.38	1.45
Venango	88.5	-4.85	0.02	103.38	1.44
Warren	89.3	-4.81	0.01	103.36	1.43
Washington	91.5	-4.69	0.06	103.23	1.40
Wayne	88.3	-4.86	0.02	103.39	1.45
Westmoreland	90.3	-4.75	0.09	103.25	1.41
Wyoming	89.2	-4.81	0.02	103.36	1.43
York	90.0	-4.77	0.13	103.22	1.42
Average	89.5	-4.80	0.12	103.25	1.43
Min	84.8	-5.06	0.00	100.30	1.35
Max	94.4	-4.55	2.92	103.55	1.51

Source: Calculated by the authors.

Table A2-6
Contributions of Independent Variables to the Miscellaneous Goods and Services Subindex

COUNTY	Misc G&S Subindex	Constant	PopD15	LIPC15	Region
		%	%	%	%
Adams	102.3	-24.55	0.10	121.81	2.63
Allegheny	105.3	-23.87	0.85	120.46	2.56
Armstrong	101.3	-24.79	0.05	122.08	2.66
Beaver	102.0	-24.63	0.20	121.79	2.64
Bedford	100.0	-25.13	0.03	122.41	2.69
Berks	102.4	-24.53	0.25	121.64	2.63
Blair	101.2	-24.81	0.13	122.03	2.66
Bradford	100.7	-24.95	0.03	122.25	2.68
Bucks	106.9	-23.50	0.52	120.46	2.52
Butler	104.0	-24.16	0.12	121.45	2.59
Cambria	100.5	-24.99	0.10	122.21	2.68
Cameron	102.2	-24.58	0.01	121.94	2.64
Carbon	102.0	-24.63	0.09	121.90	2.64
Centre	101.3	-24.80	0.08	122.06	2.66
Chester	108.3	-23.19	0.34	120.36	2.49
Clarion	99.8	-25.17	0.03	122.44	2.70
Clearfield	100.8	-24.93	0.04	122.22	2.67
Clinton	99.8	-25.16	0.02	122.44	2.70
Columbia	100.1	-25.09	0.07	122.33	2.69
Crawford	100.0	-25.13	0.05	122.39	2.69
Cumberland	103.9	-24.19	0.23	121.36	2.59
Dauphin	103.0	-24.40	0.27	121.51	2.62
Delaware	106.8	-23.53	1.53	119.48	2.52
Elk	101.9	-24.66	0.02	121.99	2.64
Erie	101.2	-24.83	0.18	121.99	2.66
Fayette	100.5	-24.99	0.09	122.22	2.68
Forest	95.4	-26.33	0.01	123.50	2.82
Franklin	101.5	-24.76	0.10	122.00	2.66
Fulton	99.9	-25.14	0.02	122.43	2.70
Greene	102.4	-24.52	0.03	121.86	2.63
Huntingdon	99.7	-25.19	0.03	122.46	2.70
Indiana	99.7	-25.20	0.06	122.44	2.70
Jefferson	100.4	-25.03	0.04	122.31	2.68
Juniata	100.3	-25.04	0.03	122.32	2.69
Lackawanna	101.8	-24.67	0.24	121.78	2.65
Lancaster	102.5	-24.50	0.29	121.58	2.63
Lawrence	100.9	-24.89	0.13	122.09	2.67
Lebanon	101.9	-24.65	0.20	121.81	2.64
Lehigh	103.4	-24.29	0.54	121.15	2.61
Luzerne	101.3	-24.81	0.19	121.96	2.66
Lycoming	101.2	-24.82	0.05	122.10	2.66
McKean	101.0	-24.88	0.02	122.19	2.67
Mercer	100.3	-25.05	0.09	122.27	2.69
Mifflin	99.4	-25.27	0.06	122.50	2.71
Monroe	100.4	-25.02	0.14	122.19	2.68
Montgomery	108.5	-23.16	0.83	119.85	2.48
Montour	103.7	-24.22	0.07	121.55	2.60
Northampton	103.3	-24.31	0.42	121.28	2.61
Northumberland	100.3	-25.06	0.11	122.26	2.69
Perry	100.9	-24.91	0.04	122.19	2.67
Philadelphia	109.6	-22.93	5.66	114.81	2.46
Pike	101.1	-24.84	0.05	122.13	2.66
Potter	99.4	-25.28	0.01	122.56	2.71
Schuylkill	100.8	-24.92	0.10	122.15	2.67
Snyder	100.5	-25.00	0.07	122.26	2.68
Somerset	99.9	-25.15	0.04	122.42	2.70
Sullivan	100.9	-24.91	0.01	122.23	2.67
Susquehanna	101.0	-24.88	0.03	122.19	2.67
Tioga	99.6	-25.22	0.02	122.50	2.70
Union	99.8	-25.17	0.08	122.39	2.70
Venango	100.4	-25.03	0.04	122.31	2.68
Warren	101.4	-24.78	0.02	122.10	2.66
Washington	104.4	-24.06	0.12	121.35	2.58
Wayne	100.1	-25.09	0.04	122.36	2.69
Westmoreland	102.9	-24.43	0.18	121.63	2.62
Wyoming	101.3	-24.80	0.04	122.11	2.66
York	102.4	-24.54	0.25	121.65	2.63
Average	101.7	-24.72	0.24	121.83	2.65
Min	95.4	-26.33	0.01	114.81	2.46
Max	109.6	-22.93	5.66	123.50	2.82

