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Regional Energy Costs and Business
Siting Decisions: An Illinois Perspective

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Regional Energy Costs and Business Siting Decisions: An Illinois Perspective

David R. Allardice and William A. Testa

The Great Lakes Region—Illinois, Indiana, Michigan, Ohio, and Wisconsin—continues to be characterized by its large manufacturing sector. Manufacturing accounted for 27 percent of the region's output in 1986 in comparison to 20 for the nation. Nonetheless, manufacturing in the Illinois and surrounding Great Lakes region has been downsizing in relation to the nation for most of the past four decades. More recently in the early 1980s, the region's manufacturing decline accelerated under the burden of a high-valued dollar, high interest rates, changing federal spending priorities, and fierce international competition.

As Sunbelt regions have prospered amidst the Midwest decline, some analysts have partly attributed Midwest travails to favorable factor cost conditions in the South *vis-a-vis* the older industrial heartland. This paper focuses on one specific factor cost difference, that being energy costs, as it affects business siting decisions. Do energy cost difference affect the siting of manufacturing facilities? If so, which industries are most sensitive? Are these industries concentrated in Illinois and the Great Lakes Region? How do industrial energy prices compare with the rest of the nation. In short, should we be concerned with energy prices as part of the region's development policy?

Influence of Energy Prices on Regional Growth

In general, changes in the general price level of energy products can give rise to differing rates of regional growth and levels of economic well being. It is helpful to enumerate the modes of transmission from energy prices to regional growth in putting this topic into perspective.

First, it may be helpful to distinguish the general *level* of energy prices from the extent that energy prices *differ* across regions (See Figure 1). These affect regional growth of business and the general welfare through different transmission mechanisms.

Nor are these two unrelated. A rise in the overall level of energy prices will tend to widen the absolute energy price differences among regions which, in turn, tends to increase the influence of energy price differences on regional growth and welfare.

Turning first to the direct impact of rising energy prices on regional growth. Rising energy prices tend to raise the cost of shipping goods to market and also the cost of shipping intermediate inputs to the production site. An industry oriented toward producing goods with substantial volume or weight will then be pulled toward areas of existing market (population) concentration. Such industries have been those associated with the Northeast and Midwest regions of the U.S. including autos and heavy machinery. In contrast, industries using bulky or heavy intermediate inputs (whose weight and volume are subsequently lost in production) will tend to locate nearer to input markets as transport costs rise. For example, processed foods and textiles might be examples to this effect.

Little empirical information is available on the geographic effects of industry shipping costs and regional growth in response to the recent 15 year hike in transport costs. One exception, Roger Schmenner inconclusively reports on his own survey of 19 manufacturing trade associations.¹ Four responded that their industry had been pulled closer to suppliers and 7 responded that their industry had been pulled closer to final product markets over the 1970s.

Perhaps the most important impact of rising levels of energy prices (according to many analysts) has followed, not from changing regional terms of trade, but from the rising income and welfare in energy-producing regions such as the East South Central Region of the U.S. While these regions have recently fallen on hard times as world petroleum prices have ebbed, such was not the case during the 1970s era of rising resource prices when income, employment and population expanded rapidly in energy extracting regions. Economic rents and windfall gains accrued to the region's residents through severance taxation of oil and gas production. And because the general pull of markets on industry is one of the strongest influences of jobs and income, rising income and employment further incited "second round" market attraction of general manufacturing and service industries to energy producing regions.

In considering the impacts of energy price differentials, we would be remiss if we did not cite the influence of energy prices on individuals' cost of living. High energy prices affect cost of living directly by way of household and transport fuel and also through the purchase of locally produced goods which are themselves produced with local utility fuels and electricity. From the regional standpoint, migration to such regions will be, other things equal, impeded by higher living costs. From the firm's standpoint, recruitment of labor (and ultimately job expansion) will be diminished through capitalization of energy price differences in wages. Firms will need

to offer higher wages in order to recruit labor to the region. As a partial consequence, firms' desired level of hiring will be curtailed.

Finally, turning to the dimension on which we will focus, regional energy price differences can be important as a business location factor, directly influencing the operating costs of plants and their geographic location (expansion) decision. This influence is most important to the goods-producing segments of the economy and especially to manufacturing which has been the engine of economic well-being for the Great Lakes Region and, arguably, for Illinois and Chicago as well. On a heat content basis (Btus) the industrial sector consumed almost 36 percent of America's energy in 1987 (including both fossil fuels and electricity) versus 42 percent in 1973. For the most part, this decline reflects improvements in energy efficiency within the manufacturing sector, much of it in response to rising energy prices.

In focusing on the industrial sector, we view the price behavior of two particular energy sources—electricity and natural gas—across time so as to evaluate the changing importance of fuel prices to firm behavior in comparison to other factor costs. Here we can see the relative price hikes for industrial gas and industrial electric power in comparison to the implicit price deflator for the nation's gross product (See Figure 2). While the general price level has risen by over two and one-half times from 1970 to 1986, natural gas prices have risen by almost 9 times—erratically following petroleum-based fuel prices upward through periods of government controls, fuel-use restrictions, and finally into an era of market deregulation. Industrial gas prices apparently peaked in 1984 (at over 11 times the price of 1970) before falling off dramatically during the so-called “gas-bubble”.

