1998

Kentucky Annual Economic Report 1998

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Center for Business and Economic Research
University of Kentucky

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CAROL MARTIN GATTON
COLLEGE of BUSINESS and ECONOMICS

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Center for Business and Economic Research

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From the Director

The Center for Business and Economic Research (CBER) is pleased to publish the 26th *Kentucky Annual Economic Report*. The *Annual Report* is one of the important ways in which the Center fulfills its mission to monitor and analyze the Kentucky economy. The 1998 Report contains seven articles that provide state and national economic forecasts and address many of the major economic policy issues facing the Commonwealth.

In publishing this report, we draw on expertise from the Gatton College of Business and Economics at the University of Kentucky and the Kentucky Finance and Administration Cabinet. Our authors include four faculty members and one graduate student from the Department of Economics, one faculty member from the Finance Area in the School of Management, and the Deputy Director of the Office of Financial Management and Economic Analysis in the Finance and Administration Cabinet. One of the strengths of CBER is that we are able to bring together some of the best economists in the state to work on our research projects.

The first article contains forecasts for the Kentucky economy for the next three years. Dr. Eric C. Thompson, CBER's Associate Director, maintains and updates the University of Kentucky State Econometric Model which produces these forecasts. Dr. Thompson forecasts that gross state product will average 2.6 percent annual growth and employment 1.9 percent annual growth from 1998 to 2000.

Dr. Donald Mullineaux, the duPont Professor of Banking and Financial Services at the University of Kentucky, examines the prospects for United States financial markets in the second article. In this article, he reviews the performance of the money, bond, and stock markets over the past year and provides some possible outcomes for the future.

The other five articles consider economic policy issues in Kentucky. My article looks at the link between education and earnings for Kentucky residents from 1964 to 1996 and compares the results for Kentucky to the rest of the United States. One of the most important findings is the rapid increase in the returns to graduate education in Kentucky throughout the 1990's.

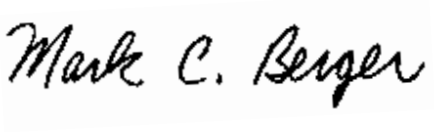
Robert Cox of the Kentucky Office of Financial Management and Economic Analysis examines Kentucky's per capita personal income. His paper is a useful complement to the study we published in last year's *Report* on Kentucky's per capita income.

Dr. Dan Black and Amitabh Chandra, a graduate student in economics at the University of Kentucky, examine the retirement behavior of Kentucky families. They point out that in Kentucky, as nationwide, men ages 55-65 have been retiring sooner than in the past. They also note the fact that more older women working may have contributed to fewer men working.

Dr. Frank Scott looks at the potential changes in Kentucky's electric utility industry that could be caused by deregulation. He finds that the prices paid by the typical electricity consumer in Kentucky will decrease as a result of a movement toward competition.

In the final article, Dr. Eric Thompson and Amitabh Chandra examine the impacts a new interstate highway can have on local economies in Kentucky.

We are continuing to expand our research program on the Kentucky economy. We recently completed the first annual Kentucky Business Confidence Survey and published the results in the first edition of our newsletter, the *Kentucky Business and Economic Outlook*. We are working to expand our Web site and the capabilities of the Kentucky Economic Information Service. In the last few months we have finished research projects sponsored by the Kentucky Transportation Cabinet, the Kentucky Department of Employment Services, and the Kentucky Administrative Office of the Courts. We are currently working on research projects that are sponsored by the Kentucky Department of Parks, the Kentucky Finance and Administration Cabinet, the Tennessee Valley Authority, and the Lexington Area Transit Authority.



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The Center for Business and Economic Research (CBER) is the applied economic research branch of the Carol Martin Gatton College of Business and Economics at the University of Kentucky. Its purpose is to disseminate economic information and provide economic and policy analysis to assist decision makers in Kentucky's public and private sectors. In addition, CBER performs research projects for federal, state, and local government agencies, as well as for private-sector clients nationwide. The primary motivation behind CBER's research agenda is the belief that systematic and scientific inquiries into economic phenomena yield knowledge which is indispensable to the formulation of informed public policy.

CBER's research includes a variety of interests. Recent projects have been conducted on manpower, labor, and human resources; transportation economics; health economics; regulatory reform; public finance; and economic growth and development. In addition to the *Kentucky Annual Economic Report*, CBER publishes a quarterly newsletter, *Kentucky Business and Economic Outlook*, which contains quarterly forecasts for the Kentucky economy as well as other business and economic issues. CBER also publishes the *Carol Martin Gatton College of Business and Economics Working Papers*, which report the results of current research by college faculty, and *Growth and Change*, a scholarly, refereed journal of urban and regional policy with international distribution.

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Authors

Dr. Mark C. Berger

Dr. Mark C. Berger is the Director of CBER, a Professor of Economics, and a Gatton Research Professor at the University of Kentucky. Dr. Berger received a Ph.D. in economics from Ohio State University in 1981. He has conducted applied economic research studies on a variety of subjects including higher education, health issues, human capital, the earnings and employment of workers, and the estimation of the demand for electricity. He has received research funding from a variety of public and private sources, including the U.S. Small Business Administration, the National Science Foundation, the National Institutes of Health, the U.S. Department of Labor, and several Kentucky state government agencies. Dr. Berger's research has been published in some of the leading journals in economics and public policy, including *American Economic Review*, *Journal of Political Economy*, *Review of Economics and Statistics*, *Industrial and Labor Relations Review*, and the *Journal of Human Resources*.

Dr. Dan A. Black

Dr. Dan A. Black is Professor of Economics and Ashland Oil Research Fellow at the University of Kentucky, and a Senior Fellow at the Carnegie-Mellon University Regional Census Data Center. He received his Ph.D. from Purdue University in 1983, at which time he joined the University of Kentucky. His research interests include labor economics and public policy. His papers have appeared in academic journals such as the *American Economic Review*, the *Review of Economics and Statistics*, and the *Journal of Labor Economics*. He is co-author with Dr. Mark Berger of a recent book on on-the-job training from the Upjohn Institute and is currently examining the retirement decisions of American households with Mark Berger, Amitabh Chandra, and Frank Scott.

Amitabh Chandra

Amitabh Chandra has been a Research Associate at CBER since 1994, and is a doctoral student in economics at the University of Kentucky. His research interests include the economics of higher education, earnings inequality, and the returns to schooling. His doctoral dissertation focuses on the returns to education. Currently, he is working with Mark Berger, Dan Black, and Frank Scott on researching the dynamics of family retirement decisions.

Robert W. Cox

Robert W. Cox is the deputy executive director of the Office of Financial Management and Economic Analysis (OFMEA) in the Kentucky Finance and Administration Cabinet. He is principally responsible for the official General Fund and Road Fund revenue estimates used to prepare the Commonwealth's biennial budgets. Mr. Cox received his M.A. in economics at the University of Virginia in 1985. After working as a research economist at the University of Virginia's Center for Public Service and Tayloe Murphy Institute for five years, he joined the staff of OFMEA in 1990. His primary interests are in the areas of public finance, regional economics, and input-output analysis.

Authors

Dr. Donald W. Mullineaux

Dr. Donald J. Mullineaux is a Professor of Finance and has held the duPont Chair in Banking and Finacial Services since joining the Gatton College of Business and Economics in 1984. He received his Ph.D. in economics from Boston College and served as Director of Research at the Federal Reserve Bank of Philadelphia from 1979 to 1984. His research on topics such as bank efficiency, inflation, interest rates, bank regulation, bank lending, and financial history has appeared in journals such as the *American Economic Review*, *Journal of Political Economy*, *Journal of Finance*, *Journal of Business*, *Journal of Monetary Economics*, *Journal of Money, Credit and Banking*, and the *Journal of Banking and Finance*. Dr. Mullineaux has lectured extensively abroad and is a faculty associate with several of the graduate schools of banking in the United States.

Dr. Frank A. Scott

Dr. Frank A. Scott is a Professor of Economics at the University of Kentucky. Dr. Scott received his Ph.D. from the University of Virginia in 1979. His research areas include the regulation of business, the economics of public utilities, the economics of health insurance and pensions, and public policy. He has received support for his research from the National Science Foundation, the Federal Trade Commission, and the Small Business Administration and has been retained by as a consultant by public utilities and by regulating bodies such as the Alabama Public Service Commission. He has published chapters in books such as *Problems in Public Utilities and Regulation* and papers in leading academic journals such as the *Review of Economics and Statistics*, *Industrial and Labor Relations Review*, *National Tax Journal*, *Journal of Policy Analysis and Management*, *Journal of Industrial Economics*, and the *Energy Journal*.

Dr. Eric C. Thompson

Dr. Eric C. Thompson is Associate Director of CBER and a Research Assistant Professor in the Department of Economics and CBER at the University of Kentucky. Dr. Thompson received his Ph.D. in agricultural economics from the University of Wisconsin-Madison in 1992. Previously, he was a Research Assistant Professor at the Center for Economic Research at West Virginia University and in the Community Economic Development Division of the West Virginia University Extension Service before coming to Kentucky in 1995. Dr. Thompson's expertise lies in the fields of economic forecasting and regional economics. He has conducted many studies on local and state economic development and currently maintains and updates the University of Kentucky State Econometric Model.

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Quarterly Forecasts for the Kentucky Economy, 1998 - 2000

Eric C. Thompson

The Kentucky economy is forecast to experience moderate growth from 1998 to 2000. Gross state product is forecast to grow at a 2.6 percent annual rate, with total employment growing by 1.9 percent and total personal income by 2.0 percent. Growth in the Kentucky economy is also expected to be broad-based with all major industry groups except mining adding employment. The largest growth is again forecast for the services and retail trade sectors, although the manufacturing sector will be a source of major improvement in 1998. Professional specialty occupations that require high education levels and service occupations are forecast to have the largest growth for the next three years. Finally, Kentucky's population is expected to grow at a 0.6 percent annual rate from 1998 to 2000, with older population groups growing at higher rates than younger groups.

Introduction

THIS ARTICLE DESCRIBES A FORECAST FOR THE KENTUCKY economy produced using the University of Kentucky State Econometric Model. The model, developed in 1995, is used to make quarterly forecasts of the state economy three years into the future. The forecasts are updated each quarter and have significant industry and demographic detail, with forecasts for many mining, construction, manufacturing, retail, and service industries and government at a detailed level. Forecasts also are presented for occupational groups, and population forecasts are made for five-year age groups for men and women. Forecast results are presented below for 20 manufacturing industries, two mining industries, three service industries, and three levels of government. Quarterly forecasts are presented below for 1998, and annual forecasts are presented for 1998, 1999, and 2000.

The Kentucky economy is forecast to experience moderate growth in 1998 through 2000. Gross state product (GSP) is forecast to average 2.6 percent per year over the three-year period, while employment growth is forecast to average 1.9 percent annually. As in most recent years, the Kentucky economy is forecast to grow faster than the United States economy. Future growth in the Kentucky economy also is expected to be broad-based. All major industry groups except mining are expected to add employment from 1997 to 1999. Eleven of 20 manufacturing industries are expected to add employment, and all nine occupational groups are forecast to add jobs over the next three years.

Faster job growth is forecast to lead to wage and salary income growth of 2.3 percent per year, and a total income growth rate of 2.0 percent annually. Employment and income growth is forecast to encourage net migration to Kentucky and yield an expected increase in the state's population of 0.6 percent per year.

The Kentucky Forecast

The rate of growth in the Kentucky economy is forecast to exceed the national growth rate (see the Appendix for a description of the national forecast). Faster growth in Kentucky is forecast because the state is expected to have faster growth than the nation in manufacturing. This faster growth is expected for Kentucky even though the state does not have a large concentration of rapidly growing national manufacturing industries, such as computers and semi-conductors.

These faster growth rates forecast for Kentucky can have enormous consequences. To give one

example, Kentucky's annual total employment growth rate is forecast to exceed the national rate by 0.5 percent on average from 1998 through 2000. This percentage difference translates into 26,000 additional jobs for Kentucky over the three years.

Recent Developments

During 1997, both the Kentucky and national economies grew at a strong rate. Employment in the Kentucky economy grew at 2.2 percent per year while national employment grew at 2.3 percent per year. To achieve this growth rate, Kentucky added roughly 36,500 jobs in 1997. This growth rate in 1997 was an improvement on growth in 1996, when the Kentucky economy added jobs at 1.9 percent per year. These figures for 1997 were based on employment data from the first nine months of the year and estimated values for the last three months.

The stronger performance in the Kentucky economy in 1997 occurred in part due to a rebound in the state's manufacturing sector. In 1996, the Kentucky economy lost nearly 2,000 manufacturing jobs, with substantial declines occurring in apparel industry employment. In 1997, manufacturing employment increased in Kentucky by more than 2,000 jobs. This rebound in manufacturing growth occurred despite a continued decline in apparel industry jobs. Wood products, paper products, and transportation equipment were among the manufacturing industries that added employment during the year. Coal mining, however, was a major industry that lost employment in Kentucky in 1997.

Other major industry groups posted employment gains in 1997. The services and retail trade sectors accounted for the most job growth. The services industry grew at 3.3 percent and added 13,500 jobs in 1997, with business and health services leading the way in service industry growth. The retail trade industry grew at a rapid 2.5 percent growth rate and added 7,900 jobs. Modest job and income growth also lead to modest population growth. Population in Kentucky is estimated to have grown by 0.5 percent in Kentucky during 1997.[1] Real personal income is estimated to have grown 3.9 percent.

The Next Year

The forecast for 1998 predicts a faster rate of growth for Kentucky than the United States. This is true for a range of measures, including real value-added output, real personal income, total employment, and manufacturing employment.

Real value-added output, or real gross state product, is forecast to grow at a moderate 2.8 percent rate in 1998. Growth is forecast to be steady and above 2.0 percent throughout the year. Gross state product is forecast to grow at an annual rate of 3.3 percent in the first quarter before falling to 2.5 percent in the second and third quarters and 2.3 percent in the fourth quarter, as shown in Figure 1. All in all, 1998 will be a year for steady, moderate to strong growth in Kentucky.

Such steady growth is also evident in employment forecasts for 1998. Total employment growth is forecast to reach an annual growth rate of 2.5 percent in the first quarter of 1998, 2.2 percent in the second and third quarters, and 2.0 percent in the fourth quarter. While it is somewhat more volatile, growth in real total personal income also is forecast

FIGURE 1

1998 Kentucky Gross State Product Growth

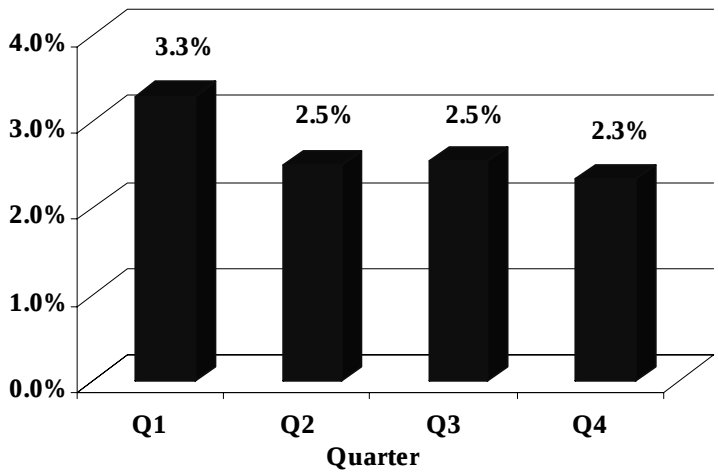


TABLE 1

Real Gross State Product (GSP), Seasonally Adjusted

	1997 Q4 GSP ($mil)	1997 Quarterly Growth at an Annual Rate Q1	Q2	Q3	Q4	Annual Growth 1998	1999	2000	Annual Averages Growth ($mil)	Growth Rate
Total	$71,573.7	3.3%	2.5%	2.5%	2.3%	2.7%	2.7%	2.5%	$1,921.2	2.6%
Agriculture	1,635.4	19.7	9.6	2.2	4.0	8.7	3.5	3.1	87.1	5.1
Mining	2,481.9	-4.7	-3.7	-1.6	0.9	-2.3	1.1	2.1	6.7	0.3
Construction	3,077.0	3.0	1.3	1.5	1.0	1.7	1.1	1.2	42.0	1.3
Manufacturing	19,008.6	3.2	2.6	3.1	2.3	2.8	3.6	3.0	610.3	3.1
TCPU	7,003.8	3.3	3.0	3.1	3.1	3.1	3.0	3.0	218.5	3.0
Trade	10,745.3	4.1	3.7	3.2	3.1	3.6	3.1	2.9	350.6	3.2
FIRE	9,347.7	1.9	1.8	1.8	1.7	1.8	1.7	1.6	163.0	1.7
Services	9,973.3	3.4	3.1	3.1	3.0	3.1	3.0	3.0	311.7	3.0
Government	8,300.8	3.2	1.1	1.7	1.3	1.8	1.4	1.5	131.3	1.6

TCPU = Transportation, Communications, and Public Utilities
FIRE = Finance, Insurance, and Real Estate

to be steady. Total personal income growth is forecast to reach 3.4 percent in the first quarter, 2.2 percent in the second quarter, 2.3 percent in the third quarter, and 1.9 percent in the fourth quarter. With steady employment and income growth, population growth is also expected to remain moderate in Kentucky in 1998. Population is forecast to increase by 23,600 during the year, reflecting a 0.6 percent rate of growth.

Just as in previous years, the largest growth among industries in 1998 is forecast for services and retail trade. Service industry employment is forecast to grow by 3.3 percent in 1998, adding a total of 14,000 jobs. Business services, growing at 6.2 percent, and health services, growing at 2.8 percent, are forecast to add the most new services jobs. Retail trade employment is forecast to grow at 2.7 percent in 1998, adding 8,800 new jobs.

The manufacturing industry is expected to be a source of major improvement in the Kentucky economy in 1998. Manufacturing employment is forecast to rise by 1.0 percent. This translates into 3,100 net new manufacturing jobs. Transportation equipment, printing, wood and furniture products, paper products, and fabricated metals are forecast to be the strongest manufacturing industries in 1998. Following the trend of the last decade, coal mining employment is forecast to decline by roughly 2.3 percent in 1998, or about 400 jobs.

The Three-Year Forecast

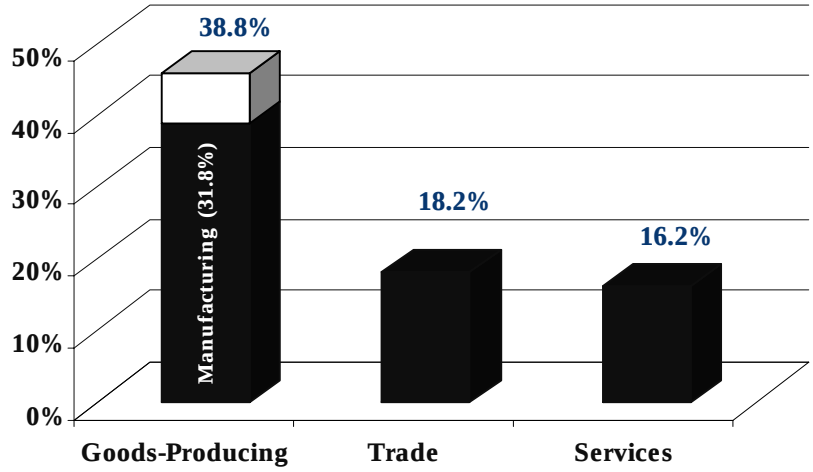
Growth in the Kentucky economy is forecast to decelerate in 1999 and 2000 relative to growth in 1998. However, growth will remain moderate for all three years. Real gross state product is forecast to grow nearly 2.6 percent on average for the three years. Total employment is forecast to average 1.9 percent per year, and real total personal income is forecast to grow by 2.0 percent on average. Each of these growth rates exceeds national forecasts. Population growth in Kentucky is expected to lag national growth. The following three sections discuss the growth of industries, income, and population in more detail.

Gross State Product and Employment

Gross state product (GSP), the measure of value-added output, is a comprehensive measure of economic activity which includes capital consumption, profits, and business tax payments as

FIGURE 2

Share of 1998 to 2000 Gross State Product Growth in Selected Industry Groups



well as employment and earnings. As a result, analysis of gross state product data can sometimes lead to a different perspective than analysis of a less comprehensive measure, such as employment growth. In particular, while more rapid job growth in the service sector is evidence of the emerging service economy, analysis of gross state product reiterates the crucial role which manufacturing and other goods-producing industries play in the overall economy. Table 1 shows growth and growth rates for gross state product for the next three years.

Manufacturing and other goods-producing industries (such as agriculture, mining, and construction) continue to account for a substantial share of gross state product. Manufacturing accounted for 26.6 percent of real gross state product in the fourth quarter of 1997, while goods-producing industries as a whole accounted for 36.6 percent. The remaining 63.4 percent of real gross state product was divided among other industries. For example, retail and wholesale trade accounted for 15.0 percent, and services accounted for 13.9 percent.

Manufacturing and other goods-producing industries are forecast to account for an even larger share of growth in Kentucky real GSP, portending an even more important role in the economy in the future. As Figure 2 shows, manufacturing is forecast to account for 31.8 percent of growth in real gross state product from 1998 through 2000. All goods-producing industries are forecast to account for 38.8 percent of real gross state product growth. Growth in manufacturing, mining, agriculture, and construction will be a crucial engine for growth in the Kentucky economy in years to come.

Figure 2 also shows the relative significance of trade and services for growth in real gross state product. These industries are forecast to play a significant but secondary role in real GSP growth. Retail and wholesale trade are forecast to account for 18.2 percent of real gross state product growth from 1998 through 2000, while services are forecast to account for 16.2 percent of growth.