Source: Calculated by the authors.

Appendix 3
Changes in the COLI indexes, 1997-2017

Table A3
Cost of Living Indexes, 1997 and 2017

	Composite			Groceries			Housing			Utilities			Transportation			Health Care			Misc Goods & Services		
County	1997	2017	% Chg	1997	2017	% Chg	1997	2017	% Chg	1997	2017	% Chg	1997	2017	% Chg	1997	2017	% Chg	1997	2017	% Chg
Adams	101.9	98.2	-3.7	101.0	101.5	0.5	101.4	88.2	-13.0	120.9	105.2	-13.0	100.0	108.0	8.0	95.8	90.0	-6.1	100.8	102.3	1.5
Allegheny	104.6	104.3	-0.2	102.9	103.5	0.6	109.5	109.1	-0.3	123.9	108.9	-12.1	105.2	108.9	3.5	108.2	91.9	-15.0	101.3	105.3	3.9
Armstrong	100.2	93.7	-6.4	100.9	100.8	-0.1	98.3	83.4	-15.1	120.9	112.9	-6.6	98.6	104.6	6.1	94.5	89.2	-5.6	98.6	101.3	2.7
Beaver	101.0	96.1	-4.9	101.1	101.3	0.1	102.3	88.4	-13.6	121.1	110.3	-8.9	100.7	106.2	5.4	96.4	89.7	-6.9	98.5	102.0	3.5
Bedford	100.4	93.0	-7.4	100.9	99.9	-0.9	98.2	78.8	-19.8	120.8	109.2	-9.6	96.8	104.8	8.2	92.2	88.2	-4.3	98.4	100.0	1.6
Berks	102.0	98.2	-3.7	101.3	101.6	0.2	103.1	90.7	-12.0	121.5	107.5	-11.5	101.3	107.8	6.4	101.3	90.0	-11.1	101.1	102.4	1.3
Blair	100.6	95.6	-5.0	101.0	100.8	-0.2	100.9	84.7	-16.1	121.0	108.1	-10.7	98.0	104.5	6.6	95.1	89.2	-6.2	98.7	101.2	2.6
Bradford	100.5	93.7	-6.8	100.9	100.4	-0.5	100.0	78.9	-21.2	120.8	110.3	-8.7	99.0	105.5	6.6	93.3	88.8	-4.8	99.4	100.7	1.3
Bucks	103.5	105.8	2.2	101.8	104.6	2.7	105.9	111.9	5.7	122.2	107.2	-12.3	105.0	112.0	6.6	107.6	93.3	-13.3	102.3	106.9	4.5
Butler	101.7	99.8	-1.9	101.0	102.6	1.5	101.5	96.2	-5.2	121.1	107.7	-11.0	100.2	108.3	8.0	96.9	91.2	-5.9	100.9	104.0	3.1
Cambria	100.2	93.3	-6.9	101.0	100.3	-0.7	98.5	80.6	-18.1	121.0	111.5	-7.9	98.1	104.0	6.0	94.6	88.6	-6.4	98.8	100.5	1.8
Cameron	99.7	94.9	-4.9	100.8	101.4	0.6	98.7	87.1	-11.8	120.8	112.7	-6.7	97.9	103.1	5.4	96.1	89.9	-6.5	98.2	102.2	4.1
Carbon	101.0	96.0	-5.0	100.9	101.3	0.3	98.8	87.4	-11.6	120.8	109.6	-9.3	98.6	105.8	7.3	94.9	89.7	-5.4	99.2	102.0	2.8
Centre	101.1	96.6	-4.5	101.0	100.8	-0.2	102.9	82.3	-20.0	121.0	105.6	-12.7	100.4	106.4	6.0	95.5	89.2	-6.6	99.4	101.3	2.0
Chester	103.1	107.9	4.6	101.6	105.5	3.8	104.9	115.2	9.8	122.1	105.4	-13.7	104.4	112.8	8.1	118.2	94.4	-20.1	105.7	108.3	2.5