Despite the problems of the electric utility industry associated with environmental concerns of both coal-fired and nuclear-based generating plants, electricity prices for industry have climbed “only” five fold since 1970—this following a long period over which industrial (and other) electricity prices had remained constant in current dollars while falling in real terms. (Electricity prices have also fallen off since 1985 in the industrial sector.)

Demand for goods is almost never perfectly inelastic and, accordingly, industry substituted other factors of production for energy (and also used it more efficiently) as the price of energy soared over the 1970s and early 80s. The industrial sector (mining, manufacturing, farming, and forestry) actually used 13.7 percent less energy in 1987 in comparison to 1973. In addition to greater efficiency and substitution of factors, an accelerated shift in the composition of America's goods away from heavy industry (energy intensive industry) has contributed to the decline in energy intensity.

Nonetheless, (in net effect) from the firm's perspective, the importance of energy to the bottom line cost equation has actually gained in importance. In 1986, the ratio of purchased energy cost to nominal output for all manufacturing was 5.2 percent in 1986 in comparison to 3.0 percent in 1971.

Energy Costs and Geographic Siting Decisions

A preview of this topic has already been foreshadowed by the fact that energy costs remain rather small in the total cost picture. For this reason, one would expect that other factors of production, such as labor cost and market proximity, will tend to overshadow energy costs for the majority of companies considering plant expansion, opening, or relocation.

Survey Approaches

Surveys of officials from Fortune 500 companies tend to bear out this assertion. The work of Roger Schmenner remains the most comprehensive and authoritative on the subject.² While summary evidence from his work will be presented, it should be noted that there have been many surveys of plant location factors conducted, and they tend to confirm the Schmenner results.³

Roger Schmenner identified 159 plant openings (using the Dun & Bradstreet "universe" file of firms) during the 1970s. An extensive interview was presented to companies experiencing plant openings over the sample period. Schmenner inquired about the relative importance of location factors in two ways.

First, he asked company representatives to list those factors which were "desirable" in the decision. This was done to key in on the "marginal" influences on location decision. Second, he asked them to rank and list those features which were "musts" in their plants location decision.

He conducted these analyses as a two stage process—asking firms once to list the factors which were important to choice of regions and once concerning their choice of actual plant site (once the regional choice had been made). He did so because he believed that most siting decisions are two-stage separable processes—first the choice of region is made dependent on one set of factors and followed by the choice of actual site within the region. The survey results were tabulated by the frequency with which plant officials mentioned particular items. (Note that no list of potential factors was provided which might coax or bias the responses).

First, in viewing those factors viewed as “desirable” in the choice of regions, the top items are dominated by the factors which location analysts have always considered prime—those being labor cost related factors and transportation factors related to materials access and shipment of final goods to markets (See Figure 3). Energy costs were cited 25% of the time, ranking 10th among items. In addition to labor and transportation costs ranking ahead of energy, so did low taxes, low land costs, low construction costs, and college nearby—the recent high tech magnet—all outdistanced low energy costs.

In viewing those factors which were “musts” in the choice of either state/region or final site selection, low energy costs were hardly mentioned at all. Favorable labor climate and proximity to markets and suppliers are mentioned as dominant considerations in the choice of state/region. As an apparent interpretation, high energy costs can be traded off for other factors such as labor climate, proximity to markets and suppliers, and quality of life which tend to dominate in the cost/profit calculus of most firms.

Interestingly, in examining “musts” in the choice of final site location, (once state/region has already been selected in stage one), a factor identified as “special provision of utilities (gas and sewerage and water)” ranked third at 34% behind “rail service” and “on expressway”. At least in a multistage decision process, the availability of energy (and possibly energy reliability) may be more important than modest price differentials once the choice of site has been narrowed down to a few.

Moreover, Schmenner also broke down the responses into broad industry categories. He reported that energy considerations were much more prominent for particular industries, e.g. metals and chemicals industries.

Statistical Studies

Econometric studies tend to agree with the results of firm surveys (See Figure 4). That is, energy rarely emerges as a significant variable. When it does so, its sign or size is suspect. Low energy prices are correlated with energy producing regions. Accordingly, the inverse correlation between low energy costs and high regional growth is possibly “picking up” the income-enhancing properties of producing regions in the 1970s rather than the impact of geographical energy price disparities *per se*.

Energy Prices and Individual Industries

We have seen that energy costs are not frequently the dominant consideration for most manufacturers. However, what holds true for the general

manufacturing industry in the Midwest does not necessarily hold true for each individual industry. To say that energy costs are not the primary consideration for the average firm is not to say that the energy cost factor is not the dominant or at least a major locational factor for *some* firms.

In identifying those firms, logic dictates that the incentive of an industry to seek out low energy costs will, other things equal, be greater for those firms where energy inputs are an inescapably higher proportion of production costs. For such industries or facilities, it is likely that small geographical variations in energy price will influence geographical variations in profitability and attendant location decisions.

Moving down the spectrum of energy intensity to industries with more moderate but still significant energy consumption, energy costs will tend to exert a marginal impact on the industry. From a local development perspective, however, a marginal movement of the latter industries could represent a large employment loss (or gain) to the community *if* the industry presence is itself very large.

From these perspectives, we identify industries which will concern development officials with two approaches into the data. First, by identifying the most energy intensive industries in the nation, we can see if these industries are prominent in Illinois. If so, economic development officials would do well to pay heed to the bottom line for these firms should the region's energy prices turn against them.