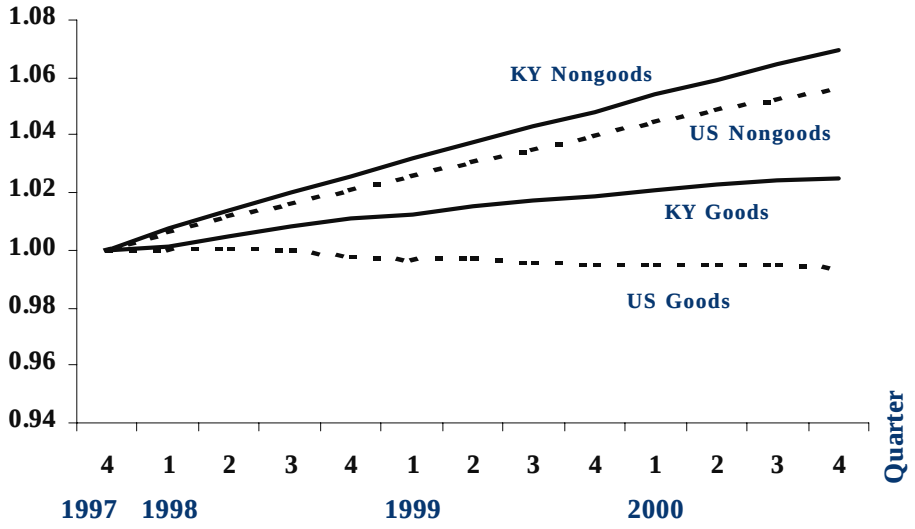
Strong growth in real gross state product is consistent with growing employment. An increase in real GSP, however, does not guarantee that employment also will increase. Productivity, or real GSP per worker, can grow rapidly enough in some industries that total employment will decline even as gross state product grows. This trend is occurring nationally in many manufacturing, mining, and construction industries. Figure 3 shows indices for employment in 1998 through 2000 compared to employment in the fourth quarter of 1997. As depicted, goods-producing employment is forecast to decline slightly in the United States from the fourth quarter of 1997 through the fourth quarter of 2000.

Growth in real GSP in goods-producing industries, however, is leading to an increase in employment in Kentucky. As shown in Figure 3, employment in goods-producing industries is forecast to increase steadily throughout the three-year period. Goods-producing industries are forecast to grow on average by 0.8 percent per year.

Nongoods-producing industries also are forecast to grow more quickly in Kentucky than nationally. Figure 3 also shows growth indices for nongoods-producing industries such as services,

FIGURE 3

Indices of Employment Forecasts for Goods- and Nongoods-Producing Industries for Kentucky and the U.S.



retail trade, wholesale trade, and government in Kentucky and the United States. Nongoods-producing industries in Kentucky consistently outperform national averages. The growth rate in Kentucky is forecast to average 2.3 percent per year compared to a 1.8 percent growth rate forecast for the United States.

Income

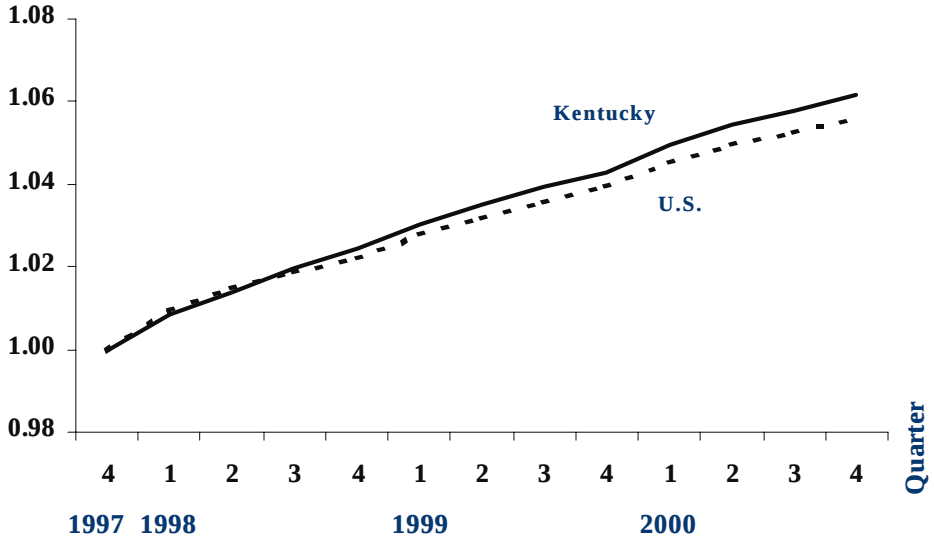
Income growth in Kentucky is forecast to exceed national growth over the next three years. Figure 4 shows indices of real total personal income in Kentucky and the United States. Real income refers to income adjusted for inflation. Growth in real total personal income in Kentucky is forecast on average to be 0.2 percent greater each year than national income growth.

Just as with employment and gross state product, the growth rate of total real personal income is forecast to decelerate over the three-year period. Growth in 1998 is forecast at 2.4 percent, while growth is forecast at 1.8 percent per year in 1999 and 2000.

Faster total income growth in Kentucky is not the result of faster population growth in the state. Population in Kentucky is forecast to grow slower than nationally over the three year period. Instead, faster income growth in Kentucky is the result of faster income growth per person. Growth in real per capita, or per person, income in Kentucky is forecast to average 1.4 percent in Kentucky compared to an average growth of 1.0 percent nationally. Kentucky's

FIGURE 4

Indices of Real Personal Income Forecasts for Kentucky and the U.S.



more rapid expansion is forecast to result in faster-rising average incomes for residents.

Population

Population growth in Kentucky has been steady throughout the 1990s.[2] Rising in-migration, reduced out-migration, or both, have lead to positive net migration, which is the number of persons migrating to Kentucky minus the number migrating out of the state.

With more persons moving to the state than leaving, population growth has exhibited the kind of steady growth seen elsewhere in the nation (net migration also is positive for the nation as a whole). Nonetheless, population growth rates in the late 1990's have slowed somewhat from the growth rates in the early 1990's. From 1998 to 2000, Kentucky's population is forecast to grow by 0.6 percent annually compared to 0.9 percent growth forecast for the nation. This figure translates into an average increase of 23,200 residents each year. Of that total, 15,900 are due to net migration.

This growth, however, is not forecast in all population groups. As nationally, Kentucky's forecast shows an aging population. The number of persons ages 30-39 in Kentucky is forecast to decline slightly over the next three years, and growth is very modest in other young age groups. At the same time, some older age groups should grow rapidly. In particular, population is forecast to grow quickly among the older portions of the labor force. The population of 50 to 59 year-old residents is expected to grow by 4.0 percent per year from 1998 through 2000. Population is also forecast to grow quickly among the oldest portion of the population. The number of persons over age 85 should grow by 5.4 percent per year over the next three years.

Forecast Detail

The strong growth forecast for the Kentucky economy is not the result of a consistent growth rate among all industries or sources of income. Many industries are growing much more rapidly than total employment, while some manufacturing and mining industries are not growing at all. The following sections examine growth in industries, occupations, and sources of income.

Employment

The strong employment picture in Kentucky is the result of broad-based growth. As nationally, the majority of job growth is forecast in retail trade and services. But, in Kentucky, nearly all industries are forecast to add employment over the next three years. There are only a few exceptions that are forecast to shed employment. These exceptions are coal mining and selected manufacturing industries.

Total manufacturing employment is forecast to grow at an average annual rate of 0.7 percent in Kentucky from 1998 through 2000. This growth rate compares very favorably with the forecast of a decline of 0.3 percent in manufacturing employment nationally. Manufacturing employment is forecast to increase by 1.0 percent in 1998, 0.6 percent in 1999, and 0.5 percent in the year 2000. These growth rates translate into an average increase of 2,300 jobs for each year from 1998 to 2000.

The broad-based growth evident throughout Kentucky's economy is also forecast for the manufacturing industry. This broad-based growth is seen in Table 2. Eleven of the 20 manufacturing industries in Kentucky are forecast to add jobs from 1998 though 2000. This compares with only five manufacturing industries that are expecting to grow nationally. The fastest rates of growth are forecast for plastics, wood and furniture products, transportation equipment, and fabricated metals. The fastest rates of job loss are forecast for tobacco products, leather products, apparel, and electric machinery.

The growth forecast for manufacturing is also forecast for the construction industry in Kentucky, which is forecast to grow by 1.8 percent per year. Growth is forecast to be fastest in 1998. Coal mining employment is forecast to decline during each of the

TABLE 2

Growth and Growth Rates for Kentucky Nonfarm Employment, Seasonally Adjusted

	1997 Q4 employment (thousands)	1998 Quarterly Growth at an Annual Rate (%)				Annual Growth (%)			Growth (thou)	Growth Rates (%)	
		Q1	Q2	Q3	Q4	1997	1998	1999	KY	KY	US
Total	1,719.09	2.49%	2.19%	2.20%	1.97%	2.21%	1.87%	1.71%	33.80	1.93%	1.44%
Goods-producing	413.88	0.59	1.29	1.46	1.04	1.09	0.79	0.63	3.49	0.84	-0.22
Mining	21.51	-3.50	-2.96	-0.95	0.44	-1.76	-0.39	-1.02	-0.22	-1.06	-3.39
Coal mining	17.87	-3.70	-3.61	-1.85	0.72	-2.13	-0.09	-0.88	-0.18	-1.03	N/A
Construction	77.95	2.91	1.85	1.65	2.10	2.13	1.69	1.65	1.45	1.82	0.53
Manufacturing	314.42	0.31	1.45	1.57	0.82	1.03	0.64	0.48	2.27	0.72	-0.34
Food products	25.14	-3.58	-1.63	-0.19	-1.01	-1.61	-0.98	0.10	-0.21	-0.83	-0.30
Tobacco	4.45	1.79	-2.29	-2.49	-4.43	-1.88	-4.73	-4.77	-0.16	-3.80	-4.35
Textiles	8.40	1.30	3.33	3.36	2.64	2.66	0.96	-0.45	0.09	1.06	-0.78
Apparel	21.51	-4.11	0.90	-1.39	-1.70	-1.59	-2.37	-0.96	-0.35	-1.64	-3.55
Wood	14.82	1.80	2.83	3.29	2.77	2.67	2.25	1.95	0.35	2.29	-0.04
Furniture	5.01	6.44	9.34	10.58	19.12	11.27	7.82	1.10	0.36	6.73	1.10
Paper products	12.46	2.11	1.81	2.39	2.45	2.19	1.90	1.86	0.25	1.98	-0.25
Printing and publishing	22.01	3.17	3.52	3.18	3.14	3.25	2.48	1.79	0.57	2.51	0.26
Chemicals	14.95	-0.08	0.65	-0.55	-1.55	-0.39	-1.15	-0.09	-0.08	-0.54	-0.39
Petroleum and coal refining	3.02	14.79	10.54	7.29	4.94	9.33	1.60	-0.42	0.11	3.50	-2.53
Rubber and plastic products	19.75	2.99	3.20	5.09	3.92	3.80	3.76	3.31	0.74	3.62	0.77
Leather products	0.98	-1.20	-0.70	-2.65	-3.36	-1.98	-2.97	-4.06	-0.03	-3.01	-6.47
Stone, clay, and glass products	11.66	0.18	1.54	-0.74	-0.81	0.04	-1.08	-0.97	-0.08	-0.67	-1.26
Primary metals	17.74	0.11	-0.26	0.38	-0.08	0.04	0.57	0.17	0.05	0.26	-1.10
Fabricated metals	23.84	2.61	1.72	1.81	0.45	1.64	1.33	1.28	0.34	1.42	0.14
Non-electric machinery	36.41	0.43	-1.67	2.08	-0.28	0.13	0.23	-0.24	0.01	0.04	-0.05
Electric machinery	25.66	-0.60	-1.95	-2.51	-2.68	-1.94	-2.31	-1.97	-0.52	-2.07	0.68
Transportation equipment	37.26	-1.94	5.51	4.06	2.28	2.44	2.86	1.81	0.90	2.37	-0.53
Instruments and related products	4.38	0.11	-0.19	-0.54	-1.17	-0.45	-0.14	0.50	0.00	-0.03	-1.31
Miscellaneous manufacturing	4.96	2.74	4.78	-0.50	2.23	2.30	-3.78	-2.60	-0.07	-1.36	-0.52
Nongoods-producing	1,305.21	3.09	2.47	2.43	2.26	2.56	2.20	2.05	30.31	2.27	1.84
TCPU	96.33	2.12	1.51	1.68	1.55	1.72	1.46	1.30	1.46	1.49	0.89
Trade	413.12	2.95	2.67	2.28	2.18	2.52	2.05	1.80	8.95	2.12	1.29
Wholesale trade	84.52	1.95	3.02	1.47	1.30	1.93	1.35	1.13	1.26	1.47	1.18
Retail trade	328.60	3.21	2.58	2.48	2.40	2.67	2.22	1.97	7.68	2.29	1.32
FIRE	69.10	-0.13	0.11	0.27	0.28	0.13	0.59	0.72	0.33	0.48	1.05
Services	429.02	3.54	3.30	3.20	3.08	3.28	3.03	2.85	13.49	3.05	2.88
Business services	83.05	6.96	6.16	6.00	5.65	6.19	5.36	4.80	4.78	5.45	N/A
Health services	149.39	3.21	2.93	2.68	2.55	2.84	2.65	2.63	4.16	2.71	2.30
Government	297.64	3.71	1.86	2.29	1.88	2.43	1.83	1.75	6.08	2.00	1.38
Federal	38.47	3.22	2.18	1.42	0.72	1.88	-0.32	-0.98	0.07	0.19	-1.64
State and local	259.17	3.79	1.81	2.42	2.05	2.51	2.14	2.15	6.01	2.27	1.83
State	88.80	0.91	0.14	0.07	0.11	0.31	0.26	0.41	0.29	0.33	N/A
Local	170.37	5.31	2.68	3.64	3.05	3.66	3.09	3.00	5.72	3.25	N/A

TCPU = Transportation, Communications, and Public Utilties
FIRE = Finance, Insurance, and Real Estate
N/A = Not Applicable

next three years. It should be noted, however, that the rate of decline in the coal mining industry is expected to be small relative to the substantial declines in the 1980's and early 1990's. After declining by 1,400 jobs per year in the early 1990's, coal mining employment is forecast to decline by only 200 jobs per year in 1998 through 2000.

The faster growth forecast for Kentucky in goods-producing industries such as manufacturing and construction also is forecast for non-goods producing industries in the economy such as retail and services. This result is not surprising given the faster rate of income growth expected for Kentucky. Income is forecast on average to grow 0.2 percent faster in Kentucky than nationally. Since demand for industries like retail and services is largely driven by local demand and incomes, faster growing incomes in Kentucky should lead all services and trade industries to grow significantly faster in Kentucky than nationally.

This faster rate of growth is clearly seen in retail employment and government employment, and is seen to a lesser extent in services employment. Retail trade employment is forecast to grow by 2.3 percent in Kentucky compared to 1.3 percent nationally over the next three years. Similarly, wholesale trade employment is forecast to grow by 1.5 percent in Kentucky compared to 1.2 percent nationally. In part reflecting continued efforts at improving education in Kentucky, state and local government in Kentucky is forecast to grow by 2.3 percent per year compared to 1.8 percent nationally. As part of continued efforts to cut the federal budget deficit, federal government employment is forecast to decline in both Kentucky and the nation in 1999 and 2000.

Despite the much more rapid growth in trade and government, some non-goods producing industries are forecast to grow only slightly more quickly in Kentucky than nationally. In particular, health services and other types of services are forecast to only grow about 0.2 percent faster in Kentucky than nationally from 1998 through 2000. Finance, insurance, and real estate are forecast to grow 0.5 percent slower in Kentucky than nationally during the period.

The rate of growth of services, however, still is forecast to exceed the rate of growth in retail employment in Kentucky. The service industry still contains some of the fastest-growing portions of the economy, such as business services and professional services. A trend in business towards outsourcing services rather than keeping in-house staff continues to fuel rapid growth in business and professional services. Table 2 indicates that business services are forecast to grow by 5.5 percent per year on average in 1998 through 2000. It is also worth noting that the rate of health care employment growth has moderated both in Kentucky and nationally. With efforts to reduce the rate of growth in health care costs, health care employment in Kentucky is forecast to grow at a 2.7 percent annual rate. This still represents a quick rate of growth but is below the average growth rate for services.

In summary, most trade and service industries are forecast to grow faster in Kentucky than nationally. This is consistent with the faster rates of income growth in the state. The state also is forecast

TABLE 3

Growth and Growth Rates for Employment by Occupation, Seasonally Adjusted

	1997 Q4	2000 Q4	Annual Growth	Annual Growth Rate
Total	1,729,333	1,831,422	34,030	1.9%
Executives, administrators, and managers	173,766	185,169	3,801	2.1
Professional specialty	214,048	233,704	6,552	3.0
Technicians and related support	61,733	65,745	1,337	2.1
Marketing and sales	182,243	196,207	4,655	2.5
Administrative support, including clerical	325,795	335,468	3,224	1.0
Service	277,282	300,696	7,805	2.7
Agriculture, forestry, fishing, and related	17,755	18,708	318	1.8
Precision production, craft, and repair	205,779	214,043	2,755	1.3
Operators, fabricators, and laborers	270,932	281,682	3,583	1.3

to benefit from a faster-growing manufacturing sector than is found nationally, although the number of new jobs in manufacturing is expected to be substantially less than the number in services or retail trade.

These patterns in industry growth also are evident in the pattern of occupational growth. As Table 3 indicates, two of the three fastest-growing occupations are service occupations, and to a lesser extent, marketing and sales occupations. Workers in service occupations include health care assistants, food preparers, cleaners, and household workers. Marketing and sales occupations are composed primarily of cashiers and other retail sales workers. Roughly 7,800 service jobs are forecast to be gained over each of the next three years, while 4,700 marketing and sales jobs are forecast to be gained.

This growth translates into a 3.0 percent annual growth rate for service occupation jobs and a 2.5 percent rate of growth for marketing and sales jobs. Both growth rates are well above the forecast overall growth rate of 1.9 percent for all occupations. Slower growth was forecast for those occupations that account for a substantial share of manufacturing employment such as precision, production, craft, and repair workers, and operators, fabricators, and laborers. The annual growth rate for both groups of occupations is forecast to be 1.3 percent. A substantial share of the job growth in these occupations is forecast to occur for workers performing these tasks in non-manufacturing industries such as construction, and transportation, communications, and public utilities.

Another pattern evident in occupational growth forecasts is the growth for occupations requiring a high level of education. Among all occupational groups, workers in professional specialty occupations have the highest level of education. This occupational group also has the highest growth rate and is forecast to experience the second largest job increase in the next three years. The number of workers in professional specialty occupations is forecast to grow by 3.0 percent annually, resulting in a net increase of 6,600 workers each year. The professional specialty occupational group includes teachers, scientists, engineers, doctors, and artists, among others. Executives, administrators, and managers, as well as technicians, are other groups of workers that, on average, have a higher level of education. The annual rate of job growth in these two occupational groups is forecast to be 2.1 percent, above the average of 1.9 percent for all occupations. The rapid growth rate for these education-oriented occupations is forecast to occur throughout the economy, rather than being tied to a particular industry.

Despite these differences among particular occupations, it is worth noting that the outlook for job growth is at least fair for all of these nine aggregate occupation types. The growth rate is forecast to exceed at least 1.0 percent per year in all major occupational groups. While the number of jobs may be declining in some more specific occupations, these aggregate numbers indicate that there at least should be jobs available for workers in related occupations. Overall, this implies that there are expanding opportunities for most Kentucky workers.

Income

Real total personal income is forecast to grow more rapidly in Kentucky than nationally. An examination in Table 4 of the sources of income growth indicates that this faster overall growth results from faster growth in earnings from work, such as wages and salaries, and benefits (other labor income).

Real wage and salary earnings are forecast to grow by 2.3 percent per year in Kentucky compared with 1.9 percent nationally. This 2.3 percent rate of growth translates into nearly $675 million of real income growth per year from 1998 to 2000. Benefits income (other labor income) is forecast to grow by 2.6 percent per year in Kentucky compared to 1.8 percent nationally. This 2.6 percent increase is forecast to yield $95 million in new income each year. Proprietor's income is forecast to grow by 1.5 percent per year in Kentucky from 1998 to 2000, adding $57 million per year to state income. Proprietor's income is forecast to grow by 1.9 percent per year nationally. Together, these three sources of working income are forecast to account for $827 million of $1,056 million

TABLE 4

Growth Rates for Real Personal Income, Seasonally Adjusted

	1997 Q4 Income ($mil)	1997 Quarterly Growth at an Annual Rate Q1	Q2	Q3	Q4	Annual Growth Rate 1998	1999	2000	Annual Averages Growth KY ($mil)	Growth Rate KY	US
Total personal income	51,321.3	3.4%	2.2%	2.3%	1.9%	2.4%	1.8%	1.8%	1,055.9	2.0%	1.8%
Wage and salary income	28,616.8	2.6	2.5	3.0	2.4	2.6	2.3	2.0	675.4	2.3	1.9
Other labor income (benefits)	3,591.8	2.2	2.1	2.3	2.7	2.3	2.5	2.9	94.5	2.6	1.8
Proprietor's income	3,668.1	4.2	2.9	2.5	1.7	2.8	1.2	0.6	56.6	1.5	1.9
Residential adjustment	-217.4	7.8	10.9	10.5	9.1	9.6	8.2	7.2	-19.6	8.3	NA
Contributions to social insurance	2,548.5	3.9	3.7	3.6	3.4	3.7	3.3	2.8	85.1	3.2	1.9
Transfer income	9,966.9	5.9	1.9	2.2	2.3	3.1	2.5	2.4	269.8	2.6	2.8
Dividends, interest, rent	7,403.0	3.6	2.0	0.6	-0.2	1.5	0.3	0.9	66.3	0.9	0.7
Per capita income ($thou)	13.1	2.8	1.7	1.6	1.2	1.8	1.2	1.2	0.2	1.4	1.0

of income growth per year in Kentucky. Earnings from work will be the key source for income growth in Kentucky. After subtracting out payments on wages for social insurance, earnings from work will account for 70.2 percent of income growth in the state.

Income from transfer payments and dividends, interest, and rent will be the other main sources of income growth for the state. Growth in these sources of income is forecast to mirror national growth. This is not surprising since growth in transfer income and dividend, interest, and rent income tends to follow growth in population, and population is growing both in Kentucky and the nation. Growth in transfer income is forecast to grow by 2.6 percent per year in Kentucky compared to 2.8 percent per year nationally, while growth in dividend, interest, and rent income in Kentucky is forecast to grow by 0.9 percent compared to 0.7 percent nationally.