Clarion	99.7	92.4	-7.3	100.9	99.8	-1.1	99.1	75.6	-23.7	120.8	110.2	-8.8	96.8	103.9	7.4	93.8	88.1	-6.1	97.8	99.8	2.1
Clearfield	100.4	93.0	-7.4	100.9	100.4	-0.4	97.5	81.6	-16.3	120.9	112.6	-6.9	96.9	103.9	7.2	93.7	88.8	-5.2	99.1	100.8	1.7
Clinton	100.1	91.9	-8.1	100.9	99.8	-1.0	98.0	75.7	-22.8	120.8	111.6	-7.6	101.7	104.6	2.8	93.0	88.1	-5.2	98.6	99.8	1.2
Columbia	100.3	93.6	-6.7	100.9	100.0	-0.9	98.7	78.9	-20.0	120.9	108.6	-10.1	98.0	104.7	6.8	94.1	88.3	-6.1	99.0	100.1	1.1
Crawford	100.6	93.1	-7.5	100.9	99.9	-1.0	100.1	77.4	-22.7	120.9	109.4	-9.5	99.3	104.5	5.2	93.9	88.2	-6.0	99.0	100.0	1.0
Cumberland	101.7	100.7	-1.0	101.2	102.5	1.3	104.3	95.5	-8.5	121.2	105.6	-12.8	101.2	108.6	7.3	102.0	91.1	-10.7	101.6	103.9	2.2
Dauphin	101.5	99.0	-2.5	101.2	101.9	0.7	104.0	92.8	-10.8	121.3	107.2	-11.7	101.9	107.1	5.1	102.1	90.4	-11.4	100.7	103.0	2.2
Delaware	108.4	107.0	-1.2	102.6	104.5	1.8	115.3	115.7	0.3	122.1	109.0	-10.7	108.5	110.7	2.0	107.1	92.8	-13.3	102.0	106.8	4.6
Elk	99.7	95.9	-3.8	100.9	101.2	0.3	99.5	83.9	-15.7	120.8	108.8	-10.0	99.1	104.9	5.9	97.2	89.7	-7.7	99.0	101.9	3.0
Erie	101.0	94.8	-6.2	101.2	100.7	-0.5	101.2	84.8	-16.2	121.3	110.9	-8.5	100.2	105.3	5.1	97.1	89.1	-8.3	99.6	101.2	1.6
Fayette	100.5	92.2	-8.3	101.0	100.3	-0.7	97.8	81.9	-16.3	121.0	114.4	-5.4	96.8	103.3	6.7	93.7	88.6	-5.4	98.7	100.5	1.8
Forest	101.0	84.6	-16.3	100.8	96.9	-3.9	95.3	58.3	-38.8	120.8	114.1	-5.5	97.8	101.8	4.1	91.3	84.8	-7.0	98.8	95.4	-3.5
Franklin	101.2	96.1	-5.0	101.0	100.9	-0.1	101.3	83.6	-17.4	121.0	107.5	-11.1	98.4	106.8	8.6	96.6	89.3	-7.5	99.7	101.5	1.7
Fulton	101.2	92.6	-8.5	100.8	99.9	-1.0	97.7	76.3	-21.9	120.8	109.9	-9.0	96.4	105.3	9.2	92.7	88.2	-4.8	97.7	99.9	2.3
Greene	100.1	95.3	-4.8	100.9	101.6	0.7	96.8	86.5	-10.6	120.8	112.7	-6.7	98.1	105.0	7.0	92.0	90.1	-2.1	98.7	102.4	3.8
Huntingdon	100.2	91.7	-8.5	100.9	99.8	-1.1	95.2	77.0	-19.1	120.8	111.9	-7.4	97.3	104.4	7.4	91.5	88.0	-3.8	98.6	99.7	1.1
Indiana	100.0	91.6	-8.3	100.9	99.7	-1.2	97.8	77.5	-20.8	120.9	112.2	-7.2	97.4	104.7	7.4	93.8	88.0	-6.2	99.2	99.7	0.5
Jefferson	100.2	92.8	-7.4	100.9	100.2	-0.7	98.6	78.3	-20.6	120.8	111.4	-7.8	98.3	104.0	5.8	94.2	88.5	-6.0	99.2	100.4	1.2
