2. State-Level Trends in Energy Intensity

States vary significantly in how they use energy, which is well illustrated by the changes in energy use by state over the past two decades. Figure 2.1 graphs the annual changes in energy intensity for the 48 contiguous states\(^1\) from 1977 through 1999 (starting in 1977 at 100 percent for all states).\(^2\) In absolute terms, energy intensity varies substantially by state. In 1999, energy intensity for each state ranged from 5 million Btus (5 mmbtu) to 30 mmbtu per dollar of GSP. The magnitude and direction of change in energy intensity also vary significantly among states, with the states’ energy intensity increasing or decreasing at various rates.

NOTE: The thicker solid line in the center of the chart represents U.S. average energy intensity.

Figure 2.1—Changes in Each State’s Energy Intensity, 1977–1999

\(^1\)We excluded Alaska, Hawaii, and the District of Columbia from our econometric analysis given their unique situations in regard to energy use and energy prices.

\(^2\)The data sources for the information presented in this chapter are primarily from the Energy Information Administration’s series of reports on state energy data (EIA [1995, 1998a, 1998b, 1999, and 2000]).
Numerous factors can affect a state’s energy intensity rates, and those factors may help to explain the source of the differences in the states’ energy intensity over the years. Some of those differences can be traced to lesser or greater increases in energy efficiency within states, but other differences are likely due to, among other factors, demographic changes and changes in the states’ economies, including the shift away from energy-intensive manufacturing and the growth of the service sector’s share of the states’ economic output. Some examples of demographic shifts include:

- the increasing size of single-family homes
- population movement to the southern and western regions of the country
- the increasing size of personal automobiles (i.e., a greater numbers of trucks and sport utility vehicles versus smaller vehicles).

These factors and others are discussed more in detail in Chapter 3.

To illustrate how the states’ energy intensities have varied by energy-consuming sector, as well as overall, Figure 2.2 shows the average annual percentage change in residential energy intensity (defined as residential energy use per capita) in the 48 states from 1979 through 1999. During this period, residential energy intensity declined in 33 states and increased in 15 states.

Analysis of energy intensity in the United States is often done at the national and energy-consuming sector levels. Upon recognizing that there is significant

![Figure 2.2—States’ Average Annual Percent Change in Residential Energy Intensity, 1979–1999](#)
variation in energy intensity among states, we also realized that having more-disaggregate data could provide a more robust set of analyses that may uncover additional information on what affects changes in energy intensity (i.e., if patterns of energy intensity are examined over 20 years on a nationwide level, 20 data points are produced; but if the analysis is disaggregated by state, almost 1,000 data points are produced).

States have not shown consistent increases or decreases in their energy intensity. For example, Figure 2.3 plots the *industrial sector energy intensity* (defined as *industrial energy use per GSP originating in the industrial sector*) for five states whose energy intensity patterns are representative of those of all 48 contiguous states. In examining all the states, we observed a few basic patterns. The energy intensity for some states increased during the late 1970s and then declined consistently from the early 1980s through the 1990s. And some states experienced declines in energy intensity through the mid-1980s and then experienced increases in intensity in the 1990s. Finally, some states consistently experienced reductions in energy intensity throughout the time period of our study. This variation in patterns of energy intensity influenced our choice of the two subperiods (1977–1987 and 1988–1999) used in our analysis.

It can be argued that declining energy intensity in the late 1970s and early 1980s was driven by rising energy prices, and with those rising prices came new state

![Figure 2.3—Percent Change in Industrial Energy Intensity for Selected States Versus U.S. Average, 1977–1999 (indexed to 1977)](image)
energy policies. By 1985, oil prices had returned to their pre-1973 levels in real dollars (adjusted for inflation), and energy prices overall remained relatively steady throughout the 1990s, with some brief periods when prices peaked or dipped. Figure 2.4 shows the average price paid for energy (in dollars per mmbtu) from 1977 through 1999 in each of the four major energy-consuming sectors (industrial, commercial, residential, and transportation) and the average price paid for energy in the United States overall. Figure 2.5 shows the average real price paid for energy in the 48 contiguous states, bounded by one standard deviation from the mean.

In this study, we examined patterns in energy intensity from 1977 through 1999. As stated earlier, we also separated the sample into two subperiods—1977–1987 and 1988–1999. The major reason for dividing the study period into two subperiods is that the price of energy is a major factor in energy intensity. Figures 2.4 and 2.5 show that energy prices were less stable prior to 1988—rising and then falling, and for the most part flattening out after 1987. Later in this report, we show that changes in energy intensity did in fact differ somewhat between the two subperiods. Some discussions in this report will focus on the later period (1988–1999) because variations in price were smaller, and therefore the influence of prices on energy intensity was less.

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3Due to data limitations, our analysis of the residential sector starts at 1979 instead of 1977.
Figure 2.5—Average Weighted Energy Price for the 48 Contiguous States Collectively, 1977–1999 (plus and minus one standard deviation)