Growth in transfer income is forecast to account for $270 million per year from 1998 through 2000, and growth in dividend, interest, and rent income is forecast to grow by $66 million per year. It is worth noting that transfer income is forecast to account for 25.6 percent of total income growth. Despite legitimate concerns about the rapid growth of transfer income, it is important to stress that earnings from work is forecast to account for a much larger share of income growth in Kentucky than transfer payment income.

Another interesting pattern is the decline of Kentucky's residential adjustment, which is the difference between what Kentuckians earn working in other states minus what residents of other states earn working in Kentucky. The decline in residential adjustment indicates that one result of Kentucky's forecast employment growth is expected to be an increase in workers from nearby states finding work in Kentucky, a decrease in the number of Kentuckians working in nearby states, or both.

Risks to the Forecast

The forecast presented for the Kentucky economy is based in part on the baseline October 1997 forecast for the United States economy produced by DRI/McGraw Hill. This baseline national forecast represents a moderate, most likely scenario for the economy over the next three years. Use of this moderate national forecast implies that the Kentucky forecast is also a moderate forecast, or a moderate scenario for the state's economy among a group of possible scenarios. The national economy has other potential outcomes, which in turn could be played out in the Kentucky economy. The two alternative national scenarios are examined below.

In the first alternative scenario, there may be a recession on the horizon for 2000. In this boom-bust scenario, economic growth accelerates in 1998 and 1999, and inflation begins to rise as the economy grows faster than economic capacity allows. Furthermore, the Federal Reserve would not move

strongly to fight inflation until 1999, when inflation surges. The Federal Reserve sharply increases interest rates in late 1999, which in this scenario leads to a recession in 2000. DRI has assigned a probability of 30 percent to this scenario.

In the second alternative scenario, a stock market correction leads to a substantial slowdown in economic growth in 1998. There is no recession in 1998, and real gross domestic product does grow. However, the rate of growth slows to less than one percent for the year, before accelerating during 1999 and 2000. This scenario is based on the assumption that a stock market correction would substantially reduce personal consumption. It also assumes that slower economic growth in southeast Asia further reduces business profits. DRI has assigned a probability of 15 percent to this scenario.

Conclusion

The Kentucky economy is forecast to experience moderate to strong growth during 1998, 1999, and 2000. Growth is expected to decelerate throughout the period, with the most rapid growth occurring in 1998. Growth is also forecast to be broad-based. Most industries are forecast to add employment, with the exception of coal mining and several manufacturing industries. All major occupational groups are forecast to add employment. Real income and population are each forecast to grow at a moderate rate. Moderate growth is forecast to help Kentucky maintain moderate statewide unemployment rates.

The services and retail trade industries are forecast to add the most new jobs during the next three years. Together, these two industries are forecast to add 21,200 of the 33,800 net new jobs expected in the Kentucky economy each year. The manufacturing industry as a whole is forecast to add 2,300 new jobs per year for 1998 to 2000. But, despite this relatively low share of employment growth, manufacturing remains a key to growth in the state economy. The manufacturing sector is forecast to account for 31.8 percent of growth in real gross state product in Kentucky. Gross state product is a broader measure of an industry's contribution to the economy than employment. It is also worth noting that, despite the growing importance of transfer payments to the Kentucky economy, the wage, salary, and benefits returns from working are forecast to be the primary sources of income growth in Kentucky during the next three years.

Growth in the Kentucky economy is forecast to exceed growth in the national economy for most employment and income measures. Manufacturing employment is forecast to grow in Kentucky from 1998 to 2000, while it declines nationally. Growth rates in Kentucky for retail trade, wholesale trade, government, and to a lesser extent, services employment are forecast to exceed growth rates for the United States. Similarly, growth rates for wages and salaries and benefits income in Kentucky are forecast to exceed those for the United States. Population growth in Kentucky, however, is forecast to be lower than across the nation.

Appendix: National Forecast

The forecast for Kentucky is based on the baseline forecast for the national economy in the DRI/McGraw-Hill publication *Review of the U.S. Economy* for October 1997. National variables forecast by DRI/McGraw-Hill are key variables in nearly every part of the University of Kentucky State Econometric Model.[3]

The baseline national forecast from DRI/McGraw-Hill depicts an economy in 1998, 1999, and 2000 that slows relative to the rapid growth of 1997 but which experiences moderate growth. Real GSP is forecast to grow by 2.3 percent in 1998 and 1999 and by 2.4 percent in the year 2000. A similar pattern is evident for employment and unemployment. Employment is forecast to grow by 1.6 percent nationally in 1998, 1.4 percent in 1999, and 1.3 percent in 2000. The unemployment rate is forecast to average 4.9 percent in 1998, 5.1 percent in 1999, and 5.2 percent in 2000.

The moderation in the U.S. economy in 1998 through 2000 is expected to result in part from a slowdown in demand by consumers and the federal government. The slowdown in federal spending is

anticipated as a consequence of the balanced budget agreement. The federal budget is assumed to head towards balance in 2002. Consumer spending is also expected to decline somewhat due to an anticipated increase in interest rates. The Federal Reserve, in an effort to fight potential inflation, is expected to raise interest rates in late 1997 or early 1998. Beyond this, however, consumer spending is expected to decline simply because it is currently too high relative to factors such as income growth and unemployment. A widening trade gap is also expected to moderate economic growth. Yet it is worth noting that exports are expected to grow in 1998 and beyond, just not as quickly as imports. Spending on housing and business investment are expected to remain strong through 2000.

The factors working to moderate the economy, including an increase in interest rates in late 1997 or early 1998, are expected to help keep inflation moderate. The Consumer Price Index (CPI), which rose 2.4 percent in 1997, is forecast to rise by 2.1 percent in 1998, 2.5 percent in 1999, and 2.8 percent in the year 2000.

Endnotes

1 Personal income data for Kentucky are not yet available for the last three quarters of 1997. Population data is not available yet for the entire year. Thus, income and population values needed to be forecast for these 1997 quarters based on the Kentucky employment data which is available and national values for income growth. Kentucky employment growth and unemployment data are key inputs into forecasts of the migration component of population and the wage and salary benefits, and proprietor's income components of personal income.

2 Moderate series birth and survival rates were taken from Michael Price, Thomas Sawyer, and Martye Scobee, *How Many Kentuckians: Population Forecast 1995-2020,* Population Research, Kentucky State Data Center, University of Louisville, 1993.

3 National industrial production and productivity by industry are variables in manufacturing and mining, gross state product, and employment equations. National consumer spending and industry employment variables are important inputs for retail and service equations. National data on income growth by source is a key variable in income growth equations.

U.S. Financial Market Outlook: Can the Bull Gallop On?

Donald J. Mullineaux

The U.S. financial markets performed well during 1997, although equity markets showed unusual fluctuation late in the year. Short-term interest rates remained near the levels prevailing in 1995-1996, while long-term rates trended downwards, as inflation remained subdued. Stock markets continued to provide robust returns, but equity prices became highly volatile towards year end. The outlook for 1998 calls for much the same scenario, provided that the real economy continues to grow in the 2.0-2.5 percent range and inflation remains low. Returns to stock investors should moderate from the abnormally high rates of 1995-1997, however. Any signs of sharply accelerated growth in 1998 are likely to be accompanied by interest rate increases and a stock market sell-off, while an economic slowdown will bring lower interest rates.

Introduction

THE MID 1990'S MAY GO DOWN IN HISTORY AS AMONG the best years ever for United States financial markets. The key question in everyone's mind, of course, is how long can this continue? I begin this review of the 1998 outlook by looking backwards in time at the recent performance of the markets for debt (the money and capital markets) and for equity (the stock market). While the past is never a strictly reliable guide to the future, history may contain some discernible clues that will shed some light on the financial future. The recent strength of financial markets, for example, is partly related to the excellent performance of the overall economy, especially with respect to the rate of inflation. If the macroeconomic picture deteriorates in 1998, the financial markets will almost surely falter as well. The good news is that a few, if any, forecasters are calling for either a recession or sharply accelerating inflation. In what follows, I consider the outlook for each sector of the financial markets: the money and bond markets, the stock market, and the market for the U.S. dollar.

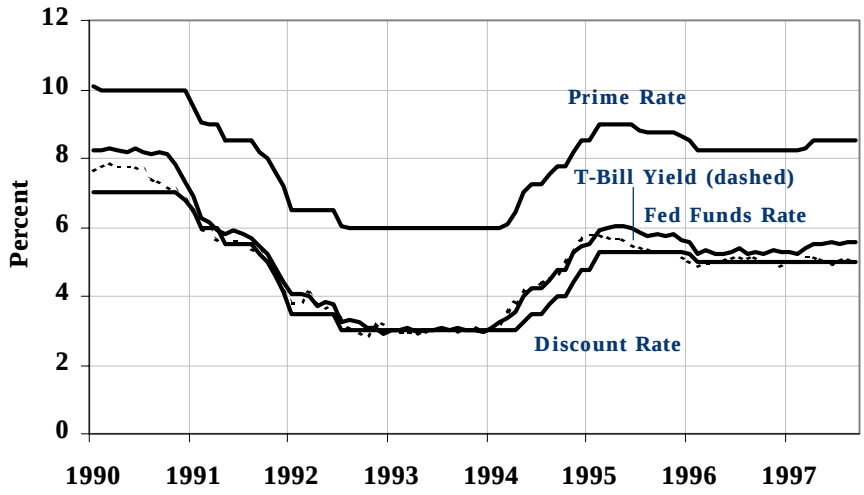
Money Market

The money market is the market for short-term financial instruments, which, by convention, refer to assets with a maturity of one year or less. While all sectors of the financial markets are subject to the forces of the demand for and supply of funds, money market conditions are strongly influenced by the actions of the Federal Reserve Bank. Indeed, the central bank focuses its short-term policy actions on the Federal funds rate, which is the yield on funds that banks lend to each other, typically on an overnight basis. Other rates in the money market on instruments such as Treasury bills and commercial paper tend to follow policy-induced movements in the Fed funds rate, as does the prime rate of interest on commercial loans.

The Federal Reserve increased its target for the Federal funds rate from 5.25 to 5.50 percent in March 1997, citing concerns about the pace of real economic growth and the potential for accelerating rates of inflation. Banks quickly followed by raising the prime rate from 8.25 to 8.50 percent and other short-term rates moved up by similar magnitudes. As the Fed was hoping, the rate of economic growth decelerated from 4.9 percent in the first quarter of 1997 to 2.2 percent in the second quarter, roughly in line with its forecast for annual growth of 2.0 - 2.5 percent for the year as a whole. (Subsequent revisions to GDP

FIGURE 1

United States Short-Term Interest Rates



data indicated that the economy grew at a real rate of 3.3 percent in the second quarter.)

The rate of Consumer Price Index (CPI) inflation likewise dropped from 2.4 percent in the first quarter to 1.1 percent in the second quarter, while producer prices were showing outright declines of better than 2 percent. Despite hints of slight accelerations in the rate of increase in wages during the summer, the Fed held rates steady through early fall. Consequently, short-term rates have been roughly constant over almost a two-year period, a scenario that contrasts sharply with the interest rate cycles of 1991-95 (see Figure 1).

In Congressional testimony in September, Federal Reserve Chairman Alan Greenspan pronounced the economy's performance "exceptional." Stock market participants took heart from the absence of any remarks in the Chairman's testimony voicing renewed concern about "irrational exuberance" in the stock market. Mr. Greenspan's comments in early spring had sparked a substantial sell-off in the stock market. Ironically, the Dow Jones index was over 1,000 points higher in the fall than at its level at the time of Greenspan's statement of concern.

In the absence of an economic downturn, the outlook for short-term interest rates in 1998 will be largely determined by Federal Reserve policy actions. Most forecasters are predicting that real economic growth will be slightly less robust in 1998 than in 1997 and that inflation will show some modest acceleration. Under this scenario, there would be little cause for the Federal Reserve to raise short-term interest rates aggressively. Most financial market participants do not view the prospects of rate changes as symmetric, however. The prevailing view is that the Fed is more likely to respond quickly to any news of acceleration in either real growth or inflation with a modest hike in the Federal funds rate than it is to react to any signals of economic weakness with a rate decline.

Indeed, market sentiment currently suggests that the only prospects for lower short-term interest rates in 1998 are predicated on a marked slowdown in economic growth or on the arrival of a business cycle downturn. The financial futures markets, which provide market-based predictions of interest rate movements, are calling for short-term rate hikes of 40-60 basis points by mid-1998. This would suggest a prime rate of roughly 9 percent by the summer of 1998 and 9.25 to 9.50 percent by year's end.

In the event of a significant slowdown in real growth or an economic recession, short-term rates would fall, probably by one to two percentage points. Rates would fall initially in response to weak demand for borrowed funds, and the Fed would push rates still lower once it recognized the business cycle downturn. Practically no economic forecasters attach any significant probability to this scenario, however.

Bond Market

While the trend in short-term interest rates was flat to slightly up during 1997, long-term rates showed more cyclical behavior (see Figure 2). The 30-year Treasury bond rate trended up from 6.6 percent to a little over 7.0 percent by mid April, then dropped to just below 6.5 percent toward the end of July and traded within a narrow band around that level into early fall. Mortgage rates and corporate bond rates tracked movements in the long Treasury rate with cycles of similar amplitude.

In one sense, long-term interest rates are determined by the same forces as short-term rates — the demand and supply of funds. However, both the demand and supply for long-dated securities are more affected by the expectations of market participants than are short-term markets. The expectations that matter are investors' perceptions of the outlook for inflation and for prospective interest rate changes (although these two sets of expectations are somewhat related to each other). If borrowers and lenders revise their expectations of future inflation in an upward direction, interest rates will increase, other things equal.

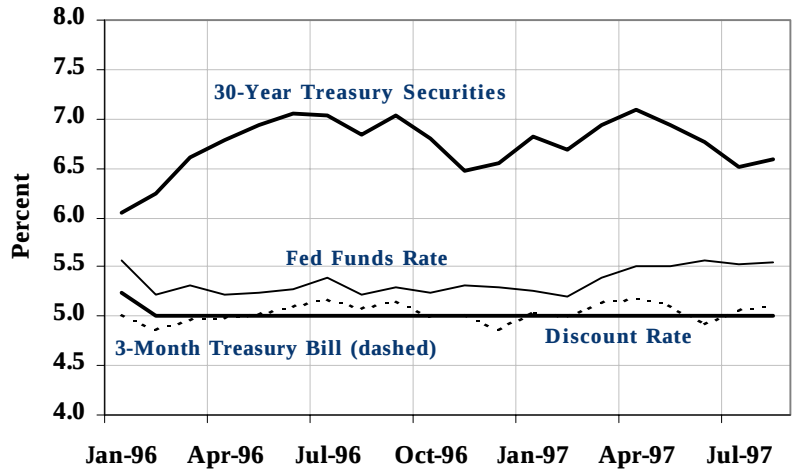
This occurs because interest rates in financial markets consist of two components: one component is the so-called "real rate of interest" and the other is referred to as the "inflation premium." The inflation premium is simply the expected rate of annual inflation over the life of the relevant security contract. Since inflation erodes the purchasing power of money, lenders demand compensation for the inflation they anticipate while a loan is outstanding. Borrowers are willing to pay this inflation premium because they, too, recognize that inflation will erode the future value of money, and consequently the inflation premium does not represent a real cost, provided that the inflation prediction embedded in rates is reasonably accurate. The "real rate of interest" accordingly is the difference between the market rate and the expected rate of inflation and it is the true or "real" reward associated with lending and the real cost of borrowing. For example, during most of 1997 the prime rate was 8.5 percent and the typical investor expected future inflation of roughly 3 percent for the next year or two, so the "real prime rate" was approximately 5.5 percent, which is a relatively high level by long-term historical standards.

For most of the United States's economic history it has proved difficult, if not impossible, to accurately measure the real rate of interest. The reason why is that economists and market analysts have no precise measure of the expected rate of inflation in financial markets. Economists cannot look inside the minds of market participants to gauge their subjective inflation predictions, so instead researchers took the difficult step of predicting investors' predictions. Since there are no reliable measures of "expected inflation," we do not know how well this approach works. However, since forecasters often err in predicting actual inflation, few analysts had much confidence in this methodology.

Thankfully, we can now measure at least one real rate of interest. In early 1997, the U.S. Treasury began to issue Treasury Inflation Protection Securities (TIPS, in market parlance) with a 10-year maturity. The interest and principal on these securities are adjusted annually to reflect changes in the rate of consumer

FIGURE 2

Selected Interest Rates



price inflation. In other words, if inflation accelerates from 3 to 4 percent, the interest rate and principal on TIPS bonds are adjusted upwards by one percentage point. There is no inflation premium on TIPS because investors are compensated annually "after the fact" for whatever inflation occurs. This means that the quoted yield on the TIPS bonds reflects a market-determined real rate of interest. The yield on the initial issue of TIPS bonds was 3.45 percent.

Since most of the rates determined in financial markets are market rates rather than real rates of interest, however, observed rate changes can reflect shifts in either of the two components. Since there was little variability in TIPS yields during 1997, we can conclude that the real long-term rate of interest was relatively constant. This means that most of the observed variability in long rates reflected revisions in the inflation outlook of investors. As the economy showed very strong growth in the first quarter, fears of accelerating inflation drove longer-term rates up. When economic growth cooled down significantly in the second quarter, long rates fell back and then fluctuated within a narrow range as evidence accumulated that inflation was not accelerating. The performance of long rates was probably helped as well by the accord announced on April 28, 1997, to seek a balanced Federal budget by 2002.

Looking ahead to 1998, the outlook for longer-term interest rates will likewise be driven by macroeconomic conditions. The "standard" forecast is for relatively stable real economic growth in the 2.0-2.5 percent range and some fairly modest acceleration in the rate of inflation, with the Federal budget position moving towards a balanced position by 2000. If this scenario comes to pass, long-term Treasury rates should continue to trade within a range of 6.25 to 6.75 percent and mortgage rates should vary between 7.25 to 7.75 percent. If economic growth accelerates to above the projected trend, long-term Treasury rates are likely to move into the 7.0 - 8.0 percent range, with the size of the rate movements depending in part on the speed and size of the Federal Reserve's response to accelerating economic growth.

A prompt Fed response to signs of above-trend growth could temper the size of the predicted upward movement in long rates if investors believe the Fed's restraining action will retard any acceleration in inflation. In the event of an economic downturn, long rates will decline and the size of the drop could be substantial. An economic recession could easily be accompanied by a zero rate of consumer price inflation or perhaps even some modest deflation, along with a likely fall in the real rate of interest. The long-term Treasury rate might drop to the 4 - 5 percent range under a recession scenario, which would result in substantial capital gains for current holders of long-term securities. The profits of financial institutions, such as banks and insurance companies, would fall substantially under such a scenario, however.

Stock Market

Despite a bumpy ride in late October, stock market investors recognized large gains in their portfolio through the fall of 1997. The Dow Jones Index increased roughly 19 percent through Election Day in November, for example. The S & P 500 and NASDAQ indices showed even larger gains of 27 and 26 percent, respectively, over the same horizon. The Dow index suffered its largest one-day point decline in history on October 27, however, dropping 554 points, then rebounded with its largest daily gain on the following day, when a record 1.2 billion shares were traded. The surge in volatility in U.S. markets was attributed primarily to economic and financial problems in East Asian markets such as Thailand, Malaysia, Indonesia, and Hong Kong. Most analysts predicted that U.S. and global markets would remain abnormally volatile during year-end 1997 and early 1998. The global financial doldrums were not limited to equity markets. The value of emerging market debt dropped by some 13.5 percent during the last week of October.

The stock market was propelled by stable economic growth, declining rates of inflation, stable interest rates, and especially by continued increases in corporate earnings and dividends. Earnings per share for the corporations in the S&P 500 index were projected to grow roughly 11 percent for 1997 as a whole, well above the pace of overall economic

activity. Over the six-year interval from 1991 to 1997, the annual compound growth in earnings per share for these same companies was 16.0 percent and the rate of annual growth in share prices was 15.3 percent.

The critical question on the minds of investors, of course, is how long can the stock market "party" go on? The ratio of corporate profits to gross domestic product reached a 20-year high in the fall of 1997, and the ratio of stock prices to earnings should average a bit over 20 for 1997, as a whole. This ratio is high by historical standards, but well below the figure of 25.5 in 1991 when earnings were at much lower levels, coming off the heels of the 1990 recession. If the "rosy scenario" for the economy unfolds, the bull market could run some more, but presumably at a more restrained pace. Most forecasters do not believe that earnings can continue to grow at double-digit rates and a likely prospect for stock market gains in 1998 should fall in the 5 - 10 percent range. The stock market would no doubt falter in the face of either accelerating inflation or a severe slowdown in real economic growth. Accelerating inflation would bring higher rates of interest, while a weak economy would mean a decline in profit performance. Either would be bad news for stock market investors.

U.S. Dollar

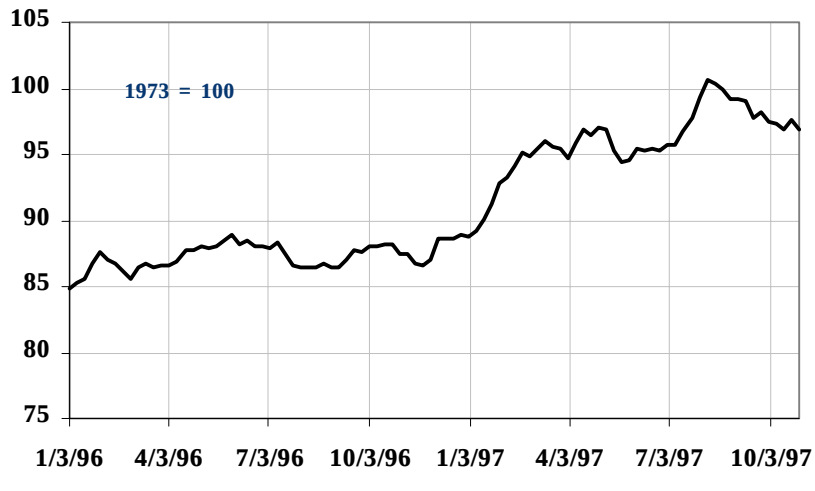
The performance of the U.S. dollar confounded forecasters during 1997. Predictions at the arrival of the new year called for a weak dollar, but by August the dollar's value was at an eight-year high relative to the currencies of our major trading partners (see Figure 3). The dollar's strength appeared to be tied to the strong performance of the U.S. financial markets and to the continued moderation of domestic inflation rates.