Secondly, we can look at the most prominent industries or "mainstay" industries of Illinois and the surrounding region. If these industries display energy intensive tendencies, it would behoove development officials to monitor any energy price disadvantage for its potential impact on these critical industries in the regional economy.

The Nation's Energy Intensive Manufacturers

Figures 5 and 6 rank U.S. industries at the three-digit SIC code level by their energy intensity—i.e. energy costs as a percent of value added for 1986. By its nature, electricity is different in character than purchased fuels which are often close substitutes in production. For this reason, the electricity intensity of industries are identified separately from purchased fuel intensity.

The energy intensive industries are generally to be found in the food processing, petroleum, chemicals, primary metals, and paper industries (Figures 5 and 6). Electricity intensive industries that are more concentrated in

Illinois than the nation (in terms of employment) include iron and steel foundries, blast furnace and basic steel, petroleum refining, and reclaimed rubber. Fuel intensive industries with high employment concentration in Illinois include (in addition) fats and oils and flat glass industries.

Illinois' Major Manufacturers—Are They Energy Intensive?

Another way to evaluate the necessity of a industrial-oriented energy policy for Illinois is to examine the energy intensity of the state's mainstay industries—i.e. those which have the highest employment concentration relative to the nation. Do they tend to be high energy users relative to the national average of all industries?

In looking at Illinois' mainstay industries, several can be identified as having above-average usage of purchased fuels (Figure 7). The metal cans and shipping containers industries consume significant quantities of both electricity and other fuels. Food processing industries, particularly fats and oils and sugar and confectionary products, also emerge as intensive consumers of energy. Moderate energy consumers which are prominent employers in Illinois include railroad equipment and construction machinery manufacturers.

These data show that there are many energy intensive industries that find Illinois and the Great Lakes Region to be hospitable environments for investment. For this reason it is important to ask—how has Illinois and the Great Lakes Region performed in terms of energy costs versus neighboring regions? Certainly, any recent energy price run ups or a general regional tendency toward high energy costs should signal a warning to both energy intensive industries and the region's economic development strategists.

Why do regional prices vary?

For most fuels, transport costs of energy itself from the site of energy product extraction account for significant geographic variation. This is true for natural gas and other fossil fuels. In addition, the differing extent that states and localities choose to impose taxes on energy sales can also play a significant role.⁴

With regard to electricity, the proximity to water resources (and often subsidized federal construction of hydro electric facilities) accounts for some of the variation—less so today than in past decades. Today, the chosen mode of electric power generation is the most notable cause. The decision to develop nuclear power and when and how much capacity to build

are largely behind today's price differences in addition to a region's accessibility to hydro resources.

Comparing product prices is a tricky business. This is no less true with energy commodities than with other goods. Care must be exercised to ensure one is comparing the price of like products. Many different energy products are consumed in sizable amounts by the industrial sector—coking coal, steam coal, distillate oil, kerosene, motor gasoline, natural gas and electricity to name a few. While many of these are important to particular industries, we will focus on two of the most common (representing the largest expenditure shares in Illinois)—electricity and natural gas. Together, these energy sources comprised almost two thirds of industrial energy expenditures in 1986 (and two-thirds of *this* was accounted for by electricity sales to the industrial sector).

Relative to other fuels, such as steam coal, these energy sources are also fairly similar in their delivered properties (respectively heat content and power). Of course, the terms of delivery are often quite different, especially with regard to interruptability features of the product—be it electricity or natural gas. The product homogeneity is further called into question for delivery of electricity where billings are often determined by peak demand charges. Reliability and existence of back-up systems are also becoming a key feature with the emerging importance of the information processing and financial transaction industries where a flicker in power supply can cost millions of dollars to energy users.

With these cautions in mind, we can broadly gauge the industrial energy price trends in Illinois and the Great Lakes Region. For the most part we will concentrate on the relative price differences across regions—as these are the primary determinants of site location.

Regional Electricity Price Variation

Regional price variation for industrial electric power has been wide and it continues so today. In part, this reflects the significant hydroelectric resources of some regions—notably the Pacific Northwest and Tennessee Valley, coupled with the significant federal subsidization which historically occurred in developing the nation's hydro electric resources. Federal ownership of electric generation has touched each of the U.S. regions but has largely bypassed the Midwest and Northeast. In contrast, over one-half of the installed nameplate generating capacity of Oregon-Washington was federally-owned (1984) and over 90 percent in Tennessee. As federal influence on energy pricing has waned, however, the regional variation in electric prices has also subsided.

Measured in index units, the standard deviation of industrial electric prices was 46 percent in 1960, 33 percent in 1970, 28 percent in 1979 and 23 percent in 1986. However, the absolute rise in energy prices has offset the decline in relative regional variation so that the "average state energy deviation" in 1986 remains at the same level as in 1970 (when deflated by the GNP implicit price deflator).

Table 1

**Regional Variation in Industrial Electricity
Average Revenue Per Unit**

Year	Standard deviation among states	
	(index units)	(cents per kwh)
1960	.46	2.3
1970	.33	1.2
1979	.28	1.4
1986	.23	1.2

Note: Prices are deflated such that 1987=100; index units are relative to U.S. average price.
Source: Edison Electrical Institute, *Statistical Yearbook*, various years.