Juniata	100.9	93.8	-7.0	100.9	100.2	-0.7	97.6	80.9	-17.1	120.8	108.4	-10.3	96.6	105.1	8.8	92.7	88.5	-4.5	100.3	100.3	0.0
Lackawanna	100.7	96.4	-4.3	101.2	101.2	0.0	100.6	87.6	-12.9	121.1	109.2	-9.8	101.6	105.3	3.6	97.4	89.6	-8.1	99.3	101.8	2.6
Lancaster	102.3	99.2	-3.0	101.4	101.6	0.2	104.6	92.7	-11.4	121.7	105.9	-13.0	102.3	108.3	5.9	100.3	90.1	-10.2	101.2	102.5	1.3
Lawrence	100.6	94.0	-6.6	101.0	100.6	-0.4	100.3	83.1	-17.1	120.9	111.3	-8.0	98.6	104.6	6.1	94.6	88.9	-5.9	98.7	100.9	2.3
Lebanon	101.4	97.4	-4.0	101.0	101.2	0.2	103.5	86.8	-16.2	121.0	106.4	-12.0	99.1	107.2	8.1	97.3	89.6	-7.9	99.8	101.9	2.1
Lehigh	103.1	99.6	-3.4	101.5	102.2	0.7	105.0	95.2	-9.3	121.4	109.0	-10.2	103.9	107.9	3.9	102.8	90.6	-11.8	101.4	103.4	2.0
Luzerne	100.4	95.1	-5.3	101.2	100.8	-0.4	99.9	85.5	-14.4	121.3	110.6	-8.8	99.5	105.3	5.8	97.7	89.1	-8.7	99.0	101.3	2.3
Lycoming	100.1	94.4	-5.7	100.9	100.8	-0.2	99.3	82.7	-16.8	120.9	110.9	-8.3	99.4	105.3	5.9	94.7	89.2	-5.8	99.4	101.2	1.9
McKean	99.7	93.8	-5.9	100.9	100.6	-0.3	98.9	80.1	-19.0	120.8	110.9	-8.2	97.4	104.3	7.0	94.8	89.0	-6.1	98.4	101.0	2.6
Mercer	100.6	93.6	-7.0	101.0	100.1	-0.8	100.9	79.8	-20.9	120.9	109.7	-9.3	98.3	104.5	6.3	94.6	88.5	-6.5	99.2	100.3	1.1
Mifflin	100.7	92.4	-8.3	100.9	99.5	-1.3	98.8	75.7	-23.4	120.8	109.0	-9.8	99.7	103.6	3.9	92.4	87.8	-5.0	98.9	99.4	0.5
Monroe	103.2	93.7	-9.3	101.0	100.2	-0.8	98.5	81.4	-17.4	121.0	110.4	-8.7	101.5	107.6	6.0	95.5	88.5	-7.3	101.4	100.4	-1.0
Montgomery	105.0	109.3	4.1	102.4	105.6	3.1	109.0	119.6	9.8	123.1	106.5	-13.5	107.0	113.0	5.6	121.8	94.3	-22.5	106.8	108.5	1.6
Montour	100.6	99.7	-0.9	100.9	102.4	1.5	102.1	93.9	-8.1	120.8	105.9	-12.3	111.8	106.7	-4.5	101.8	91.0	-10.6	101.3	103.7	2.4
Northampton	102.5	99.4	-3.0	101.3	102.2	0.8	103.7	95.1	-8.3	121.3	108.4	-10.6	101.9	108.7	6.7	99.5	90.6	-8.9	100.6	103.3	2.8
Northumberland	100.0	93.2	-6.8	101.0	100.1	-0.8	99.3	79.6	-19.9	120.9	110.5	-8.6	97.7	104.0	6.5	94.4	88.4	-6.3	98.9	100.3	1.4
Perry	101.3	95.3	-5.9	100.9	100.5	-0.4	101.8	80.9	-20.5	120.8	106.6	-11.8	98.0	107.3	9.5	94.0	88.9	-5.5	99.8	100.9	1.1