U.S. interest rates are abnormally high relative to foreign rates, although the yield spread was declining by early fall. The trade-weighted value of the dollar was up roughly 14 percent over the first seven months of 1997, then traded at relatively stable levels through early October. The value of the dollar stumbled in response to the developments in global financial markets in the final week of October, as interest rates were increased sharply by many Asian central banks and more modestly in Europe. Most analysts turned bearish on the dollar's near-term outlook, and consensus predictions emerged for dollar depreciation of some 5-10 percent during 1998.

While most of this discussion has focused on the performance of and outlook for returns in financial markets, it should be noted that the markets were quite effective in achieving their main purpose: providing funds to support new investment spending. The forecast for 1998 calls for more of the same. Bank commercial lending probably grew at about a 9 percent rate in 1997 and should grow only a bit more slowly in 1998. Consumer lending growth was also robust in 1997 and the rate of increase in 1998 should again fall in the 6 - 7 percent range observed last year. Mortgage lending growth is expected to accelerate in 1998 to a range of 5 - 6 percent, after slowing significantly in 1997 in response to weaker construction spending. New financings in

FIGURE 3

Dollar's Trade-Weighted Exchange Index



the bond and equity markets hit record levels in 1997 and should show continued strength in 1998 if the economy performs as predicted.

Conclusion

The overall prospects for financial markets depend significantly on the prospects for the macroeconomy. If real growth continues in the Federal Reserve's preferred range of 2.0 - 2.5 percent (as most forecasters are predicting), if inflation remains moderate, and if there are no major "shocks" to either the domestic or global economies or markets, the remarkable performance of U.S. markets should continue through 1998. Clearly there are many things that could "tip the financial market apple cart," but this has been the case since the economic recovery began way back in 1991. As one forecaster with a penchant for hedging his bets put it, "The markets will do well in 1998, unless they don't."

Education and Earnings in Kentucky, 1964 - 1996

Mark C. Berger

Kentucky's efforts in the 1990's to reform its primary, secondary, and higher education systems has focused attention on the importance of education to later success in the job market. An analysis of data from 1964 to 1996 shows that people who complete college will earn about 60 percent more than those who only complete high school, while those with graduate or professional degrees earn about twice that of high school graduates. Moreover, dropping out of high school will have large negative effects on a person's earnings, with male high school graduates earning about 40 percent more than male high school dropouts. This earnings penalty is larger in Kentucky than in the rest of the United States, and in Kentucky it is large for men than for women.

Introduction

FOR MANY YEARS, POLICYMAKERS HAVE BEEN INTERESTED in the low level of education of Kentucky's citizens. According to the 1990 Census, 35.4 percent of Kentuckians age 25 and over had not completed high school, compared to 24.8 percent for the entire country. Similarly, only 13.6 percent of Kentuckians age 25 and over had completed a bachelor's degree or higher, compared to 20.3 percent for the entire U.S.[1] This low level of education completion stems in large part from the high dropout rate from high school in Kentucky. According to the Kentucky Department of Education, the percentage of ninth graders who complete high school has hovered between 62 and 69 percent from 1973 to 1992.[2] At the same time, many citizens have been interested in improving the quality of education provided to Kentuckians. These concerns about the quantity and quality of education have led to efforts to reform Kentucky's education systems.

Efforts to reform primary and secondary education culminated in the Kentucky Education Reform Act (KERA) of 1990. This legislation made drastic changes in the financing, governance, testing, and teaching in Kentucky's public schools. More recently, Kentucky's higher education has undergone a transformation. In May 1997, House Bill 1 was passed by the General Assembly and signed by Governor Paul Patton, changing the governing structure of higher education in Kentucky.

Why has there been so much effort devoted to improving the quantity and quality of the education of Kentucky's citizens? One important reason is the belief that more education will lead to greater success in the job market. In fact, one of the desired outcomes of KERA is to make Kentucky students more competitive in the job market. In this paper, I provide evidence on the labor market success of different schooling groups in Kentucky and the rest of the United States from 1964 to 1996. In this way, I provide direct evidence on the economic returns to completing schooling in Kentucky and the rest of the country over time.

Data and Methodology

This analysis uses data from the March Current Population Survey (CPS) that have been compiled by Unicon Research Corporation. The Current Population Survey is conducted monthly by the U.S. Bureau of the Census for the purpose of calculating official federal statistics on employment and unemployment. The monthly questionnaire includes data on employment, job search activity, and demographics, including age and level of

schooling completed.

In some months additional batteries of questions are included on special topics. Each March, a series of questions known as the Income Supplement are included in the survey. Each person age 15 and over is asked questions about annual wage and salary earnings and income from nonlabor sources, hours and weeks worked and health insurance coverage in the previous year, and industry and occupation for the longest job during the previous year. The main CPS data and the March supplements from 1964 to 1996 are used in this paper to examine the returns to schooling in Kentucky and the rest of the country.

TABLE 1

Average Weekly Earnings for Kentucky and the Rest of the United States from the Current Population Survey

Year	*Kentucky* Average Weekly Earnings	*Kentucky* Sample Size	*Rest of U.S.* Average Weekly Earnings	*Rest of U.S.* Sample Size
1981	$233	1,123	$257	75,604
1986	$301	729	$352	67,206
1991	$384	873	$441	81,672
1996	$533	780	$557	66,915

The CPS is based on the civilian noninstitutional population of the United States. The sample is located in 729 sample areas comprising 1,973 counties and independent cities with coverage of every state and the District of Columbia. Each month, the Census Bureau designates approximately 71,000 housing units for interviews. Of these, some 57,000 households are interviewed, consisting of approximately 114,500 persons age 15 and over and 33,500 children age 0 to 14. Typically, several hundred workers from Kentucky are included in the sample.

The analysis here uses regression equations explaining the natural log of weekly earnings. Weekly earnings are estimated as annual wage and salary earnings divided by the number of weeks worked during the year. The log transformation is used because it provides the best statistical fit of the data and allows interpretation of the results as percentage differences in earnings.

A number of variables are included in the regression models. In this analysis of weekly earnings, variables measuring race, marital status, labor market experience, and schooling are included in the models. Specifically, variables measuring three race categories (black, white, other), whether the individual is married and living with his or her spouse, potential years of experience (age minus schooling minus six), experience squared, experience cubed, and experience raised to the fourth power, and five different schooling completion groups (high school dropout, high school graduate, some college, college graduate, graduate or professional degree) are included in the models. Separate regression equations are estimated for males and females, for Kentucky and the rest of the U.S., and for each year from 1964 to 1996. In all, 132 models were estimated (33 years times 2 (rest of U.S., KY) times 2 (male, female)). Thus, this model allows us to estimate differences in earnings for individuals in different years with different amounts of schooling, holding constant experience, marital status, race, and gender.

Table 1 shows the number of observations used in the analysis of earnings for Kentucky and the rest of the country for 1981, 1986, 1991, and 1996 and the averages of weekly earnings. For the four years shown, the number of workers in the Kentucky sample ranges from 729 to 1,123 and for the rest of the country the sample size ranges from 66,915 to 81,672. In each of the years shown, the average weekly earnings in Kentucky are somewhat below the average weekly earnings in the rest of the country.

Table 2 shows the average weekly earnings of males and females in the five different schooling groups in Kentucky and the rest of the United States in 1996. The data for both Kentucky and the rest of U.S. illustrate the effect that more education has on earnings. For both men and women, high school graduates earn substantially more than high school

TABLE 2

Average Weekly Earnings by Schooling Level and Gender, Kentucky and the Rest of the United States, 1996

Schooling Level	*Kentucky* Men	*Kentucky* Women	*Rest of the U.S.* Men	*Rest of the U.S.* Women
Less than High School	$401	$176	$340	$206
High School Graduate	$520	$303	$576	$382
Some College	$578	$371	$628	$391
Bachelor's Degree	$767	$706	$966	$571
Graduate or Professional Degree	$1,628	$1,006	$1,386	$794

dropouts, those with some college earn more than high school graduates, and those with bachelor's and higher level degrees earn even more. Women have lower weekly earnings than men in both Kentucky and the rest of the country, and the earnings of three out of the five schooling groups for both men and women are lower in Kentucky than in the rest of the country. In all four groups, however, the returns to higher schooling can be clearly seen.

Returns to Schooling, 1964 - 1996

By combining the results from our estimated models for all 33 years, we can obtain long-term pictures of trends in the returns to schooling in Kentucky and the rest of the country. Figures 1 through 4 show trends in the returns to schooling for men and women in Kentucky and in the rest of the country. Each figure shows the estimated percentage difference in earnings between high school graduates and the other four schooling groups for each year. Thus, if the figure indicates that college graduates are at 50 percent for a particular year, it means that college graduates are earning 50 percent more than high school graduates. Similarly, a figure may show that high school dropouts are at -50 percent in a particular year. Thus, dropouts in that year are earning 50 percent less than high school graduates. These percentage differences are calculated using the results of the regression models that hold constant a number of other factors. Therefore, the results should be interpreted as the estimated percentage differences in earnings between each schooling group and high school graduates, after controlling for race, marital status, potential years of experience, gender, and whether or not the person lives in Kentucky.

Figures 1 and 2 show the percentage differences in earnings in Kentucky by education level over time. Because the sample sizes for the ten education level – gender groups in some years are fairly small, we show three-year moving averages of the returns to smooth out some of the year-to-year variation in the estimated differences. This allows us to focus on the longer-term trends in the returns to education. It also means that the figures for Kentucky do not begin until 1966, once there are three years with which to calculate the moving average.

Kentucky

The trends over time in earnings differences by education for males in Kentucky are shown in Figure 1. The increase in weekly earnings associated with completing college versus completing high school has drifted upward from around 40 percent in the late 1960's to around 60 percent in the mid 1990's. Aside from a dip in the early 1990's, the return to completing college has been increasing since 1984. Those with a graduate or professional degree now earn about twice what high school graduates earn, up from about 60 percent in the late 1970's. While the premium to completing a graduate degree fell in the late 1960's, late 1970's, and late 1980's, the overall trend has been upward.

The gap between men with some college and high school graduates has narrowed somewhat over time in Kentucky. In other words, larger returns are obtained from completing a college degree, rather than just attending college. Male high school graduates in Kentucky have consistently earned about 40 percent more than high school dropouts from the 1960's to the 1990's. This result illustrates quite graphically the importance of completing high school in determining an individual's economic future.

FIGURE 1

Percentage Earnings Differences between High School Graduates and Other Education Levels for Males in Kentucky

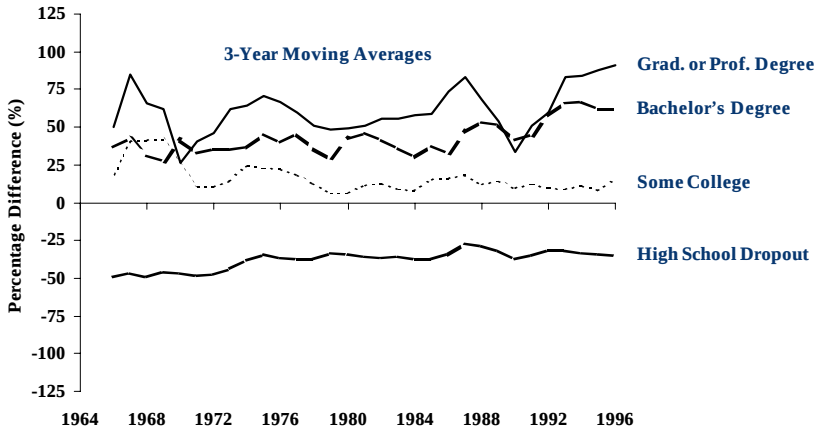
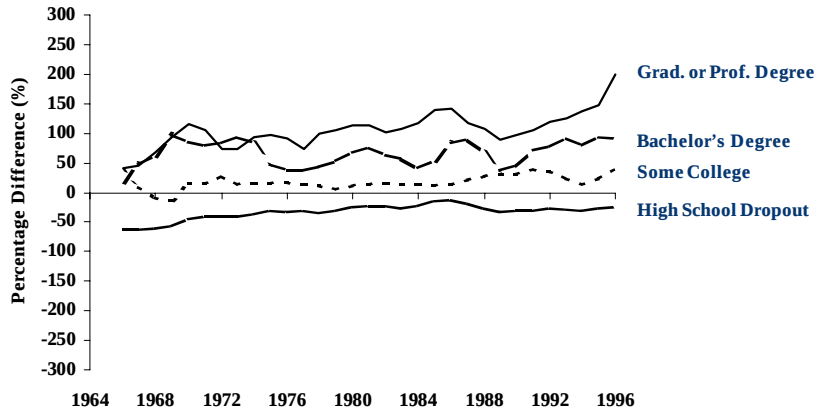


FIGURE 2

Percentage Earnings Difference between High School Graduates and Other Education Levels for Females in Kentucky



Percentage differences in weekly earnings across education categories for Kentucky women are illustrated in Figure 2. Except for dips in the late 1970's and late 1980's, the earnings premiums for completing a bachelor's degree or graduate or professional degree have grown over time. Weekly earnings of bachelor's degree holders are currently almost twice those of high school graduates, while graduate and professional degree holders earn about 200 percent more than high school graduates. Part of this difference reflects differences in hours of work per week. High school graduates are more likely to be working part-time than college graduates. Even taking into account differences in hours worked per week, however, the earnings premiums associated with completing college are very sizable.

The differences between those with some college and high school graduates are considerably smaller, as is the case for men. Those with some college earned approximately ten percent more than high school graduates in the late 1970's. That difference has been drifting upward to approximately 40 percent in recent years, however. On the other hand, the difference between high school graduates and high school dropouts has been narrowing over time. In the late 1960's, high school dropouts earned 40-50 percent less than high school graduates, while in more recent years the difference has been 20-30 percent. A 20-30 percent difference in earnings, however, is still a large penalty to pay for not completing high school.

Rest of the U.S.

Figures 3 and 4 show percentage differences in weekly earnings predicted from the estimated regression models for the rest of the United States. Figure 3 shows the results for males from 1964-1996 and Figure 4 shows the results for females over the same period. Because the sample sizes for the rest of the United States are so large, it is not necessary to show three-year moving averages as was the case for Kentucky.

While similar to those in Kentucky, there are some differences in timing of changes in directions and levels of earnings differences in the rest of the United States. The premium for completing a bachelor's degree or graduate or professional degree fell from 1971 to 1980 but has increased fairly steadily since 1980. The premium for completing a graduate or professional degree has risen quite rapidly in the 1990's. In 1980, bachelor's degree graduates earned about 35 percent more than high school graduates, while those with graduate and professional degrees earned about 45 percent more. By 1996, those with graduate and professional degrees were earning more than twice what high school graduates earned, while bachelor's degree holders were earning 60 percent more than high school graduates.

FIGURE 3

Percentage Earnings Difference between High School Graduates and Other Education Levels for Males in the United States

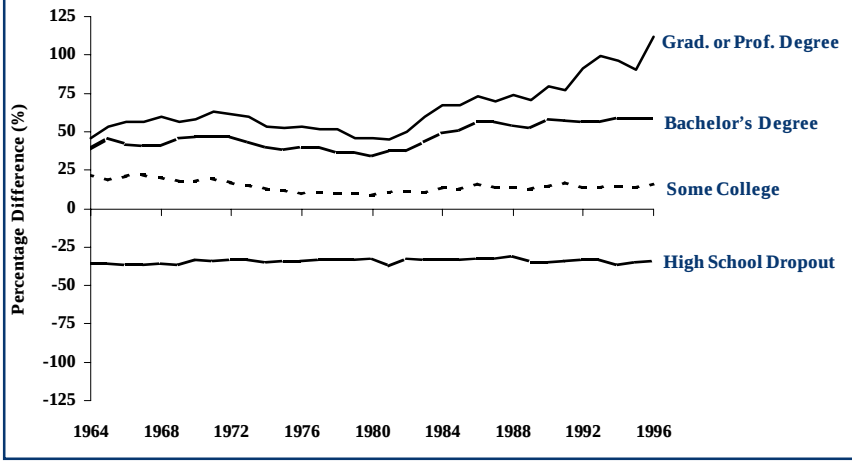
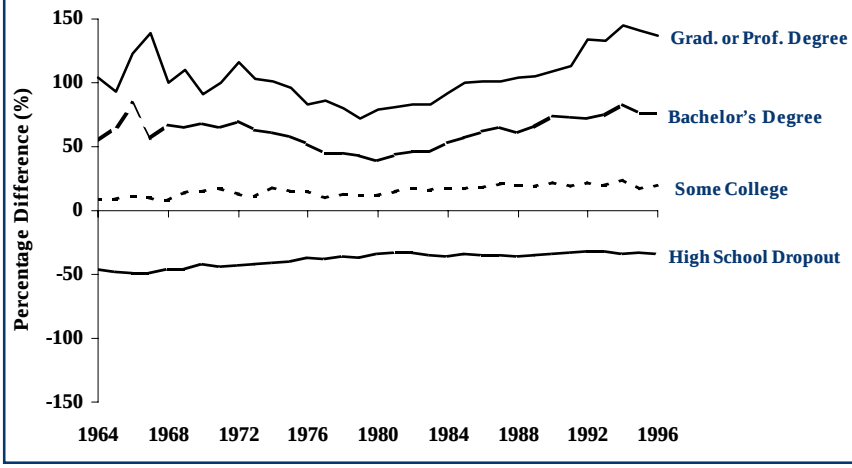


FIGURE 4

Percentage Earnings Difference between High School Graduates and Other Education Levels for Females in the United States



The trend for those with some college has been similar but not as pronounced. After declining somewhat since the late 1960's, the gap between those with some college and high school graduates has hovered between 10 and 15 percent since 1980. Over the entire period, the earnings penalty associated with not completing high school has been around 35 percent. Thus, the earnings penalty associated with dropping out of high school is larger in Kentucky than in the rest of the country.

For women, the earnings premium for completing a bachelor's, graduate, or professional degree dropped from the late 1960's to approximately 1980. Since 1980, these earnings premiums have been steadily rising. While in 1980 bachelor's degree holders earned about 40 percent more than high school graduates and graduate and professional degree holders earned approximately 80 percent more, by 1996 the premiums were about 75 and 140 percent, respectively.

The gains over time for those with some college have been much less noticeable, rising from 12 percent in 1980 to 20 percent in 1996. Again, it is the completion of a college degree that yields the largest returns, not simply college attendance. The earnings penalty associated with dropping out of college for women has dropped from 45 percent in the 1960's to a still sizable 35 percent in the 1990's.

Conclusion

The analysis of long-run trends in the returns to education in Kentucky yields several important conclusions. First, there is a large earnings penalty associated with dropping out of high school in Kentucky. For men, this penalty is larger in Kentucky than in the rest of the country and in Kentucky, it is larger for men than for women. This penalty has been present during the whole time period under analysis, from the 1960's to the 1990's. Persuading individuals to finish high school could result in large economic benefits for them and for the state of Kentucky.

Second, while there are some payoffs associated with attending college in Kentucky, the payoffs are substantially larger for completing a bachelor's, graduate, or professional degree. The returns to obtaining a bachelor's degree or higher have been increasing in Kentucky since the mid 1980's. The returns to completing a graduate or professional degree have been increasing rapidly in the 1990's. By 1996, males with a graduate or professional degree in Kentucky were earning twice what a high school graduate was earning. For females, graduate and professional degree earnings were three times that of high school graduates.

Given the large earnings differences across education levels in Kentucky, the focus on reducing dropout rates, raising education levels, and improving education quality in Kentucky is warranted. These earnings differences mean that the potential returns to increased investment in education in Kentucky are large. Furthermore, the widening earnings differences over time mean that the potential returns are also growing, not only for individuals making investments, but also for the entire state.

Endnotes

1 The educational attainment data for Kentucky and the U.S. can be found in U.S. Bureau of the Census, *Statistical Abstract of the United States: 1996* (116th edition) Washington DC, 1996, Table 245.

2 Lonnie Harp, "State begins all-out drive to cut school dropout rate," *Lexington Herald-Leader*, June 12, 1997, A1, A10.

Kentucky's Per Capita Personal Income: The Roles of Women and Education

Robert W. Cox

In 1975 an in 1995, Kentucky's per capita personal income was at about 80 percent of the national average. While per capita incomes in other Southern states—including Georgia, North Carolina, and Tennessee—have increased relative to the national average during that time period, Kentucky's fell in the mid-1980's before returning to around 80 percent in 1995. Evidence suggests that average earnings has failed to rise a rate that will bring Kentucky's average toward the national average. Increasing labor force participation by Kentucky females who have relatively low education levels provides a strong case for the failure of earnings to rise as they take low-skill, low-paying jobs. Labor force participation by females may increase in the future, so per capita income may still not rise unless the educational attainment of Kentucky's adult population is improved.

Introduction

THIS ARTICLE ANALYZES KENTUCKY'S LONG-TERM PER capita personal income in relation to the national average. In 1996, Governor Paul Patton announced his long-term goal of placing Kentucky on a path that will raise the standard of living of Kentuckians up to the national average in the next 20 years, and per capita personal income, while by no means the only measure that can be employed to measure standard of living, is one of the broadest measures available.

Personal income for all 50 states is measured by the U.S. Department of Commerce and defined as the sum of earnings by industry, income from property (dividends, interest, and rent), and transfer payments. Per capita personal income (PCPI) is simply the total personal income for the state divided by the population. Thus, it has little to offer to those who are concerned with the distribution of income. This shortcoming notwithstanding, an increase in the state's per capita personal income relative to the national average is generally regarded as a desirable outcome, and for this reason an analysis of the components of PCPI is a useful exercise if it can point the way to some possible policy options for the state.