Regional Natural Gas Price Variation

Natural gas price variations are also significantly different across regions. Here, however, we must be careful in that natural gas for industrial use is much more substitutable for other fuels in industrial applications (e.g., with residual fuel oil and distillate oil) than is the case with electric power. As

Table 2

Regional Variation in Natural Gas Prices for Industrial Use

	Standard deviation among states	
	(index units)	(per thous. cub. ft.)
1967	.74	\$.83
1977	.37	\$1.04
1987	.33	\$.96

Source: U.S. Department of Energy, *State Energy Price and Expenditure System*.

a result, single fuel price comparisons overstate energy cost differences because energy bills can be reduced by the firm's choosing the lowest cost combination of fuels given the region's set of local fuel prices.

The variation across states for industrial natural gas has been declining from 1967 to 1977 to 1987 where the standard deviation in index units stood at a remarkably high 33 percent (down from 37 percent in 1977). However, the absolute rises in real energy prices have acted to maintain a real dollar natural gas price variance across regions. Much of the variation in natural gas prices arises from transport costs. Regions close to natural gas production in the West South Central Region have fared well (See Figure 8). We should also note that these price data have become less reliable as more and more industrial gas sales are contracted directly with producers and are therefore "off the system" so that the price terms are not reported to the Energy Information Administration.

Price Variations in the East North Central Region

Industrial electricity and natural gas prices (i.e. average revenue) vary widely—even within the East North Central Region (Figure 10). Michigan stands out with both high gas and high electricity prices. Indiana maintains median electricity and low gas prices while Illinois tends to exhibit the reverse—moderate gas but higher electricity prices. Both Ohio and Wisconsin experienced low electricity prices but relatively higher natural gas prices in 1986.

Changing Electricity and Natural Gas Prices in Illinois

Electricity prices to industry in Illinois fell relative to the national average over the 1960s and into the 1970s. In 1960, electricity prices were one-third higher in Illinois in comparison to the nation. By 1970, prices were 20 percent higher, and by the mid 1970s, prices were some 6-7 percent higher. They began to climb once again in the mid-1970s. The latest tally from the Energy Information Administration indicates that, in 1986, prices appeared to be some 14 percent higher than the nation (Figure 11). Still, in perspective to relative price disadvantages of the 1960s, when the subsidy effects of federal hydro electric projects were greater, Illinois' disadvantage appears moderate.

Natural gas prices came in at about 35-40 percent above average in Illinois as recently as the early 1970s. These price deviations fell to the 15-25 percent range by the early 1980s, but they have recently begun to rise once again (Figure 11).

Conclusions

The Great Lakes Region has been undergoing a period of long term decline in manufacturing at the expense of Southern and Western regions. The tendency of the Great Lakes to experience above average energy prices to end users does not appear to have been a major cause of this upheaval. Regional energy price differences in the nation have tended to converge in relative terms while remaining much the same in absolute terms. Energy prices to industry in Illinois are moderately above average for both natural gas and electricity—more so for electricity than natural gas. An upward price trend for both products has recently emerged. However, the permanence of this trend for the long term is not yet apparent nor is its importance in the geographic decision to locate or expand a business.

Surveys and statistical studies of plant openings, expansions, and relocations do not find energy prices to be a dominant consideration. However, they are mentioned prominently as “desirable” in surveys and questionnaires. Results of statistical studies of regional growth tend to confirm the survey results.

Because energy prices are not yet strikingly high in this region, there seems to be little cause for making energy concerns the major focus of the region's economic development policy. Nonetheless, several mainstay industries of the Illinois economy, including the steel industry and also the pulp and paper industry in the larger Great Lakes Region, are particularly sensitive to energy utility prices. Accordingly, failure to consider the impact of high energy prices for such industries could be a mistake in building the region's long term economic base.

Footnotes

¹ Roger Schmenner, *Making Business Location Decisions*, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1982.

² Ibid.

³ For a review see Diane F. Siegel and William A. Testa, “Energy Prices and Industrial Location Decisions—an annotated Bibliography”, prepared for the Commercial Club of Chicago by the Planning and Database Committee, *Jobs For Metropolitan Chicago*, 1984.

⁴ For example see Diane F. Siegel and William A. Testa, *Taxation of Public Utilities Sales: State Practices and the Illinois Experience*, Working Paper Series on Regional Economic Issues, Federal Reserve Bank of Chicago, 1986.

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Figure 1: Energy costs and regional growth