Philadelphia	127.6	118.8	-6.8	106.3	106.6	0.3	148.6	152.2	2.4	123.5	118.5	-4.0	119.2	109.7	-8.0	101.7	93.5	-8.0	99.7	109.6	9.9
Pike	103.2	94.3	-8.7	100.9	100.7	-0.2	100.4	84.0	-16.3	120.8	110.4	-8.6	101.0	107.9	6.8	94.2	89.1	-5.4	102.0	101.1	-0.9
Potter	100.2	90.5	-9.7	100.8	99.5	-1.3	98.0	74.0	-24.5	120.8	113.5	-6.0	97.5	103.4	6.0	94.0	87.8	-6.6	98.3	99.4	1.1
Schuylkill	100.0	94.2	-5.8	101.0	100.5	-0.5	98.7	82.8	-16.1	121.0	110.1	-9.0	98.4	104.9	6.6	95.3	88.8	-6.8	98.9	100.8	2.0
Snyder	100.6	94.7	-5.9	100.9	100.3	-0.6	101.0	80.8	-19.9	120.8	106.9	-11.5	98.5	105.8	7.4	97.4	88.6	-9.0	100.0	100.5	0.5
Somerset	100.5	91.8	-8.6	100.9	99.9	-1.0	98.3	76.7	-22.0	120.9	112.4	-7.0	97.1	104.5	7.6	93.6	88.2	-5.8	100.2	99.9	-0.3
Sullivan	100.1	93.5	-6.6	100.8	100.5	-0.3	98.4	81.3	-17.5	120.8	111.1	-8.0	97.1	104.3	7.4	92.4	88.9	-3.8	100.0	100.9	0.9
Susquehanna	100.5	94.7	-5.8	100.9	100.6	-0.3	98.5	81.7	-17.0	120.8	108.6	-10.1	96.8	105.8	9.3	93.2	89.0	-4.5	100.4	101.0	0.6
Tioga	100.4	91.5	-8.8	100.9	99.7	-1.2	98.8	74.6	-24.5	120.8	111.8	-7.4	96.7	104.9	8.5	93.2	88.0	-5.6	98.6	99.6	1.0
Union	100.5	93.7	-6.7	100.9	99.8	-1.1	101.5	77.0	-24.1	120.8	107.0	-11.4	99.3	105.7	6.5	94.1	88.1	-6.3	101.4	99.8	-1.5
Venango	99.9	92.5	-7.4	100.9	100.2	-0.7	99.0	78.5	-20.7	120.9	112.3	-7.1	98.1	104.2	6.2	97.8	88.5	-9.5	99.1	100.4	1.3
Warren	99.7	95.4	-4.4	100.9	100.9	0.0	100.2	78.5	-21.7	120.8	108.3	-10.4	98.5	104.3	5.9	96.1	89.3	-7.1	99.9	101.4	1.5
Washington	100.7	99.6	-1.1	101.1	102.9	1.8	101.1	101.8	0.7	121.2	110.1	-9.1	99.4	107.4	8.1	99.3	91.5	-7.8	99.1	104.4	5.4
Wayne	101.2	93.3	-7.8	100.9	100.0	-0.8	97.4	78.8	-19.1	120.8	109.2	-9.6	100.1	105.7	5.6	93.5	88.3	-5.5	100.4	100.1	-0.3
Westmoreland	100.9	97.9	-3.0	101.3	101.8	0.6	101.5	92.1	-9.3	121.5	109.5	-9.9	101.2	106.8	5.6	98.8	90.3	-8.5	99.8	102.9	3.1
Wyoming	99.8	94.6	-5.2	100.9	100.8	-0.1	97.4	83.7	-14.0	120.8	110.0	-8.9	99.0	106.0	7.0	93.9	89.2	-5.0	99.5	101.3	1.8
York	102.1	98.5	-3.5	101.3	101.5	0.2	103.3	90.4	-12.5	121.5	106.8	-12.1	101.6	108.3	6.5	99.4	90.0	-9.5	101.5	102.4	0.9

Source: Kurre (2000) and C2ER.

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