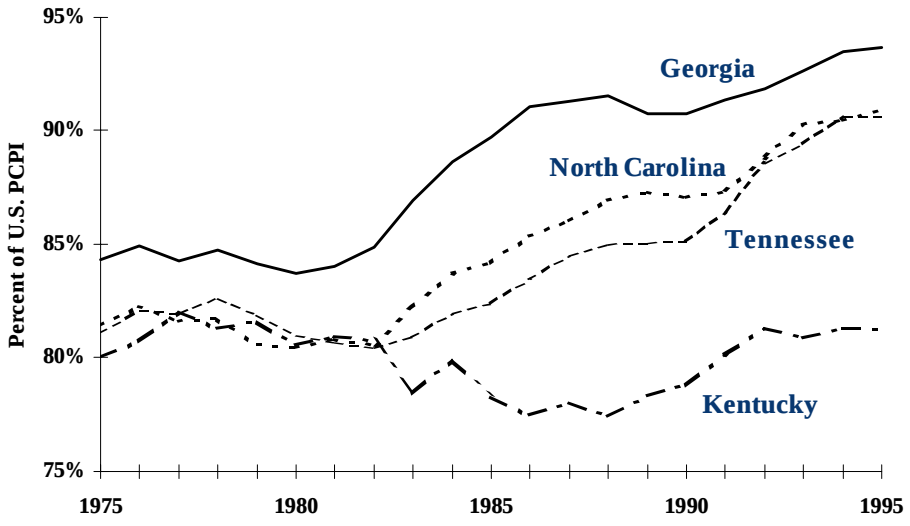
Background

It has been observed that for the previous 20-year period, Kentucky's PCPI has hovered around 80 percent of the national average (see Figure 1). During this time period, several other Southern states that initially had per capita incomes close to Kentucky's level have made impressive income gains relative to the national average. In particular, Georgia, North Carolina and Tennessee have closed the gap considerably between the U.S. PCPI and their state averages, each moving over 10 percentage points closer to the U.S. average. Given this scenario, in discussions involving the Kentucky Office of Financial Management and Economic Analysis (OFMEA), the Governor's Office of Policy and Management, and the Kentucky Long-Term Policy Research Center, the participants expressed interest in examining the differences between the characteristics of personal income in those states and Kentucky.

The analysis of per capita personal income undertaken by OFMEA closely followed the earlier work of Garnick (1990), who decomposed income into several components and analyzed the contributions of each component in the convergence of state per capita income. This analysis focused on factors such as a state's industrial mix, its regional

FIGURE 1

Per Capita Personal Income (PCPI) as a Percent of U.S. Per Capita Personal Income, 1975 -1995



earnings differential, jobs ratio, working age ratio, and ratios of income from property and transfer payments. Each factor is compared to the same ratio at the national level to see if it has contributed to a convergence of state and national per capita income. The factors are described below.

Components of Per Capita Personal Income

TPI / N = (H / J)*(E / H)*(J / Nw)*(Nw / N)*(FI / E)*(TPI / FI)

TPI / N = Per Capita Personal Income (TPI = total personal income, N = population)

H / J = Industry Mix (H = hypothetical earnings, J = jobs)

E / H = Differential regional earnings (E = earnings)

J / Nw = Job Ratio (Nw = population aged 18-64)

Nw / N = Working age ratio

FI / E = Property Income Ratio (FI = earnings plus dividends, interest, and rent)

TPI / FI = Transfer Payments ratio

All computed ratios are measured against the same ratios at the US level, and differences in time reveal how the ratio is growing in relation to the US average. For example, the per capita income ratio for Kentucky from 1975 - 1985 is calculated as $\ln(\%\Delta Y_K) - \ln(\%\Delta Y_{US})$.

If the ratio is positive, then this particular ratio is growing faster than the national average, and contributed to growth in per capita income. If it is negative, then this factor has been a net drag on per capita income growth.

Per Capita Personal Income: The total personal income (earnings; dividends, interest, and rent; and transfer payments) divided by the population of the region. Used as a fundamental measure of a region's economic welfare.

Industry Mix: This ratio reveals how the region's existing pattern of jobs contributes to per capita income growth. To do this, an assumption is made that each job pays the same in the region as the national average. This is termed "hypothetical earnings." Therefore, any changes in the growth of total earnings comes not from local wage differentials, but rather from changes in the types of industry that dominate the regional economy. A large positive number would reveal that employment in the region has been moving toward industries that (nationally) are higher-paying. A negative number shows that employment within the region has been concentrating in relatively low-paying industries.

Differential Regional Earnings: This ratio compares the actual earnings of workers in the region to the hypothetical earnings those workers would have made if they were compensated at the national average rate. A positive number in this category indicates that earnings are rising faster in the region

than the national average increase. A negative number indicates that earnings increases have lagged the national average.

Job Ratio: The job ratio compares the rate of job creation to the rate of population increase in the working age (18 – 64) category. A negative number means that jobs are not being created at a rate equal to the rise in the working age population. (A likely result of this phenomenon is an increase in the unemployment rate.) A positive number means that the economy has been generating jobs faster than the increase in the working age population.

Working Age Ratio: This is a demographic ratio exclusively, meant to reveal if the labor force in the region is rising or falling compared to overall population growth. If this number is positive, then the working age population is rising faster than the overall population. If this ratio is negative, it indicates that the population of non-working age individuals (children or the elderly) is rising faster than the average.

Property Income Ratio: This ratio is a measure of factor income (earnings and dividends, interest, and rent) to earnings. If this number is positive, then income from wealth, in the form of dividends, interest, and rent, is rising faster than earnings. A negative number indicates that income from wealth has lagged behind earnings.

Transfer Payments Ratio: The transfer payments ratio is a measure of the importance of transfer payments (government retirement, Social Security, Medicare, Medicaid, AFDC, and unemployment being among the largest) in the regional economy. A positive number indicates that transfer payments are increasing in importance in the economy. A negative number means that transfer payments have been rising slower than factor income.

Interpreting the Ratios

The analysis was applied to Kentucky, Georgia, North Carolina, and Tennessee from 1975 to 1995, and the results are reported in Table 1. To further identify sources of income convergence, the period

TABLE 1

Percentage Difference from National Average Percentage Change in Per Capita Personal Income by Detailed Component: 1975 - 1985, 1985 - 1995, 1975 - 1995

	Per Capita Personal Income	Industry Mix	Differential Regional Earnings	Job Ratio	Working Age Ratio	Property Income Ratio	Transfer Payments Ratio
1975 - 1985							
Kentucky	-2.18%	-1.59%	1.50%	-4.68%	0.64	0.96	0.99
Georgia	6.22	3.28	2.60	1.84	1.79	-1.74	-1.53
North Carolina	3.33	3.30	0.97	-0.45	0.35	-0.68	-0.17
Tennessee	1.51	1.02	5.27	-3.76	0.07	-1.49	0.40
1985 - 1995							
Kentucky	3.69%	0.23%	-5.51%	5.51%	3.54	-0.59	0.50
Georgia	4.32	0.85	4.21	-3.14	2.36	0.73	-0.70
North Carolina	7.68	2.14	2.31	2.47	-0.08	0.48	0.37
Tennessee	9.58	1.26	1.86	5.12	2.08	-1.02	0.29
1975 - 1995							
Kentucky	1.51%	-1.36%	-4.01%	0.83%	4.19	0.37	1.49
Georgia	10.54	4.13	6.81	-1.30	4.14	-1.01	-2.23
North Carolina	11.01	5.44	3.28	2.03	0.27	-0.20	0.20
Tennessee	11.09	2.28	7.13	1.35	2.15	-2.52	0.69

was broken into two 10-year periods, 1975-85 and 1985-95. It was observed that during the first 10-year period, Kentucky's per capita personal income lost 2.18 percentage points versus U.S. per capita income. The major contributors to this decline were the industrial mix and the jobs ratio. The industrial mix refers to the types of industry that predominate in the state and allows the analyst to determine whether high-wage or low-wage industries (based on national wage levels) have a major presence in the state.

In Kentucky's case, the 1975-85 time period saw a decline in several of the state's major high-paying industries, including coal mining, tobacco manufacturing, and most durable-goods manufacturing. At the same time, Kentucky's job growth was sluggish, with total employment falling from 1979 to 1982. Not until 1984 did employment again reach the 1979 level. The major job growth that occurred was in traditionally low-wage industries such as agricultural services and retail trade. For the most part, the comparison states did not experience similar employment shifts, primarily because they were less dependent originally on tobacco manufacturing and coal mining. (North Carolina, a tobacco-dependent state, was successful in replacing lost tobacco manufacturing jobs with other jobs in high-paying industries.)

For Kentucky, the industry mix during the 1985-95 period was more favorable, but overall contributed only slightly to per capita income convergence. During this period, Kentucky made significant gains in employment in durables manufacturing, air transportation, and several high-paying nondurables industries. But at the same time, employment growth in traditionally low-wage industries like apparel manufacturing kept the overall industry mix from contributing more.

The regional earnings differential measures how average wages in each state compare to the national average. Thus, slow-rising earnings (for each industry) relative to the national average will cause this factor to contribute to a divergence from the national per capita income. From 1975 to 1985, Kentucky experienced a positive regional earnings differential, which helped dampen the divergence in per capita personal income, and largely offset the negative effects of the unfavorable industry mix. From 1985 to 1995, however, the regional earnings differential turned negative by a large margin. This indicates that per capita earnings in Kentucky over the most recent 10-year period have diverged from (i.e., lagged behind) the growth at the national level. The slow wage growth has been the largest single drag on per capita income growth in Kentucky. This phenomenon was not experienced in any of the other three comparison states for either 10-year period.

The jobs ratio measures total employment by the working age population in each state. If this ratio is growing at a faster rate than the national average, then this is a positive factor in per capita income growth. Unfortunately, for Kentucky this factor was negative by a large margin in the 1975-85 period as the recession of the early 1980's and the decline in the coal industry hit the state hard. This was reversed in the most recent 10-year period, as the jobs ratio became the largest single factor contributing to the modest convergence in per capita personal income that Kentucky has experienced. Quite simply, Kentucky's employment growth has been the brightest spot in its economic picture over the last 10 years.

The working age ratio refers to the population between the ages of 18 and 64 compared to the total state population. A state with a fast-growing working age population will be better positioned to experience faster employment and earnings growth, which will contribute to per capita income growth. In all four states included in this analysis, this measure was positive except for the case of North Carolina in the last 10 years, when this measure turned slightly negative. This is entirely a demographic phenomenon. Kentucky's positive ratio indicates that demographics have not worked against the state. Although there are several possible reasons for this ratio to be positive, it seems to refute the argument that Kentucky is saddled with a large elderly population who do not contribute to its economy.

The property income and transfer payments ratios measure whether incomes from these sources have grown faster than the national average. Unlike

most of the other measures, these do not show a consistent trend for any state, and their contribution to per capita income convergence (or divergence) is minimal.

Possible Causes of Per Capita Earnings Divergence

Given the rapid employment growth experienced in the state over the past 10 years, the failure to lift PCPI closer to the national average appears particularly disappointing. The foregoing analysis identified slowly growing average earnings as a likely culprit in the lackluster per capita personal income growth. It is the purpose of this paper to focus on the one identified factor, the regional earnings differential, where Kentucky in recent times differs the most from its more successful comparison states. From 1985 to 1995, this ratio exactly counterbalanced the contributions made by the jobs ratio.

One may get an impression of the severe consequences this had on per capita income growth by observing what would have happened if this ratio had been neutral (i.e., growing at the national rate). In this case, Kentucky's PCPI growth in the 1985 - 95 period would have been greater than Georgia's or North Carolina's and nearly as high as Tennessee's. Instead of a per capita income equal to just 81 percent of the national average, it would stand at nearly 87 percent of the national average, a gain of $1,276 for each resident of the Commonwealth compared to its actual current level. If Kentucky had simply followed the national trend, then this would have led to an improvement in the regional earnings differential. But with earnings diverging from the national average, other events must be countering the national trend.

Obviously, improving the earnings performance of Kentucky's jobs is a key element of improving Kentucky's PCPI relative to the nation. It is useful therefore, to try to understand the underlying reasons for the poor performance of the regional earnings differential factor in the 1985 - 95 period. Both Garnick (1990) and Mallick (1993) have commented on the ways in which supply and demand affects earnings. Garnick chose to focus on population effects. Given an increase in employment opportunities within a state or region, new migrants might be attracted, or out-migration might be prevented. This has a positive effect on per capita income if the new jobs are going to existing state residents who were previously unemployed or working for lower earnings. If new jobs are going to new residents, however, it will increase per capita incomes only if the average earnings of the new jobs are higher than the state average earnings. Thus, an increase in employment can indirectly lead to a lower per capita income, or at least a lower rate of growth in per capita income.

While not ignoring the issue of migration of the labor force, Mallick chose to emphasize the change in the labor force participation rate. Migration, as he pointed out, is a costly activity, particularly for families with children. But, "in response to relatively low earnings of the primary wage-earner and changing cultural attitudes, there has been an increased incentive for women to participate in the labor market." The result will be an increase in the labor force participation rate of women, which has been observed in Kentucky.

Mallick observed that during the 1950's and 1960's, the female labor participation rate increased dramatically at the national level. He contends that the increase in the employment rate had a negative effect on earnings, primarily because it kept wage rates from rising in the poorer states: "Were it not for the effect of differential employment rate growth across the states, wage rates would have converged almost three times as fast and per capita incomes would have converged almost twice as fast as they actually did."

Recent data from the U.S. Bureau of Labor Statistics identify the gains in earnings due to increased education. For example, a college graduate earns $49,000 per year on average, versus $25,000 per year for a worker with only a high school diploma. In other words, earnings almost double. Mallick noted that the rise in female labor force participation during the 1950 - 70 period nationally was accounted for by relatively less-educated women. Since the 1970's, however, the most rapid growth

occurred in college-educated women: "With the growth in female employment rates dominating overall growth in employment rates as indicated, this implied that the 1950's and 1960's would be characterized by a relatively slow rate of wage growth in the aggregate."

Supply and Demand Effects

The connection between employment growth and population growth has been documented by many researchers. Although there is something of a "chicken and egg" problem in interpreting events like population and employment change, it is generally agreed that a rapid growth in employment will be followed by an increase in population, brought about by increased migration into the region. For this to be a factor in Kentucky's poor per capita income performance, then net in-migration should be greater here as a percentage of the population than it is in the other states.

Earlier research by Cox (1994) demonstrated a definite link between relative employment opportunities and net migration rates in Kentucky, although the responsiveness of migration to new employment opportunities is muted when compared to other regions. Migration data from the U.S. Bureau of the Census for the most recent five-year period (1990 - 95) indicates that in-migration to Kentucky was less than one-half the rate that occurred in the other three comparison states. In that period, in-migration amounted to just 2.1 percent of the Kentucky population. In the other three states it ranged from 5.0 percent to 6.3 percent. In theory, at least, slower population growth should have led to greater per capita earnings growth through upward demand pressure on wages and salaries. Since this did not happen, then other events must have dominated.

Mallick observed that in states where the employment rate (a measure similar to the jobs ratio as defined above) has grown the strongest, wage rate growth has been depressed. This is true if relatively low-skill workers are entering the labor force and exerting downward pressure on aggregate wage growth in the economy. This situation was true in the U.S. in the 1950's and 1960's, primarily due to the rapid growth in the labor force participation of women who lacked the education and experience of their male counterparts. In the 1970s and later years, the new female entrants into the labor force tended to be better educated and have more experience than their predecessors, leading to higher earnings growth.

To see the extent to which this transformation was occurring in Kentucky, labor force participation rates from 1987 to 1995 among males and females age 16 and older were compared against Georgia, North Carolina, and Tennessee (see Table 2). In Kentucky, the labor force participation rate increased by 6.5 percent for women, while declining 2.8 percent for men. Thus Kentucky had the largest decrease in the participation rate for men, and the highest increase in the rate for women.

The most significant feature of Table 2 is that in Kentucky a rapid convergence of the labor force participation rate by gender is occurring. In 1987, the ratio of employed men to employed women was over 1.3 in Kentucky, making it the most male-dominated workforce among the four comparative states. The shift in the gender composition of the workforce from 1987 to 1995 resulted in a ratio that is within the range of the other three states. This strongly implies that the net employment gains made in Kentucky over the last 10 years were brought about primarily by attracting greater workforce participation by women.

The implications of this shift for the regional earnings differential are significant. It has commonly been observed that women earn less than men on average, but this alone would not entirely explain the relative divergence in the regional earnings differential. National data from the Bureau of Labor Statistics show that average earnings of female workers, while still only about 76 percent of the average for males in 1995, have been rising faster than wages for males since 1985, when they were only 68 percent of the male average. Mallick's observations on the impact of rapidly expanding female workforce participation nationally in the 1950's and 1960's may have foreshadowed events occurring in Kentucky during the last 10 years. If the

TABLE 2

Labor Force Participation by Gender, 1987 and 1995

Labor Force Participation Rates
(percent of civilian noninstitutional population, age 16 and over)

	1987		*1995*		*1987 - 1995 Change*	
	Men	**Women**	**Men**	**Women**	**Men**	**Women**
Kentucky	73.5%	49.5%	70.7%	56.0%	-2.8	6.5
Georgia	77.9	57.6	75.8	59.2	-2.1	1.6
North Carolina	77.3	59.9	74.7	59.8	-2.6	-0.1
Tennessee	73.4	54.5	74.4	60.3	1.0	5.8

Ratio of Employed Men to Employed Women

	1987	*1995*	*Change*
Kentucky	1.31	1.15	-0.16
Georgia	1.16	1.16	-0.03
North Carolina	1.16	1.11	-0.05
Tennessee	1.21	1.11	-0.10

Source: U.S. Bureau of Labor Statistics, Geographic Profile of Employment and Unemployment

TABLE 3

Years of School Completed by Persons Age 25 and Over

	Less than 9 Years		*High School Graduates*		*1 - 3 Years of College*		*4 or More Years of College*	
	1980	**1990**	**1980**	**1990**	**1980**	**1990**	**1980**	**1990**
Kentucky	31.3%	19.0%	53.1%	64.6%	10.7%	19.2%	11.1%	13.6%
Georgia	23.7	12.0	56.4	70.9	13.4	22.0	14.6	19.3
North Carolina	24.6	12.7	54.8	70.0	13.8	23.6	13.2	17.4
Tennessee	27.7	16.0	56.2	67.1	11.9	21.1	12.6	16.0
United States	18.3	10.4	66.5	75.2	15.7	24.9	16.2	20.3

Source: U.S. Bureau of the Census

new entrants to Kentucky's labor force, particularly the new female participants, are undereducated compared to the new entrants in the comparison states, then it could potentially explain much of the relatively slow wage growth.

Unfortunately no data exist on the educational level of new entrants into the labor force. In fact, the data on educational levels of the entire workforce is not ideal. The most recent comprehensive measures are from the 1990 Census. Table 3 reveals educational levels of the adult population age 25 and over in 1980 and 1990 for Kentucky and the comparison states. In this table, it can be seen that Kentucky fares poorly in its educational attainment compared to Georgia, North Carolina, and Tennessee. In general, the state made comparable gains in improving its educational attainment overall. (Much of this may be mainly a result of demographics. As older, less educated Kentuckians died off, they were replaced by younger, better educated adults.) Since Kentucky in 1980 was suffering from lower educational levels overall, the 1990 results still showed the state lagging behind.

The salient feature in Table 3 is that Kentucky's percentage of adults completing four years of college or more was significantly lower than that for the comparison states in 1990, and in the 10-year period from 1980 to 1990, gains in this category were less than in the other three states. In 1990, only 13.6 percent of Kentuckians age 25 and over had completed four or more years of college, whereas this percentage ranged from 16.0 to 19.3 percent for the other states. The inference to be drawn on how this impacts the labor force is that the new replacements in the age 25 and over were not composed of college graduates at a rate comparable to that for new adults in the comparison states.

The increased participation of women in the Kentucky workforce is one reason, however, to concentrate on educational levels of Kentuckians by

gender. Here the evidence is also not in Kentucky's favor (see Table 4). The attainment of a four-year college degree by women in Kentucky has lagged behind that of men since at least 1980. In 1990, only 12.2 percent of adult women in the state held a college degree, versus 15.3 percent of men. The differences between men and women at other levels of educational attainment are insignificant, which makes the difference at the college graduate level more surprising. It is not known how this figure compares in other states. Its particular importance in Kentucky derives from the fact that the female labor force participation rate has climbed as rapidly as it has.

Conclusion

Kentucky's per capita personal income growth has not been strong enough in recent times to put the state on a path of permanent convergence toward the U.S. average. This analysis has uncovered evidence to suggest that this is due to a failure of average earnings to rise at a rate required to contribute to a convergence. Several possible explanations exist that can account for this shortcoming. The strongest case can be made that an increase in the labor force participation rate of females has kept earnings from rising as high as they might have otherwise. This may be due to the relatively low educational levels of the new female entrants. This new supply of labor available to work for lower wages has been able to fill the jobs opening in Kentucky without creating upward pressure on wage levels.

Since the labor force participation rate of females in Kentucky is still lower than the U.S. average or those of comparison states, this may suggest that further increases in employment may yet occur without seeing upward pressure on wages. Thus, Kentucky may see good employment gains in the near future, without similar gains in per capita personal income.

If this analysis is correct, it strongly suggests that the surest means to improve Kentucky's per capita income performance is to improve the educational attainment of its adult population. In particular, attention should be paid to improving the educational attainment of women in the Commonwealth, if all citizens are to share in improving economic fortunes.