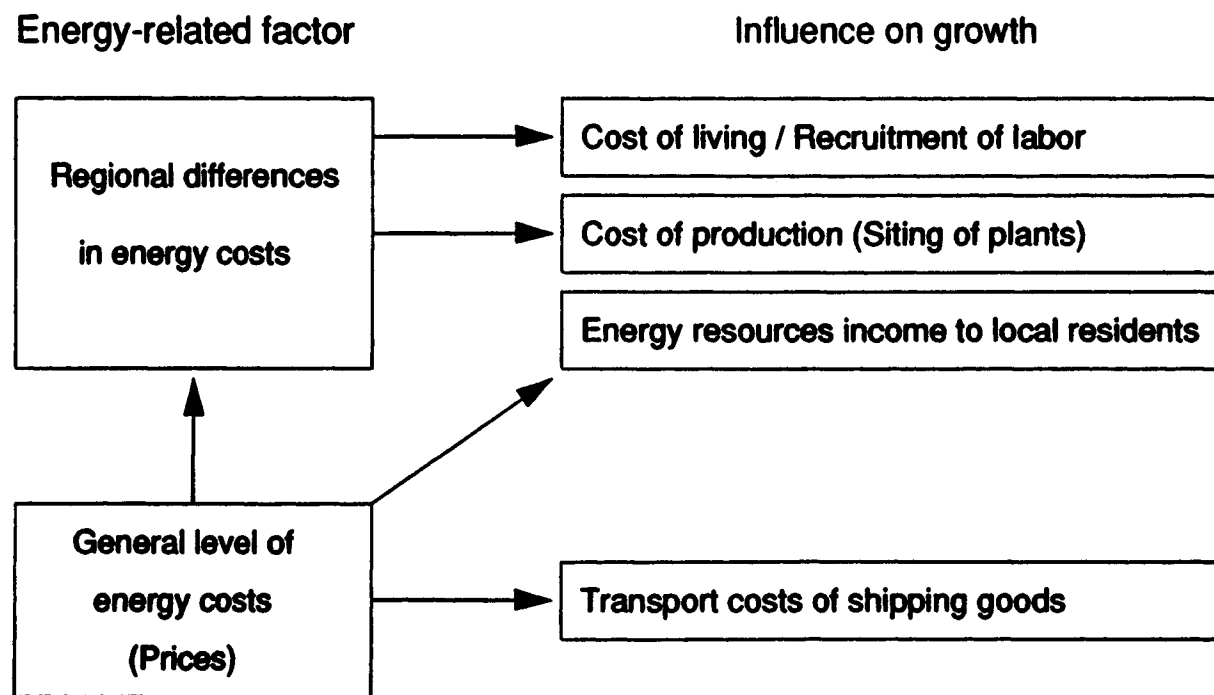


Figure 2: Rising industrial energy prices, 1970 to 1986

Price inflation for industrial energy sources has been acute. Natural gas price hikes have exceeded electricity since 1970.

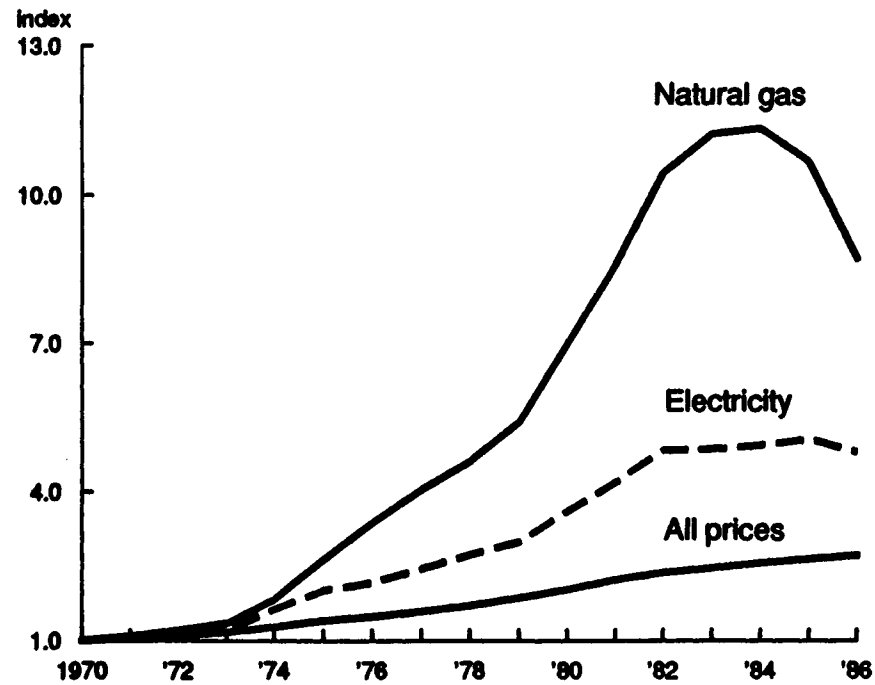


Figure 3: Factors viewed as desirable by frequency of mention

Low energy costs are not a dominant concern for the typical manufacturing plant location decision.

Favorable labor climate	74%
Low land costs	60%
Near markets	42%
Low taxes	35%
On expressway	35%
Rail service	30%
Low construction costs	29%
Low wage rates	28%
College nearby	26%
Low energy costs	25%
Government help with roads, sewers, water & labor training	25%
Near suppliers	23%
Government financing	13%
Available land, buildings	3%
Near other divisional facilities	3%
Air transport	1%
Quality of life	1%

SOURCE: Roger Schmenner, *Making Business Location Decisions*.