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TABLE 4

Educational Attainment by Gender in Kentucky, 1980 and 1990

	Percent of Population Ages 25 and Over			
	Less than 9 Years	*High School Graduates*	*1 - 3 Years of College*	*4 or More Years of College*
Total				
1980	31.4%	53.1%	10.7%	11.1%
1990	19.0	64.6	19.2	13.6
Female				
1980	29.9	53.1	10.5	9.2
1990	18.2	65.0	19.8	12.2
Male				
1980	33.0	53.1	10.9	13.1
1990	19.8	64.2	18.5	15.3

Source: U.S. Bureau of the Census

The Retirement Behavior of Kentucky Families

Dan A. Black and *Amitabh Chandra*

By comparing the retirement behavior of married men to single men across different education levels and over time, we establish the following facts: First, the labor force participation (LFP) of older men across all education levels has been falling over time. Second, there have been significant declines in the LFP of the "younger old," those ages 55-61. This result holds up across different education levels, implying that it is not only the less-skilled workers who are retiring sooner. Third, the number of married households where only the husband works has been declining over time, whereas the number of married households where the wife works has been increasing over time. The retirement dynamics in Kentucky are similar to those for the U.S. but the magnitudes of the changes over time are larger in Kentucky than for the U.S.

Introduction

AN IMPORTANT ASPECT OF LABOR MARKET DYNAMICS IS the transition that workers make from employment to non-employment and vice versa. Many of these transitions are temporary in nature. For example, a worker may be laid off and experience a "spell" of unemployment before finding a new job. Alternatively, a homemaker may choose to work temporarily during the Christmas months to supplement family income. There are also labor market transitions that are more permanent: A young worker's decision to pursue additional schooling or pursue full-time employment will determine initial entry into the labor force. Perhaps the most pervasive example of a permanent labor market transition is the decision to retire, or permanently withdraw from the labor force.

The determinants of the retirement decision are complicated and depend on a number of variables. These factors may include the worker's age and health, availability of a pension plan, characteristics of his or her family (such as presence or absence of spouse), and overall economic conditions in the economy, such as employment opportunities for older workers or opportunities for workers with a specific type of skill. The growth of pension plans since World War II, the availability of partial Social Security benefits at age 62, and increased longevity among the aged have all contributed to the increase in early retirement. Over time the relative importance of these factors has changed, producing considerable variation in the retirement decisions made by families. To illuminate the effects of these variables on the retirement decision of Kentucky families, we provide the first systematic inquiry of retirement dynamics in the Commonwealth.

Our research has important implications. Since the late 1950's there has been a steady decline in the number of older men who work past age 55. If these trends persist as the baby boom generation begins to retire in 2005, policymakers will have to struggle with the twin problems of a shrinking tax base and expanding medical costs for the elderly.[1] Additionally, because the Social Security system is a quasi-"pay-as-you-go" system, a decline in the pool of productive workers as a consequence of early retirement will place considerable demands on the ability of younger workers to sustain the Social Security trust fund. Furthermore, the fewer remaining workers will each have to produce more to support current gross national product (GNP) levels. Furthermore, we can expect the industrial composition of the economy to change as it adjusts to the needs of an aging society. In Kentucky, the number of people over age 65 is projected to reach

610,000 by 2010 and will reach approximately 800,000 by 2020.[2] The change from 1990 - 2010 represents a 31 percent increase in population since 1990. To understand the magnitude of these future changes, it is instructive to examine the past behavior of retirement dynamics.

To pursue this analysis further, we conduct our study at three levels. First, we provide a brief overview of our data and methods. We present empirical evidence from the Current Population Survey (CPS) to document the retirement behavior of older Kentucky families over time. We provide comparisons with the rest of the United States to illustrate the extent to which trends in Kentucky are different from the national trends in the rest of the United States. We then use our data to identify the extent to which (relatively) increasing labor force participation (LFP) by older women has contributed to the decline in the LFP of their husbands. We compare changes in the LFP of older married men and older single men to isolate the extent of the "spouse effect" on the retirement decision. Throughout this paper we study changes in LFP across different education levels to assess the importance of the argument that the increase in early retirement has been driven by a reduction in employment opportunities for older workers. Finally, we conclude with a discussion of how the implications of our research can be used to formulate better public policy for Kentucky.

Data and Methods

In this paper we use data from the Current Population Survey (CPS). The CPS is a monthly survey of 60,000 households in almost 700 different geographic areas and is the official source of the U.S. government unemployment statistics.[3] Respondents to the CPS are included in the survey for four months, excluded for eight months, and then included again for four months. Questions pertaining to earnings and hours worked are asked of respondents in the "outgoing rotations," i.e., those workers at the end of their 4th and 16th months in the survey. The use of the CPS data allows for a year-to-year comparison of changes in the distribution of earnings and therefore allows for a much richer analysis than data obtained from the Census.

The CPS outgoing rotation data are available for the period 1979 - 1994 from the National Bureau of Economic Research (NBER). For each month of data during this period we selected only those observations where the husband was ages 55 to 65. We make this restriction because fewer than 10 percent of men over age 65 actually work.[4] Most of our analysis looks at retirement outcomes over three time periods: the first from 1979 - 82, the second from 1983 - 88, and the third from 1988 onward. Although it is possible to analyze monthly changes in the dynamics of retirement behavior with the outgoing rotations of the CPS, this addition adds little to our empirical findings.

Our method of analysis is essentially non-parametric in nature. That is, we examine the entire distribution of outcomes instead of restricting ourselves to looking at "average" values. This approach is powerful as it allows the researcher to study the outcome of a process (here, retirement behavior) without imposing assumptions on the underlying data-generating process, and it also lends itself to a graphical presentation of results.

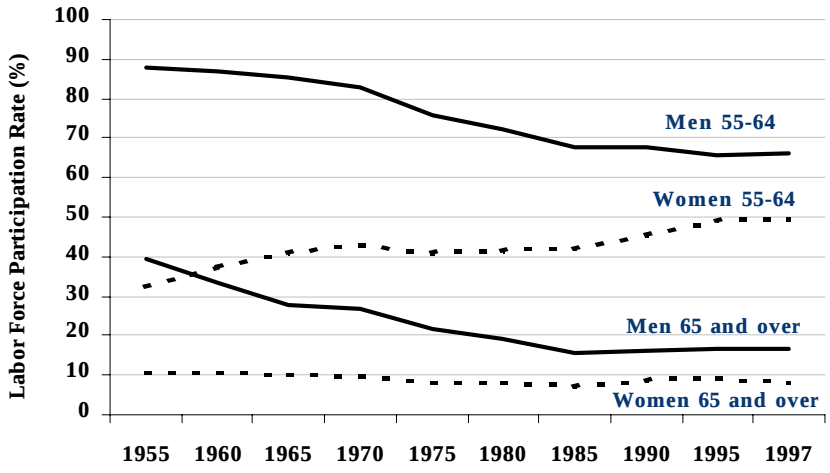
National and State Trends

The labor force participation rate (LFP) refers to the percentage of a population engaged in or seeking employment. We follow the U.S. Bureau of the Census in defining a person as being employed if he or she worked one hour or more for pay, or did 15 hours or more of unpaid work in a family business or farm. Therefore, if we want to calculate the LFP rate of men over age 55, we would add the number of such men who were employed as well as those who were actively seeking employment (the unemployed) and divide this sum by the total number of men over the age 55.

With these definitions in mind, in Figure 1 we illustrate changes in the participation rates of older men and women over time in the United States. Notice the striking decrease in the LFP of older men,

FIGURE 1

U.S. Labor Force Participation Rates by Gender, 1955 - 1997



especially those ages 55 to 64. Their LFP has fallen over 20 percentage points over the course of four decades, from about 88 percent in 1955 to 66 percent in 1997. The LFP rate of men over age 65 has fallen as well: its current level is one-half of the participation rate in 1960. Simultaneously, the LFP of women ages 55 to 64 has steadily increased over time—rising over 12 percent points from 1960 to 1997—whereas that for women ages 65 and over has remained relatively constant. The results from Figure 1 raise two immediate and interrelated questions:

- First, why has the LFP of older men declined over time, and are there systematic differences across education levels and marital status in the retirement behavior of older men?
- Second, to what extent can the decline in the LFP of older men be explained by the fact that their wives are working at higher ages? Do men with higher education levels respond differently to having a working spouse, being more or less likely to retire sooner?

In this section, we study the answers to these questions in greater detail. An answer to the first question will allow us to assess the importance of the argument that older men are withdrawing from the labor force because of reduced employment opportunities for older workers. The second question takes us to the heart of an important and difficult aspect of family decision making that has been unstudied in the economics literature. Theoretically, married older men with working wives are more likely to retire sooner than those without working wives because of a "wealth effect" resulting from the additional benefit of their spouse's income. On the other hand, men with working spouses may themselves be more educated and therefore less likely to retire if they have to forgo more earnings than less educated men.

We illustrate the differences between the U.S. and Kentucky in the labor force participation rates of older men (ages 55 and over) over time in Figure 2. In the U.S., the LFP of this group fell from an average of 68 percent in the years prior to 1983 to a little over 63.5 percent. Historically, the LFP of older men in Kentucky has been much lower than those for the U.S., and these differences have been exacerbated over time: participation rates for this group have fallen from about 63 percent to 55 percent in recent years. Older men in Kentucky are therefore about eight percent less likely to be in the labor force than other men of their age in the rest of the United States.

Differences by Education Level

In Figure 2 we collected data across all education levels to illustrate aggregate changes in LFP. It is possible, however, that there is considerable variation across education levels in the retirement decision. If men with lower schooling are finding employment opportunities less numerous, they may respond by withdrawing from the labor force completely. To examine the extent to which differences in LFP differ by education we present separate LFP rates by education level for the U.S. and

FIGURE 2

Labor Force Participation Rates for Men Ages 55-65

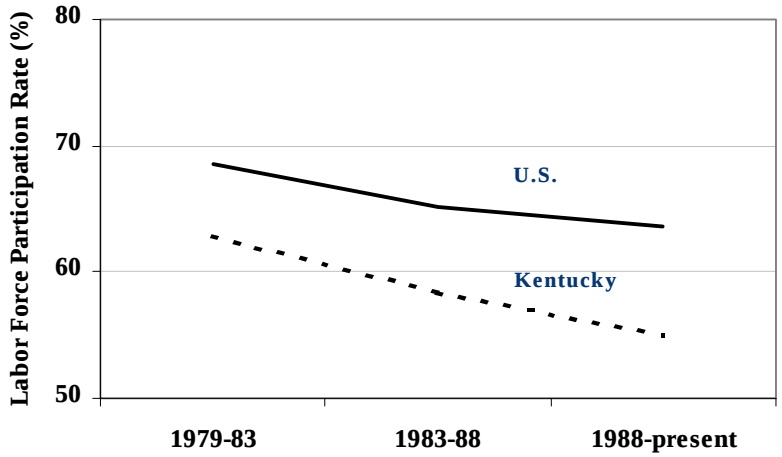
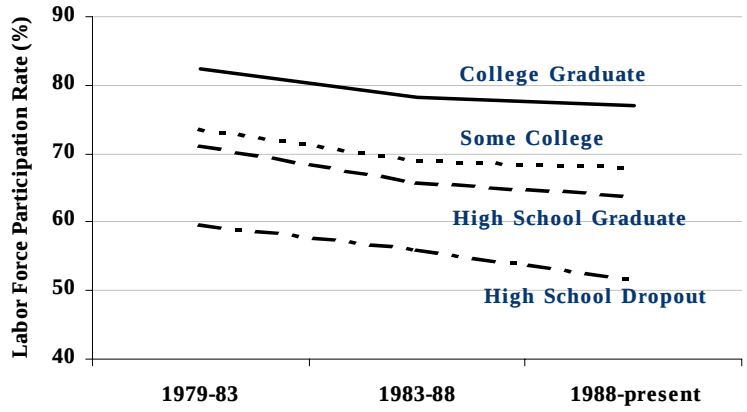


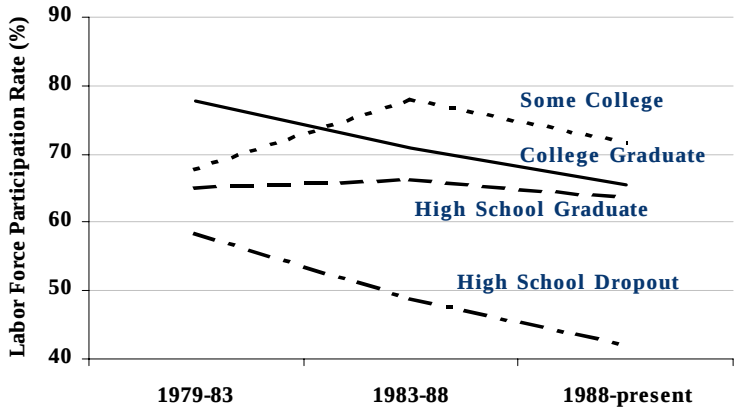
FIGURE 3

Labor Force Participation Rates of Men Ages 55-65 by Education Level

a.) United States



b.) Kentucky



Kentucky in Figures 3a and 3b. In both the United States and Kentucky there has been a decline in the LFP of men over age 55 across all education levels. This decline is more pronounced for high school dropouts, but there has been a substantial withdrawal from the labor force by men with college degrees as well.

In comparing the U.S. to Kentucky, we note that high school dropouts in Kentucky are almost 10 percent less likely to be participating in the labor force than other high school dropouts in the U.S. Surprisingly, during the 1979-83 period, the two groups had virtually identical participation levels. Another important finding is that college graduates in Kentucky during the 1979-83 period had participation rates similar to the national average. Over the course of a decade, however, their participation rates have fallen precipitously relative to the national average. This finding suggests that that the role of disability insurance (DI) has been overstated in the retirement literature. DI recipients are typically high school dropouts and high school graduates, and if DI were driving the empirical results of Figure 3, we would expect the bulk of the decline in male LFP to be limited to older men with low education levels. This is not the case: While the LFP rate for older men who were college graduates fell from 82.3 percent to 76.9 percent, the corresponding decline in Kentucky went from 77.7 percent to 65.6 percent.

Differences by Age

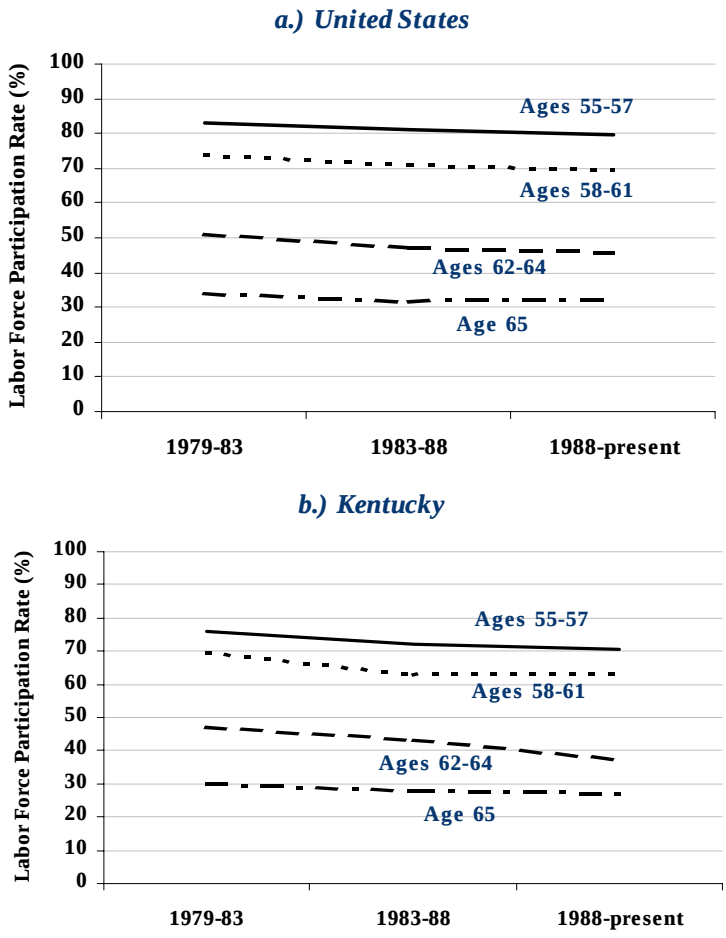
In the above analysis we have examined the retirement behavior of men between the ages of 55 and 65. But in doing so we have ignored any differences by age for men within this interval. Specifically, the participation rates of men fall with age—older men are less likely to be in the labor force. These results are not surprising because the availability of Social Security benefits at age 65 (with partial benefits at age 62) makes retirement more attractive at later ages within the 55 – 65 age group. Additionally, older men may be troubled by health problems more than relatively younger men, thereby inducing them to retire sooner. The availability of health insurance through Medicare after age 65 further reduces the incentives to work (insofar as a worker's job provides health insurance). To explore the age distribution of the retirement decision in further detail we compare the LFP rates of specific groups of older men in Figures 4a and 4b. In our graphs, we separate the retirement decision for men ages 55-57, 58-61, 62–64, and 65. We treat men of ages 62-64 and 65 as separate groups to isolate the effects of Social Security and Medicare on the participation decision.

Figures 4a and 4b illustrate a decreasing relationship between age and LFP. This result is true in a point in time and has strengthened over time. In Kentucky, men ages 55-61 have been withdrawing from the labor force faster than the corresponding trend for the U.S. For the U.S. and Kentucky, the participation rates for men ages 55-57 were 82.8 and 76.0 percent, respectively, during the 1979-83 period. In recent years, however, the LFP of this group of men has fallen by 3 percent to 79.8 percent nationally, whereas in Kentucky it has fallen almost 6 percent to 70.4 percent. The labor force withdrawal of Kentucky men ages 58-61 has also been faster than the corresponding decline for the national average, as has the decline in participation for men ages 62-64.

To summarize, in Kentucky older men have been withdrawing from the labor force earlier than ever before. This trend is similar to that observed for the rest of the United States but is far more pronounced in Kentucky. Our results document the increase in early retirement among older men across all education levels. In addition, we find that while the younger members of this age group (ages 55-57) reduced their labor force participation nationally by 3 percent, the corresponding decline in Kentucky was almost 6 percent.

FIGURE 4

Labor Force Participation of Older Males by Age Group



Retirement Behavior of Married Men

The preceding analysis has examined the retirement behavior of men over age 55. However, there is considerable variation in the marital status of these men. Many are married, whereas others are single (either unmarried, divorced, or widowed). As discussed previously, economic theory suggests that there should be differences in the LFP of men depending on their marital status. For example, men with spouses who work should retire sooner than those with non-working spouses, or for that matter, single men. This is because men typically marry women who are younger than them and therefore may be able to retire if their wives continue to work. This hypothesis is weakly confirmed by the data presented in Figure 1, where the LFP of women over age 55 has been steadily increasing over time. However, Figure 1 compares the LFP of older men with older women. It does not distinguish between married and single men, or those married men whose spouses work and do not work. A more robust test of this hypothesis would explicitly look at the retirement behavior of married men.

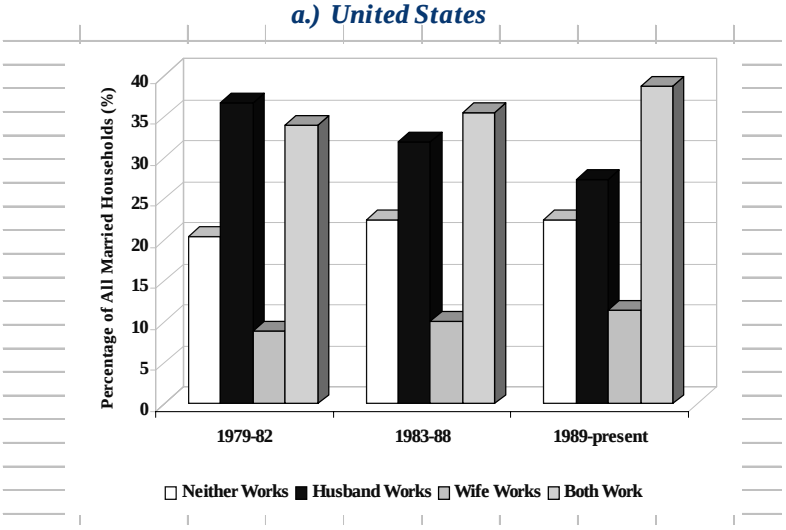
To explore this issue in more detail, we first restrict our sample to the set of married households. We then place each household into one of four categories: the first contains those households where neither spouse works, the second contains those households where only the husband works, the third contains those households in which only the wife works, and the fourth contains those households where both spouses work.

If our hypothesis about the increased labor force participation of (married) women is correct, then we should expect an increase in the number of type three households (only the wife works), and a decline in the number of type two households (only the husband works). Indeed, as Figures 5a (U.S.) and 5b (Kentucky) illustrate, this is exactly what has happened. The two charts in Figure 5 illustrate the composition of married households for the three time periods under study. Notice that the fraction of households where only the husband works has been falling over time, whereas the fraction of married households where only the wife works has been increasing over time.

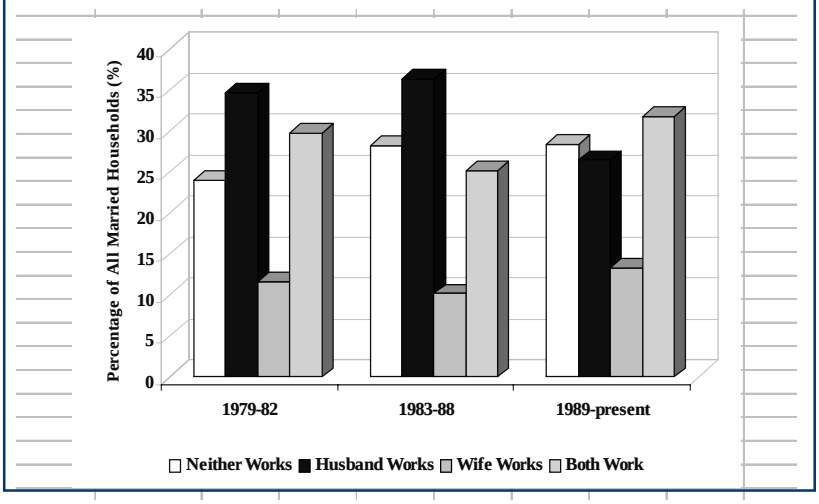
FIGURE 5

Changes in the Labor Force Participation of Married Households

a.) United States



b.) Kentucky



When we replicate this exercise for Kentucky in Figure 5b, we obtain similar results. The fraction of married households with only the husband working has fallen by over eight percent, whereas the number of households where only the wife works has increased by a little less than two percent. In Kentucky, we also obtain the surprising result that in recent years (after 1988) the fraction of households where only the wife works is larger than the corresponding fraction for the United States—the difference is almost two percent. As Figures 5a and 5b illustrate, the proportion of these households (where only the wife works) has also been historically higher in Kentucky than in the United States. One possible explanation is the relatively high incidence of black-lung disease among older Kentucky men, which lowers their labor force participation.

To explore the dynamics of the retirement decision for married households in further detail, we now ask whether the patterns exhibited in Figures 5a and 5b are true across all education levels. Specifically, is it the case that the fraction of households where only the husband works has been declining over time even when we control for the husband's education level? In other words, is the observed pattern of the husband withdrawing from the labor force while his wife works true for husbands with different levels of education? An answer to this question will help isolate the extent to which the trends discussed in Figures 1 and 2 stem from declining job-opportunities for older workers who are low-skilled, or whether the decline in the LFP of older men is part of a secular trend.

In Table 1 we compare the distribution of older married households over time by education level of the husband. We immediately notice the reduction in the fraction of households where only the husband works over time. This trend is true at higher levels of education as well. For example, the fraction of such households has fallen 13 percent for families where the husband had completed college. There was a corresponding increase of over seven percent in the number of households where only the wife works.

These findings suggest that the decreased labor force participation of married older men is not a function of skill-augmenting technological change. If it were, then we should observe older male high school dropouts to be withdrawing from the labor force faster than male college graduates. However, the fact that the decrease in the LFP of older men who are college graduates is decreasing faster than that of those who are high school dropouts and high

TABLE 1

Percentage of Married Households by Education Level of Husband

	United States					*Kentucky*				
	Neither Works	Husband Works	Wife Works	Both Work	Total	Neither Works	Husband Works	Wife Works	Both Work	Total
Husband is a high school dropout						***Husband is a high school dropout***				
1979-82	26.0%	33.7%	11.6%	28.6%	100%	**1979-82**	26.7%	33.4%	13.2%	26.8%	100%
1983-88	27.8	30.6	13.0	28.6	100	**1983-88**	32.6	32.6	13.7	21.2	100
1989-present	30.1	26.4	15.1	28.4	100	**1989-present**	36.8	20.6	17.2	25.4	100
Husband is a high school graduate						***Husband is a high school graduate***				
1979-82	19.1	36.7	8.2	36.0	100	**1979-82**	24.5	35.8	9.5	30.2	100
1983-88	22.5	31.8	10.0	35.7	100	**1983-88**	25.9	42.0	6.9	25.3	100
1989-present	22.3	27.2	11.7	38.8	100	**1989-present**	23.5	29.2	10.7	36.6	100
Husband has some college						***Husband has some college***				
1979-82	17.6	37.4	7.5	37.6	100	**1979-82**	18.4	40.4	12.8	28.4	100
1983-88	20.0	30.8	9.4	39.8	100	**1983-88**	15.7	37.1	5.7	41.4	100
1989-present	19.9	26.2	10.5	43.4	100	**1989-present**	13.6	31.8	14.4	40.2	100
Husband has completed college						***Husband has completed college***				
1979-82	12.0	43.5	4.9	39.6	100	**1979-82**	13.0	33.8	7.8	45.5	100
1983-88	15.0	35.4	5.7	43.8	100	**1983-88**	23.3	38.0	6.2	32.6	100
1989-present	15.4	30.5	7.2	46.9	100	**1989-present**	29.1	33.0	4.9	33.0	100

school graduates suggests that skill-augmenting technological changes have not played an important role in the retirement decision.

Comparison with Single Men

As a final test of our hypothesis that the increased LFP of women has contributed to a decline in the LFP of older men, we compare the results of the preceding two sections with the retirement behavior of single men. We use single men as a quasi-control group in this study because there is no "spouse effect" on their retirement decision. If our premise is correct, we would not expect significant declines in the retirement behavior of single men. We call this group a quasi-control group because single men may be different from married men in ways that are observable as well as unobservable. They are different insofar as they are unmarried, but they may also have different characteristics in terms of education levels and health status.

In Figure 6 we compare the LFP of older single men in the United States and Kentucky. In the U.S. the labor force participation of this group has fallen three percent, whereas in Kentucky the decline has been over 16 percent. To determine the relationship between education and retirement we examine changes in the LFP of single men by education level in Figures 7a and 7b. For the U.S. we see substantial declines in the LFP of single men who are high school dropouts and high school

FIGURE 6

Labor Force Participation of Older Males in Kentucky and the U.S.

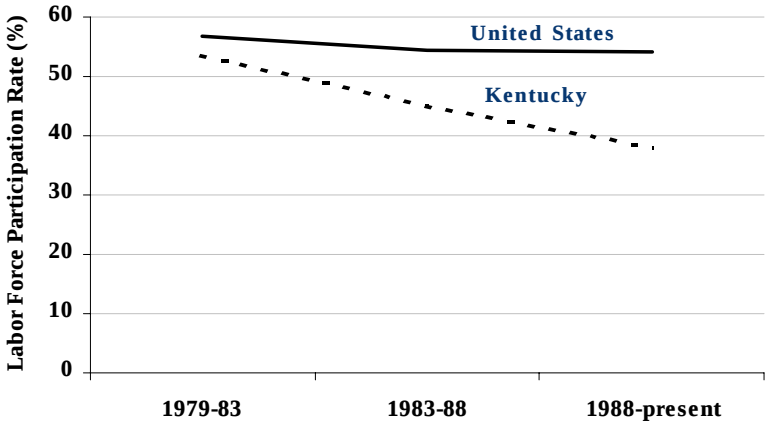
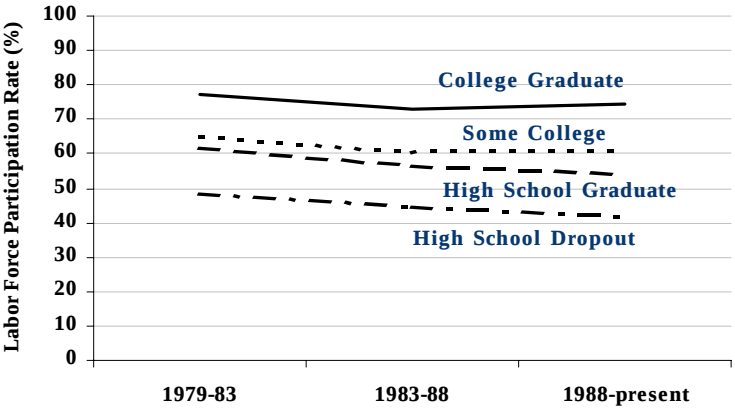


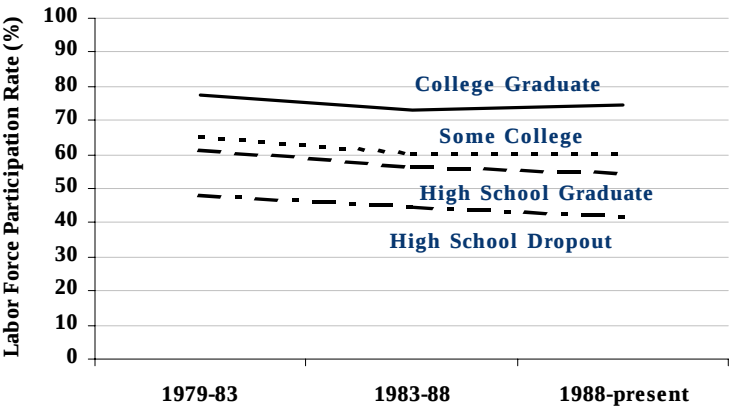
FIGURE 7

Labor Force Participation of Older Males by Age Group

a.) United States



b.) Kentucky



graduates—both groups reduced their participation by approximately seven percent over the decade. The decline in participation rates for single men who were college graduates was small, and their LFP rates fell three percent from 1979-83 to recent years. In Kentucky however, a different story emerges. There was a 25 percent decline in the LFP of high-school dropouts and a 10 percent decline in that of high-school graduates.

Conclusion

In this paper we have examined the dynamics of family retirement decisions for older households. By comparing the retirement behavior of married men to single men, across different education levels and over time, we have established the following facts. First, the LFP of older men across all education levels has been falling over time. Second, there have been significant declines in the LFP of the "younger old," those ages 55-61. This result holds up across different education levels, implying that it is not only the less-skilled workers who are retiring sooner. Third, the number of married households where only the husband works has been declining over time, whereas the number of married households where the wife works has been increasing over time. This result also holds up across different education levels. Finally, in comparing the United States to Kentucky we note that retirement dynamics in Kentucky mirror those for the United States but with larger magnitudes.

Endnotes

1 We are not arguing that early retirement implies health problems for the elderly. Instead, our point is that the elderly will have health problems regardless of retirement status, but early retirement (in an already aging society) reduces the size of the tax base that pays for treatment costs.

2 Kentucky State Data Center, 1996.

3 For a detailed description of the CPS and related terminology see the U.S. Department of Labor, (1992). *Bureau of Labor Statistics (BLS) Handbook of Methods*, Bulletin 2414.

4 In related research we study the dynamics of the retirement decision in the United States up to the age of 75, using data from the March CPS which covers the time period 1964-97. See Berger, Mark C., Black, Dan A., Chandra, Amitabh, and Scott, Frank A. (1997). "The Dynamics of Family Retirement Decisions," Department of Economics, University of Kentucky. Mimeo.

The Changing Market for Electricity in Kentucky

Frank A. Scott

The electric power industry is currently undergoing some dramatic changes. Regulatory and technological changes have paved the way for competition in the generation of electricity. In the future, residential, commercial, and industrial customers will be able to choose their energy supplier. This study analyzes what a competitive market for electric energy would look like in a twenty-state region surrounding Kentucky. From supply and demand analysis, the short-run price of electric power is predicted to be 2.1 cents per kilowatthour. The long-run price is predicted to be 3.0 cents per kilowatthour. The actual price paid by consumers would be higher because it would include transmission and distribution costs as well.

Introduction

Electricity in the United States is supplied by for-profit investor-owned companies, not-for-profit cooperatives, and government agencies. The large majority of customers are served by the first category, investor-owned utilities. These companies traditionally have been granted a monopoly in their service areas, and at the same time have ceded pricing authority to state regulators. The typical electric utility is vertically integrated, carrying out the generation, transmission, and distribution functions itself.

Regulation of electric utilities has traditionally been carried out at the state level by public utility commissions, with a lesser role for the federal government through various federal agencies. While other regulated industries have one by one been exposed to competitive reform, electric power has remained the last great monopoly. That is about to change, because the electric power industry is currently undergoing some fairly dramatic changes. A number of states have initiated regulatory reform, and Congress and the U.S. Department of Energy are also playing significant roles.

Much of the economic impetus for deregulation comes from technological changes in the generation of electricity. The production technology of the 1960's and 1970's dictated larger and larger conventional steam plants. The generation of electricity, because of the considerable economies of scale, was thought to have natural monopoly characteristics. Recent developments in electricity production have reversed that thinking. Smaller generating units using jet aircraft engine technologies are proving to be more and more cost competitive with large plants using conventional steam technology.

Along with changes in technology, regulatory changes have also paved the way for competition in the generation of electricity. The Public Utilities Regulatory Policies Act of 1978 opened the door for electricity producers using alternative technologies to sell their power into the existing transmission and distribution grid. The Energy Policy Act of 1992 further opened up the generation of electricity of non-utility producers. The Federal Energy Regulatory Commission has also promoted competition for wholesale power by requiring utilities to act as common carriers and open up their transmission lines to other power producers.

The upshot is that the marketplace for electricity is changing. In the future, electric utilities will be competing with one another for large industrial customers. Smaller commercial and residential customers will be able to choose their electricity

supplier as well. There is general agreement among industry insiders and experts that such changes are coming. The major uncertainty thus is not what the marketplace for electricity will look like in ten or fifteen years, but how the transition from regulated monopoly to open competition will be accomplished in the next five to ten years.

The purpose of this paper is to evaluate the changing market for electricity in Kentucky. That requires an economic analysis of the electric utility industry as it currently exists in the state and the surrounding region, including characteristics of electricity producers and characteristics of major classes of customers.

Economic Analysis of Electricity Supply

The first step in understanding what competition might look like in the electric utility industry is to analyze electricity supply. Electricity is currently supplied to customers in Kentucky by a combination of investor-owned utilities, rural electric cooperatives (coops), municipal utilities, and the Federal Government. There are four major investor-owned utilities (IOU's) in the state, Kentucky Power Company (a subsidiary of American Electric Power Company [AEP]); Union Light, Heat and Power Company (a subsidiary of Cinergy Corporation); Kentucky Utilities Company (KU), and Louisville Gas and Electric Company (LG&E). A proposed merger between KU and LG&E, if approved, will reduce that number to three. There are two rural electric cooperative generation and transmission companies and 27 rural electric cooperative distribution companies. Thirty municipal utilities distribute electricity, and three of those 30 also generate power. The Tennessee Valley Authority (TVA) owns and operates generating units within Kentucky, and its distribution territory extends into several of the counties along the Tennessee border.

While it is worthwhile to consider the production of electricity within Kentucky, a complete understanding of electricity supply requires an analysis of producers in the surrounding region. The legal borders of states have steadily shrinking economic significance for the supply of electricity. Electric utilities buy and sell power across a wide territory in their hourly task of supplying electricity to their customers. Kentucky producers already compete with producers far removed from Kentucky in the market for wholesale power. For that reason we turn next to a regional analysis of electricity supply.

Producers who are sensitive to one another's prices and compete with one another are normally considered to be in the same economic market. That is how one defines the geographic boundaries of a market. This analysis thus includes nineteen states surrounding Kentucky. The states are Alabama, Arkansas, Georgia, Illinois, Indiana, Iowa, Maryland, Michigan, Minnesota, Mississippi, Missouri, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia, West Virginia, and Wisconsin. These states were selected because they are in the same reliability council as Kentucky or are in adjoining reliability councils.[1]

In 1994 there were 729 utility-owned power plants operating in these twenty states that had a capacity rating of 25 megawatts or greater. As of January 1, 1996, the nameplate rating of existing capacity owned and operated by electric utilities in this region was 378,214 megawatts. Kentucky's share of that total capacity was 4.6 percent. Fourteen of the twenty states rely primarily on coal for electricity production. Only Arkansas, Illinois, Maryland, Mississippi, South Carolina, and Virginia have less than 50 percent of installed capacity in coal-fired units, and only in Mississippi (natural gas) and South Carolina (nuclear) are other energy sources more prevalent than coal. Nuclear units do comprise a significant (20 percent or greater) proportion of the generating capacity in Alabama, Illinois, North Carolina, Pennsylvania, South Carolina, and Virginia. Gas units account for twenty percent or more of the capacity in only Arkansas and Maryland, and only Tennessee and Virginia have twenty percent or more in hydroelectric units.[2]

Electric power generators in the twenty-state region produced 1,728.3 billion kWh of electricity in

TABLE 1

Electric Power Industry Generation by State, 1995

	(Billions of Kilowatthours)		
	Utility	*Nonutility*	*Total*
Pennsylvania	168.9	17.5	186.4
Illinois	145.2	4.0	149.1
Ohio	137.9	1.6	139.4
Indiana	105.2	4.3	109.5
Georgia	102.0	6.3	108.3
Michigan	92.5	15.6	108.1
North Carolina	96.1	10.8	106.9
Alabama	99.6	6.3	105.9
Kentucky	86.2	*	86.2
Tennessee	82.3	3.6	85.9
South Carolina	78.4	2.6	81.1
West Virginia	77.3	3.4	80.7
Missouri	65.4	0.3	65.7
Virginia	52.7	10.8	63.6
Wisconsin	51.0	3.1	54.1
Maryland	44.7	1.8	46.4
Minnesota	42.5	2.8	45.3
Arkansas	39.5	2.6	42.1
Iowa	33.5	1.2	34.7
Mississippi	26.4	2.8	29.2
Region	1,627.1	101.2	1,728.3
United States	2,994.5	374.4	3,369.0

* = Number less than 0.05 rounded to zero.
Source: Utility Generation: Energy Information Administration, *Electric Power Annual 1995*, Volume 1, DOE/EIA-0348(95)/1 (Washington, DC, July 1996), Table 9. Nonutility Generation: Energy Information Administration, *Electric Power Annual 1995*, Volume II, DOE/EIA-0348(95)/2 (Washington, DC, December 1996), Tables 58 and 59.

1995, or 51.3 percent of the nation's total output. Of that, 1,627.1 billion kWh (94.1 percent) came from utilities while only 101.2 billion kWh (5.9 percent) came from nonutility sources. Nonutility generators are much more significant in other regions of the country, accounting for 11.1 percent of the total national output. The nonutility shares of production in the New England, Middle Atlantic, and Pacific Contiguous regions were 27.9 percent, 19.0 percent, and 21.3 percent, respectively.

Kentucky utilities generated 86.2 billion kWh in 1995, and only a negligible portion of that came from nonutility sources. That was 5.0 percent of the regional output, and 2.6 percent of the nation's output. By way of contrast, Kentucky has only 1.5 percent of the nation's population. Table 1 contains information on state-by-state electric power production in 1995.

The major owners of generating facilities in the state—AEP, Cinergy, KU, LG&E, TVA, Big Rivers, and East Kentucky Power—are all interconnected to each other's transmission systems. Each owns transmission lines that are used for transmitting their own power from generating units to distribution points. To one degree or another, each of these utilities also wheels wholesale power across its transmission lines as part of the regional transmission grid. AEP has the most extensive transmission network of the four IOU's in the state, given that it serves a wide geographic area in Kentucky and surrounding states.

AEP, Cinergy, KU, LG&E, and East Kentucky Power are all participating in discussions to form an independent system operator (ISO) that would coordinate transmission of power and facilitate competition in the regional wholesale market in the Midwest. Negotiations to create a regional ISO are currently underway. It would behave as a single control area for transmission service purposes.

Economic Analysis of Electricity Demand

The buyer side of the electric utility industry in Kentucky is substantial and diverse. Total sales of electricity to final users in 1995 were 65.6 billion kilowatthours. Investor-owned utilities are the largest supplier of electricity, providing over 52 percent of the electricity sold in Kentucky in 1995. IOU's provide the largest share of sales to all categories of customers, be it residential, commercial, or industrial.

The majority of electric power (rather than revenue) of utilities in Kentucky is sold to industrial customers. As seen in Table 2, industrial customers in 1995 bought 48 percent of electric output, residential customers bought 31 percent of output,

commercial customers bought 16 percent of output, and the remaining 5 percent of output went to other customers, such as lighting for highways. Relative to these overall averages, sales by investor-owned utilities are relatively concentrated towards commercial customers and sales by coops are relatively concentrated towards residential customers.

TABLE 2

Share of Electric Sales in Kentucky by Customer Class, 1995

Type of Utility	*Total Sales* (Billions of kWh)	*Share by Customer Class* Residential	Commercial	Industrial
Investor-Owned	33.8	34%	24%	34%
Rural Electric Cooperative	18.2	40%	8%	51%
Municipal	5.7	31%	16%	51%
Federal	7.9	0%	0%	99%
Total	65.6	31%	16%	48%

Source: Energy Information Administration, U.S. Department of Energy. *Electric Sales and Revenue: 1995* (December 1996).

The price paid for electricity varies with each customer's level of consumption. However, one useful way to examine price is to look at the average sales revenue per kWh sold, which is an average price. In Kentucky, the average revenue per kWh of electricity sold is 4.38 cents.[3] This overall average, naturally, reflects the different average prices paid by different classes of customers at each separate utility. In general, industrial customers pay the lowest rates. The average revenue per kWh for industrial customers in Kentucky is 3.25 cents. The average revenue per kWh is 5.25 cents for commercial customers and 5.62 cents for residential customers, respectively.[4]

Among different types of utilities, customers of investor-owned utilities pay the lowest rates on average. As can be seen in Table 3, this was true of residential class customers. In 1995, residential customers of investor-owned utilities paid on average 1.0 cent per kWh less than residential customers of rural electric cooperatives, and 0.3 cents less than residential customers of municipal utilities.

Just as with supply, it is appropriate to evaluate demand over a wider region than just Kentucky. Unsurprisingly, a large volume of sales occur within this wider region. Total annual sales in 1995 of electricity to final customers in the wider region were 1,524.7 billion kWh. In the region, investor-owned utilities account for an even larger share of final sales than in Kentucky. As can be seen in Table 4, IOU's in 1995 accounted for 77% of final sales to customers in the region, relative to 52% in Kentucky. Rural electric cooperatives accounted for 10% of final sales, and municipal utilities accounted for 11%. Utilities operated by federal or state utilities accounted for 2% of final sales within the region.[5] IOU's provide the majority of sales in the region to all categories of customers: residential, commercial, and industrial. Relative to Kentucky, sales in the twenty-state region are more evenly divided

TABLE 3

Average Revenue per kWh in Kentucky by Customer Class, 1995

Type of Utility	*Customer Class (cents per kWh)* Residential	Commercial	Industrial	All Customers
Investor-Owned	5.22	5.08	3.53	4.56
Rural Electric Cooperative	6.28	6.31	3.44	4.84
Municipal	5.52	5.08	4.50	4.91
Federal	-	-	2.17	2.18
All Customers	5.62	5.25	3.25	4.38

Source: Energy Information Administration, U.S. Department of Energy. *Electric Sales and Revenue: 1995* (December 1996).

TABLE 4

Share of Electric Sales in Kentucky and the Twenty-State Region, 1995

Type of Utility	*Kentucky* Sales (Billions kWh)	Percent	*Twenty-State Region* Sales (Billions kWh)	Percent
Investor-Owned	33.8	52%	1,169.3	77%
Rural Electric Cooperative	18.2	28	155.2	10
Municipal	5.7	9	167.3	11
Federal	7.9	12	32.3	2
Total	65.6	100	1,524.7	100

Source: Energy Information Administration, U.S. Department of Energy. *Electric Sales and Revenue: 1995* (December 1996).

among residential, commercial, and industrial sectors. In Kentucky, the proportion of final sales made to industrial customers was 48%. As is seen in Table 5, 39% of final sales in the region are made to industrial customers. The share of sales made to residential customers is 34%, and the share to the commercial customers is 25%. The remaining 2% of sales go to other final customers, such as lighting for highways. The sales of investor-owned utilities and municipal utilities roughly match these overall sales figures. However, the sales of rural cooperative utilities are skewed towards residential customers, with 62% of final sales going to residential customers.