Figure 4: Findings of energy price variable in statistical studies of regional growth

	<u>Sample observations</u>	<u>Findings</u>
Dennis Carlton 1979	new and single est. branch plants in 3 industries; plastics products (SIC 3079) electronic components (SIC 3679) electronic transmission equipment (SIC 3662)	energy price influence was surprisingly high; Carlton urged caution; perhaps energy prices acting as proxy for other variables
William Testa 1988	75 metro areas 1976-85 for total, nonmanufacturing, and manufacturing job growth; and also manufacturing output	no impact of electricity or purchased fuel prices
Lynn Browne 1980	50 states investment by manufacturing industry 1959-1976	electricity price significant for electrical and nonelectrical machinery industries (not for metals, textiles, apparel, or paper)
Tim Bartik 1985	branch plant openings for manufacturing; 1972-78	no effect of energy utility prices
Michael Wasylenko 1984	employment growth across 48 states from 1973-80	electricity price significant for total employment (and trade) but not manufacturing industry

Figure 5: U.S. electricity intensive industries

Electricity intensity is highly skewed. In Illinois and the Great Lakes Region, the steel industry stands out as the most concentrated among the nation's electricity intensive industries.

	Electricity per output	Illinois employment	Great Lakes employment
	(- - - - - index - - - - -)		
Primary nonferrous metals	51.2	.3	.6
Industrial inorganic chemicals	8.5	.6	.6
Hydraulic cement	7.0	.4	.6
Building paper and board mills	4.6	n.a.	.5
Blast furnace and basic steel	4.4	1.4	2.0
Petroleum refining	4.1	1.2	.6
Paper mills, excluding building paper	3.8	.1	1.2
Yarn and thread mills	3.6	.1	*
Reclaimed rubber	3.5	6.3	2.7
Paperboard mills	3.5	.3	.6
Pulp mills	3.4	*	.2
Weaving mills	2.7	*	*
Iron and steel foundaries	2.5	1.2	2.1
Agricultural chemicals	2.4	.3	.5
Industrial organic chemicals	2.3	.6	.7
Plastics materials	2.3	.5	.4

SOURCE: U.S. Department of Commerce, *Annual Survey of Manufactures 1986* and *County Business Patterns 1985*.

Figure 6: U.S. fuel intensive industries

Several of the nation's largest users of fuels have a marked presence in Illinois and the surrounding region. In Illinois these include metals, refining, and glass industries.

	Fuel cost per output	Illinois employment	Great Lakes employment
	(- - - - - index - - - - -)		
Hydraulic cement	10.6	.4	.6
Petroleum refining	7.9	1.2	.6
Paperboard mills	7.9	.3	.6
Building paper and building mills	7.8	n.a.	.5
Petroleum and coal products	6.9	1.2	.7
Structural clay products	6.6	.2	.7
Blast furnace and steel products	6.0	1.4	2.0
Pulp mills	5.7	•	.2
Nonferrous metals (primary)	5.4	.3	.6
Nonferrous metals (secondary)	5.2	1.8	1.3
Flat glass	5.2	2.1	1.6
Paper mills (excluding building)	5.0	.1	1.2
Industrial organic chemicals	4.8	.6	.7
Agricultural chemicals	4.5	.3	.5

SOURCE: U.S. Department of Commerce, *Annual Survey of Manufactures 1986* and *County Business Patterns 1985*.

Figure 7: Concentrated industries in Illinois

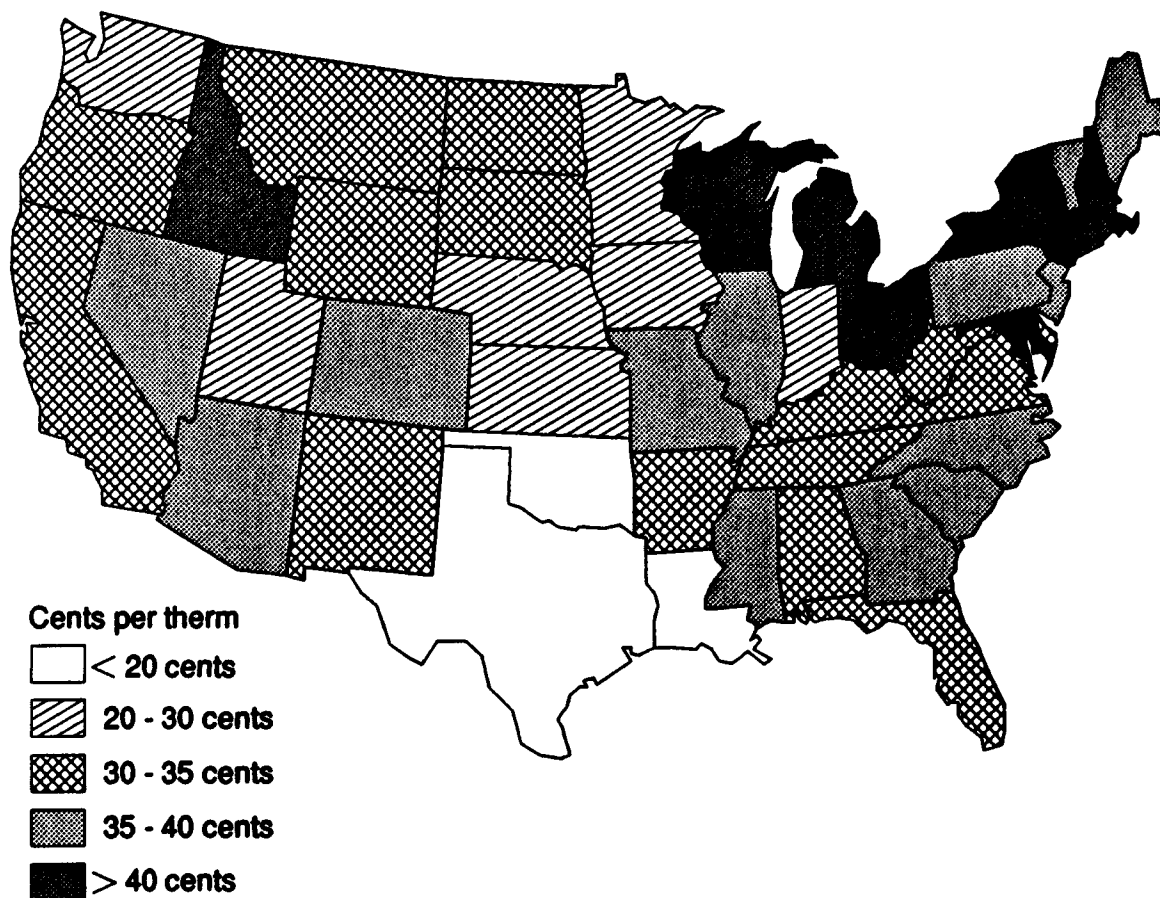
Several mainstay industries in Illinois are highly energy intensive.

	Employment	Electricity	Purchased Fuels
	(- - - - - index - - - - -)		
Reclaimed rubber	6.3	3.5	1.7
Railroad equipment	6.2	.6	.8
Screw machine products	2.9	.5	.4
Sugar and confectionary products	2.8	.5	1.4
Fats and oils	2.6	1.9	4.2
Farm and garden machinery	2.3	.4	.5
Construction machinery	2.3	.6	.4
Electrical lighting and wire equipment	2.2	.5	.4
Metal cans and shipping containers	2.1	.9	1.0
Periodicals	2.1	.1	•
Flat glass	2.1	1.7	5.2

SOURCE: U.S. Department of Commerce, *Annual Survey of Manufactures 1986 and County Business Patterns 1985*.

Figure 8: Price of gas delivered to industrial customers, 1987

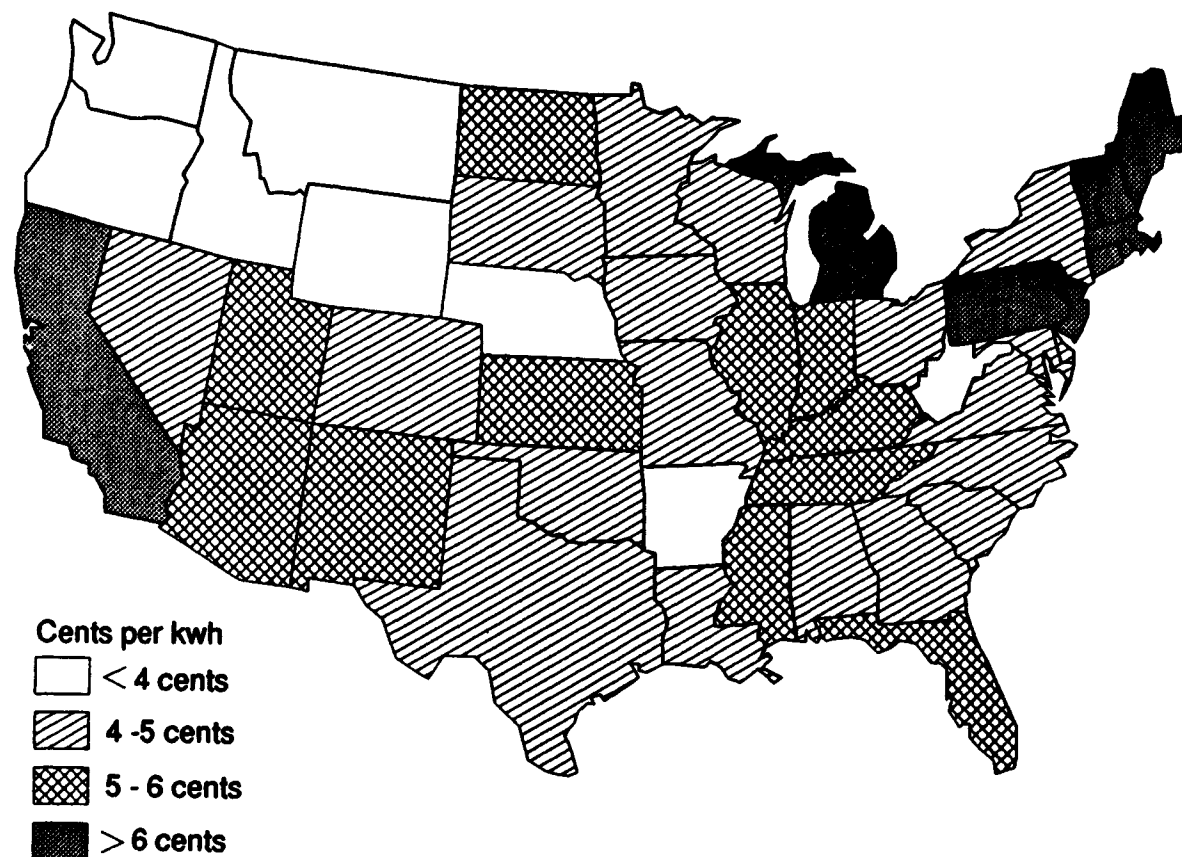
Natural gas prices vary by region. Natural gas costs in the ENC region are above-average—but moderately so for Illinois.



SOURCE: U.S. Department of Energy, Energy Information Administration, *Natural Gas Annual 1987*.

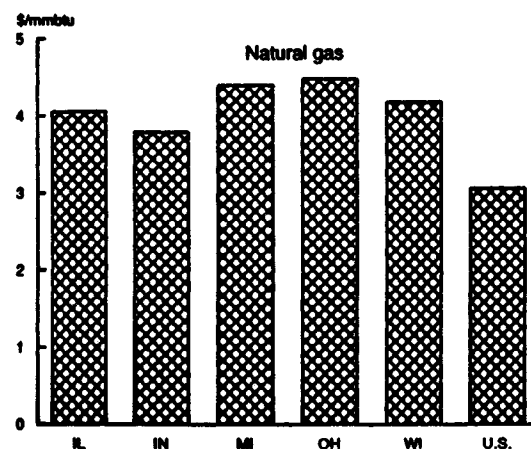
Figure 9: Industrial electricity average revenue, 1986

There are wide differences across regions in the price of electricity—even within the ENC region.

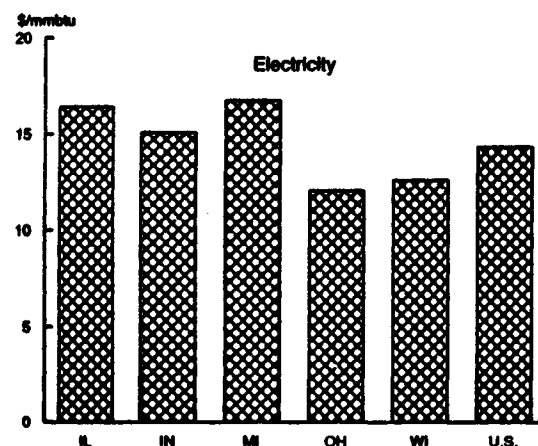


SOURCE: Edison Electrical Institute, *Statistical Yearbook 1986*.

Figure 10: Industrial energy utility prices in the ENC Region, 1986



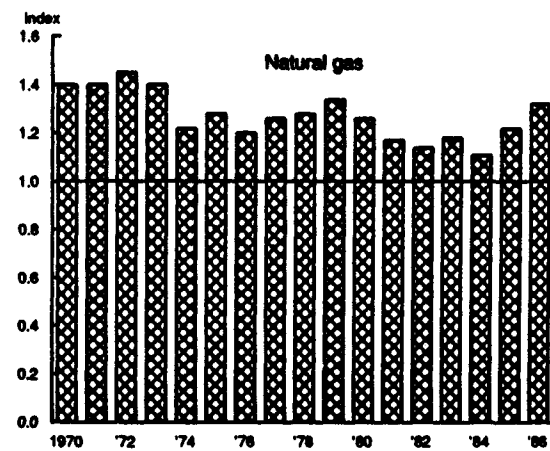
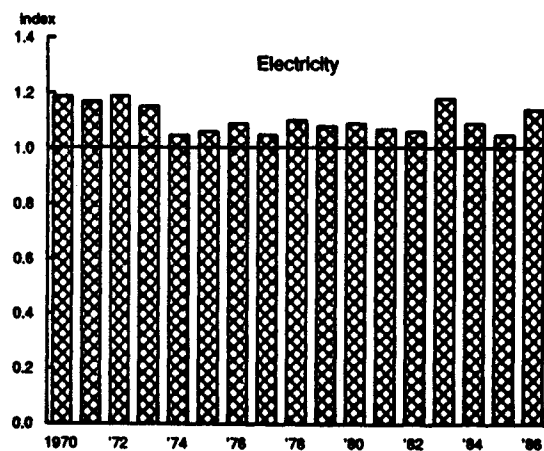
Energy source prices vary within the ENC region—especially for electricity.



SOURCE: U.S. Department of Energy, Energy Information Administration, *State Price and Expenditure Data System*.

Figure 11: Industrial energy prices in Illinois relative to the U.S.

Industrial prices for electricity and natural gas have climbed in recent years.



SOURCE: U.S. Department of Energy, Energy Information Administration, *State Price and Expenditure Data System*.

Federal Reserve Bank of Chicago

RESEARCH STAFF MEMORANDA, WORKING PAPERS AND STAFF STUDIES

The following lists papers developed in recent years by the Bank's research staff. Copies of those materials that are currently available can be obtained by contacting the Public Information Center—322-5111.

Staff Memoranda—A series of occasional papers in draft form prepared by members of the Research Department and distributed to the academic community for review and comment.

**SM-81-2	George G. Kaufman	"Impact of Deregulation on the Mortgage Market," 1981
**SM-81-3	Alan K. Reichert	"An Examination of the Conceptual Issues Involved in Developing Credit Scoring Models in the Consumer Lending Field," 1981
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SM-84-4	George G. Kaufman	"The Role of Traditional Mortgage Lenders in Future Mortgage Lending: Problems and Prospects"
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Working Paper Series On Regional Economic Issues—A series of research studies on financial and economic topics relating to the Seventh Federal Reserve District.

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Staff Studies—A series of research studies dealing with various economic policy issues on a national level.

SS-83-1	Harvey Rosenblum Diane Siegel	"Competition in Financial Services: the Impact of Nonbank Entry," 1983
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