The average revenue per kWh of electricity sold in the twenty-state region is 6.30 cents. The average revenue per kWh for industrial customers is 4.45 cents. The average revenue per kWh is 6.98 cents for commercial customers and 7.88 cents for residential customers.

To compare different types of utilities in the region, it is useful to look at the average revenue per kWh for IOU's, coops, and municipals within each state. Average revenue per kWh across all classes of customers is lowest for municipal utilities in thirteen of the states, and for investor-owned utilities in the other seven states. Within this twenty-state region, Kentucky has the lowest rates for electricity. This result is not surprising since Kentucky has the second lowest electricity rates in the country. Along with Kentucky, several other states, including Tennessee, West Virginia, Alabama, Indiana, and Wisconsin have relatively low average rates. States with high rates within the region include Illinois, Michigan, and Pennsylvania.

A Competitive Market for Electricity

The electric utility industry is undergoing a transformation. By the end of the next decade the electric utility industry will be characterized by full consumer choice at the retail level, very much like the market for long-distance telephone service today. Access to the power network will be provided by a local "wire service" monopoly, similar to the role

TABLE 5

Share of Electric Sales in the Region by Customer Class, 1995

Type of Utility	*Total Sales* (Billions of kWh)	*Share by Customer Class* Residential	Commercial	Industrial
Investor-Owned	1,169.3	31%	28%	39%
Rural Electric Cooperative	155.2	62	12	24
Municipal	167.3	35	20	43
Federal	32.3	4	4	90
Total	1,524.7	34%	25%	39%

Source: Energy Information Administration, U.S. Department of Energy. *Electric Sales and Revenue: 1995* (December 1996).

currently played by local telephone service companies. The local utility will own and maintain the distribution network, and likely handle billing and many other customer service functions. Transmission lines will continue to be owned and maintained by electric utility companies, but a regional independent system operator will handle operation and access to the transmission grid. Utilities, power marketers, independent power producers, and other entities will compete for the business of supplying electrical energy over the transmission and distribution grid to residential, commercial, and industrial customers.

How we get to this end result is another matter. What happens in the transition period will depend very much on what state and federal legislators and regulators do to facilitate or impede change. In this section we analyze the developing competitive market for electricity. We first discuss what can be anticipated to happen in the short run if Kentucky adopts a stance of facilitating change. Then we discuss what the world will look like after the transition when a new long-run equilibrium state is reached.

Short-Run Adjustments

In a competitive market the short-run price of the product is determined by the interaction of market demand and supply. The demand curve represents the consumption behavior of buyers of the product, while the supply curve represents the production behavior of sellers of the product. The equilibrium price is determined by the intersection of supply and demand, because consumers will want to buy exactly as much electricity as producers want to sell at that price.

The short-run demand for electricity is heavily influenced by equipment choices that households and firms have made in the past. In deciding how much power to use, residential consumers are constrained by their existing stock of household appliances, heating and cooling systems, and behavior patterns. Commercial customers are similarly constrained by their lighting, heating, and cooling systems, and by the existing stock of other electrical devices. Industrial customers are constrained by production processes they have implemented and by machinery and equipment that they have installed. The result is that short-run demand for electricity tends to be inelastic. In other words, the consumption decisions of electricity customers tend to be insensitive to changes in the price of electricity in the short run.

The short-run supply for electricity is determined largely by utilities' historical investments in generating units. In understanding short-run supply it is important to recognize the putty-clay nature of the technology of producing electricity. There is considerable flexibility at the design stage—capacity, fuel type, and a host of other factors can be varied. Once in place, however, generating assets usually can be modified only at considerable expense. Since a generating unit has no practical alternative use besides producing electricity, most if not all of the capital investment thus is a sunk cost and cannot be recovered.

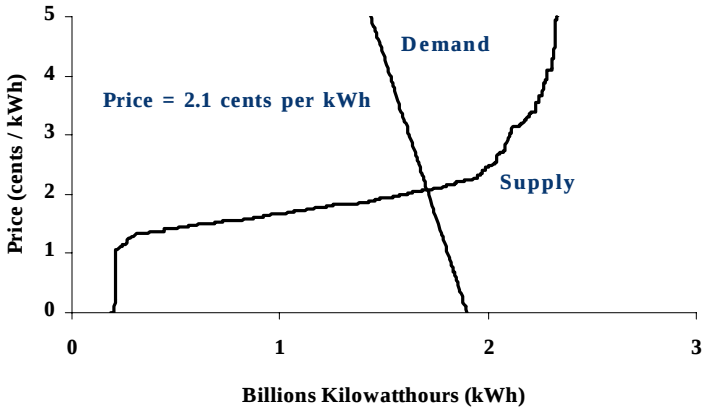
A well-known rule of business decision-making is that sunk costs are irrelevant to current production decisions. Whether a physical asset is used to produce electricity in the short run thus depends on its current fuel, operating, and maintenance costs, and not on its historical capital costs. If the electricity produced by a plant can be sold at a price that at least covers the variable costs of generation, then that plant will be operated in the short run.

What this means for short-run market supply is that the supply curve will resemble a stair-step function. As the price at which electricity can be sold increases, more and more generating units can profitably produce power. If the price of electricity is very low, only a handful of very efficient plants will be turned on and their power offered for sale. If the price of electricity is high enough, even very old and very inefficient plants will be taken out of mothballs and brought on line.

If the market for electricity is opened up to competition, then the price of electricity will be determined by the forces of demand and supply. In the near term, depending on how quickly

FIGURE 1

Short-Run Price for Electricity



competitive forces are allowed to come into play, the price will be set by the interaction of short-run demand and short-run supply. Using the information on current consumption behavior by residential, commercial, and industrial customers in the twenty-state region, we have simulated the short-run market demand for electricity.[6] Using information on variable production costs of the electric generating units in the same twenty-state region, we have simulated the short-run market supply for electricity as well.[7]

Figure 1 illustrates the projection of short-run supply and demand. The projected average short-run price of electric power in the regional market is 2.1 cents per kWh.[8] This is an estimate of the average price across all utilities and customer classes in the region over the course of an entire year, but its validity is supported by the fact that current transactions in the regional wholesale power market occur at prices in this range or lower. In a competitive market, the variability of the customer's electricity usage will affect the costs that the customer imposes on the generating system. Customers with constant power usage thus may pay less than 2.1 cents per kWh for their electric energy while customers with highly variable power usage may pay more. To obtain an estimate of the price that end users of electricity will likely pay, one must add transmission, distribution, and any relevant administrative costs, plus taxes and any other charges that regulators might tack on to the consumer's bill. Even with these add-ons, it is very likely that the typical electricity customer in Kentucky will see their electric bill fall in the short run.

Based on the short-run elasticity for all customers and an average power charge for electricity of 2.1 cents per kWh, the short-run increase in consumption can be estimated for the twenty-state region. For such an estimate, we also require information on the average cost per kWh for transmission, distribution, and taxes. We have two different sources for such information. From a 1997 report by the Energy Information Administration, we estimate an average charge of 2.0 cents per kWh charge for transmission, distribution, and taxes.[9] This figure is based on a nationally representative sample, and will not necessarily apply to any particular utility or customers class in Kentucky or others states in the region. Based on this estimate, the total increase in consumption in the short run is estimated to be 8.8% for the region. Using another source, White (1996), we estimate the national average transmission, distribution, and tax costs per kWh for investor-owned utilities to be 1.1 cents.[10] Based on this transmission, distribution, and tax cost, the total increase in consumption in the short run is estimated to be 13.4% for the region.

With a decline in price there will be a short-run increase in electricity consumption in the twenty-state region. Lower electricity prices are one obvious benefit to electricity consumers. In addition, greater consumption of electricity will benefit industries that supply the resources used to produce electricity. Since many of the generating units in the region are coal-fired, and since the projected useful lives of many of these base-load coal-fired plants extend twenty or more years into the future, the increase in electricity consumption will lead to an increase in the demand for coal. This will be an additional benefit of deregulation in states such as Kentucky which have relatively large coal industries.

Long-Run Equilibrium

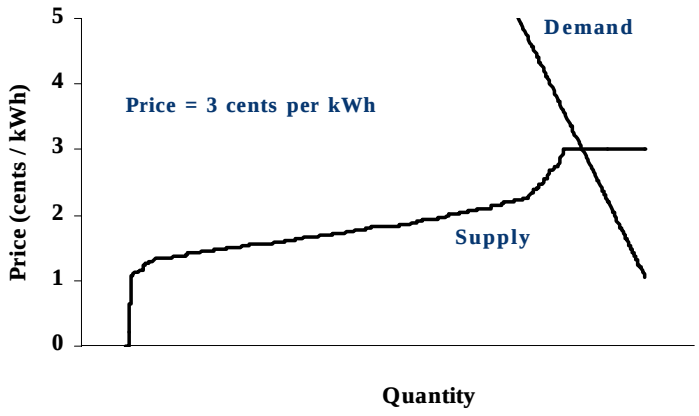
The level toward which price will tend to move in the future is known as the long-run equilibrium price. In a competitive market the long-run equilibrium price is determined by the lowest possible average total cost of producing the product. Competition among producers will force inefficient producers out of the market. The only firms that will survive are those that produce the product as cheaply as is possible, given the state of technology and the prices of inputs. Competition among firms to win the patronage of customers will drive the price down to the level of minimum average total cost. While short-run disruptions in supply or demand may cause the price to deviate temporarily from the long-run equilibrium level, the expected level of the price in a competitive industry is determined by the minimum long-run average total cost.

In the long run, the demand for electricity can be expected to increase in response to lower prices. Household and business users of electricity will change the types of appliances, heating and cooling systems, lighting, and machinery and equipment they use as existing stocks wear out. Households will change their behavior and businesses will change their production processes in response to lower electric rates. For these reasons the long-run demand for electricity is more elastic, i.e., more sensitive to price, than is short-run demand. Even though consumers will demand more electricity in response to lower rates as more and more time passes, the expected long-run price of electricity will still be determined primarily by cost factors. That is because producers, given sufficient time to adjust, will build whatever generating capacity it takes to satisfy consumer demand.

Figure 2 illustrates the expected long-run outcome in the electric utility industry. The long-run demand curve incorporates greater responsiveness to changes in price than is possible in the short run.[11] The period of eight years is roughly the time it would take to reach the long-run demand response. The long-run supply curve indicates that the cost of generating electricity using the most up-to-date technology available is the determining influence on market price. The long-run supply curve embodies the notion that long-run expansions in industry output will be accomplished by building new generating units using the most economically efficient methods possible. The expected long-run price of electricity will be determined by the intersection of long-run supply and demand, as is shown in Figure 2. The estimated long-run equilibrium price of electric power is three cents per kilowatthour. Again, this is an estimated average price across all utilities and customer classes in the region over the course of an entire year. This long-run equilibrium is reached because at the same time that demand is increasing, the upward sloping portion of the industry supply curve will be decreasing (or shifting to the left). That will happen because each year some existing generating units become uneconomical to operate and are retired. How long it takes for long-run demand to intersect with long-run supply in the horizontal portion of the long-run supply curve thus depends on the decisions that utilities will make about renovating or retiring existing generating units in a deregulated environment.

FIGURE 2

Long-Run Price for Electricity



At some point in the future, long-run equilibrium will therefore be reached at 3.0 cents per kWh for electric power. Under this long-run scenario, the total increase in consumption will be 14.8% for the region using 2.0 cents per kWh for transmission,

distribution, and tax costs. Using 1.1 cents per kWh for transmission, distribution, and tax costs, the total increase in consumption in the region will be 31.2%.

Since the notion of long-run average cost plays such an important role in the determination of expected long-run price, it is worthwhile to discuss the long-run average cost curve for electricity in more detail. Recent advances in the technology of generating electricity have made gas-fired combined cycle units cheaper than the alternatives if one is building new generating capacity from scratch. The latest combined cycle plants have heat efficiency rates in the 55 to 60 percent range. Current estimates put the average total cost of generating electricity using a modern combined cycle gas-fired unit in the range of three cents per kWh.[12] This figure includes capital costs as well as all fuel, operation, and maintenance costs. This means that a firm can plan, design, build, and operate one of the new combined cycle gas-fired plants and make a normal economic profit if the electric power can be sold for as little as three cents per kWh.

In understanding the long-run adjustments that will occur as the market for generating electricity is opened to competition, two other points are important. First, economies of scale are not nearly so important with gas turbine technology as is the case with nuclear and coal-fired generating units. This means that smaller scale generating units are just as cost effective as larger units.[13] Non-utility generators will be able to build merchant power plants and enter the competitive wholesale electric power market on a small scale, which makes investing in such a venture a much less risky proposition. Second, the length of time that it takes to design and build a new electric plant has been dramatically shortened. Some construction companies claim to be able to complete construction and start producing electricity in less than two years for a combined cycle gas-fired plant.[14] This means that even if the short-run price of electric power, net of transmission and distribution charges, were to exceed three cents per kWh, it would not remain there for long. Both existing firms and new entrants to the industry would find it profitable to build new generating capacity, and that capacity could be brought on line in less than two years. That makes the adjustment from short-run disequilibrium (price greater than three cents) to long-run equilibrium (price equal to three cents) easily less than five years.

Conclusion

The market for electricity is changing. The industry has historically been heavily regulated, however, technological changes have opened the door for competition in the generation of electric power. Transmission and distribution still have natural monopoly characteristics. The result is that there are economic forces at work that will dramatically change the current configuration of the electric utility industry.

A number of states have already taken steps to make the generation of electric power a competitive market, where consumers can choose their energy supplier. Provisions for an independent operator of the transmission system usually accompany such proposals. Sooner or later, such changes will come to Kentucky.

Since electricity rates in Kentucky are very low already, we predict only modest rate declines in the short run if the state moves to a competitive market for generation. Other states in the region will experience greater price declines than Kentucky, given that their rates are higher than ours are. Lower rates will lead to increased consumption of electricity. The coal industry should thus gain from deregulation, since coal is the predominant source of energy for generating electric power in the region. The long-run price will be determined by the economic cost of producing and distributing electric power. Competition leads to lower prices, and so electricity consumers can expect to pay lower prices than they would if the current regulatory regime were to continue indefinitely. And that should be welcome news to residential, commercial, and industrial users of electricity.

Endnotes

1 Overall system reliability planning and coordination are carried out by the National Electric Reliability Council (NERC). NERC is divided into ten regional reliability councils, which are responsible for overall coordination of bulk power policies that affect the reliability and adequacy of service in their areas. See Energy Information Administration (January 1995) for a comprehensive study of system reliability.

2 Utility Data Institute (1994) and Energy Information Administration (December 1996b), Table17.

3 There is one small difference between the sales and average revenue figures for Kentucky presented in this section and related tables produced by the Energy Information Administration of the U.S. Department of Energy in its publication *Electric Sales and Revenue: 1995*. This difference results because the analysis presented in this report does not include the sales of one large electric utility which only sells electricity to one large industrial customer, a U.S. Department of Energy uranium factory. This one utility affects figures so much because the sales of this utility to its one customer account for roughly 11% of all sales to final customers in Kentucky.

4 Energy Information Administration, U.S. Department of Energy, 1995. *Electric Sales and Revenue: 1995* (December).

5 Sales here refer to final sales to customers. Thus, wholesale sales by federally operated utilities such as the Tennessee Valley Authority to other utilities for distribution are not included.

6 The short-run demand curve is based on current consumption levels at the existing level of rates in the twenty-state region. The curve itself is then derived using estimates of short-run price elasticity for residential, commercial, and industrial customers.

7 The short-run supply curve is based upon existing production capacity in the twenty-state region. It incorporates the following assumptions. Each fossil-fueled or nuclear generating plant is assumed to be economically viable at a level of average variable cost equal to the lowest level attained by that particular plant in either 1994, 1995, or 1996. Fossil-fueled plants are assumed to be capable of operating at 80% of nameplate capacity and nuclear plants are assumed to be capable of operating at 90% of nameplate capacity. The amounts of power generated by hydroelectric units and by non-utility generators in 1996 are assumed to remain constant. The original source for the data used in this exercise is the FERC Form #1.

8 If we assume that each fossil-fueled plant will operate at 70% of nameplate capacity and each nuclear plant will operate at 80% of capacity, then the estimated competitive price rises to approximately 2.25 cents per kWh.

9 This estimate of transmission, distribution, and tax costs is based on Energy Information Administration (1997). The transmission, distribution, and tax cost is assumed to be 1.5 cents per kWh for industrial customers and 2.3 cents per kWh for residential and commercial customers. Industrial customer costs are assumed to be lower because industrial customers in a deregulated environment will not bear the costs of distributing electricity to residential and commercial customers. Based on Table 2 of White (1996), distribution costs are assumed to be 62% of total transmission and distribution costs. To arrive at this percentage, one-quarter of the "other operating expenses" in White's Table 2 were assigned to transmission costs and one-quarter were assigned to distribution costs.

10 This figure is based on Table 2 of White (1996), with one-quarter of "Other Operating Expenses" assigned to transmission costs and one-quarter assigned to distribution costs. This implies that actual prices paid by residential and commercial consumers will be 1.3 cents per kWh above the power charge. Since many large industrial customers will be able to tap directly into the transmission grid and avoid distribution charges, it is assumed that 0.8 cents per kWh should be added to the power charge to get the price paid by industrial customers. The overall average of 1.1 cents per kWh thus is a weighted average, where the weighting factor is the industrial customer's share of final regional sales which is reported in Table 7 of this report.

11 The long-run demand curve also reflects an estimated 2.2% annual growth in demand over time due to growing incomes, commercial sales, and industrial output. The annual demand growth rate of 2.2% is used because 2.2% was the average annual growth in electric utility electricity final sales in the United States from 1990 to 1996.

12 Rose, Muthiah, and Fusco (1997) provide a detailed financial analysis of the cost of producing electricity using the latest technology, and explain how one can calculate long-run average total cost. Other sources that corroborate the three cents per kilowatthour estimate for long-run average cost include Schuler (1996), Hansen and Smock (1996), Maloney and McCormick (1996), and the Northbridge Group (1997).

13 See Schuler (1996) and Hansen and Smock (1996) for a discussion of economies of scale in combined cycle gas-fired generating units.

14 Choi and Jarboe (1996) discuss Bechtel's current approach to power plant design and construction. Other companies routinely advertise similar construction timetables in trade journals.

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Economic Impact of Interstate Highways in Kentucky

Eric C. Thompson and *Amitabh Chandra*

The construction of interstate highways can have significant and wide-ranging effects for residents of a county and for that county's economy. Specifically, interstate highways will create road user benefits that will be experienced by all residents of an area. These benefits include savings in travel time, lower accident costs, and lower vehicle operation costs as a result of the new interstate. Restricted-access interstate highways allow motorists to drive at higher speeds than on other types of highways, and fewer accidents occur on the wider and straighter interstate highways. In addition, counties will experience employment and earnings impacts as a result of a new highway. Existing businesses will have lower operating costs due to the highway and new businesses may locate there because of the improved transportation, providing additional job opportunities to local residents.

Introduction

From a national perspective, the location of interstate highways ideally is a process of choosing routes in order to move people and goods throughout the country at minimum time and cost. However, the construction of interstate highways often has secondary consequences that may also influence the location decision. In particular, new interstate highways can bring reduced travel costs and job growth in areas where the highways are located. These consequences may lead local citizens and officials to lobby for highway routes through their town or county.

The incentives for attracting a new interstate can be especially strong in rural areas. Many rural counties are located far from any interstate-quality highway, so the location of a new highway may significantly lower the cost and raise the convenience of travel from these counties. These counties also may feel a significant need for the employment impacts of a new interstate since many rural counties have low per capita incomes and high unemployment rates. These dual needs for travel time savings and new employment opportunities provide an economic justification for the highway investment. Substantial economic justification is needed for any highway investment project, naturally, because of the enormous costs of highway projects. On average, one mile of a new highway costs $15 million. In mountainous areas, this cost can rise to $25 million.

This paper discusses how a study of the economic justification for a highway investment could be conducted and uses some examples of the impact that a new interstate highway could have on areas in rural Kentucky. The first portion of the paper examines the reduction in travel costs that would occur when an interstate highway is constructed. A comparison of the cost per mile driven on interstate highways will be compared with the cost of driving a mile on a principal arterial highway. An interstate-quality highway broadly refers to four-lane or wider, divided highways that also meet high safety requirements. Principal arterial highways include all highways besides interstate highways that run between towns and cities.

The second portion of the paper discusses the economic impact that a new interstate highway might have on a rural county that it runs through. As part of this section, the job and earnings impact of a hypothetical new highway will be estimated for five rural Kentucky counties using a model developed by the University of Kentucky Center for Business and Economic Research.

Road User Benefits

A new interstate highway improves the efficiency of the transportation system by reducing the cost at which people and goods are transported throughout the economy. In particular, in rural areas, building a new interstate will allow some drivers to switch from traveling on slow, winding, and small highways to faster, straighter, and wider interstate highways. This change allows the costs of driving to fall for many rural residents.

The cost of traveling falls because drivers of automobiles and trucks switching to an interstate highway can save time, face reduced risk of accidents, and experience reduced vehicle operation costs. As a consequence, there are benefits to society from building a new interstate highway—so-called road user benefits—resulting from savings in travel time, accident costs, and vehicle operation costs.

These three types of road user benefits form a large share of the economic impact of highways on rural counties. Each of these benefits is discussed below. In particular, the reduction in travel costs per mile is calculated as travelers switch from driving on smaller rural highways to driving on an interstate highway.

Benefits from Time Savings

The first step in assessing the road user benefits that would occur as vehicles switch from driving on other principal arterial highways to interstate highways is to measure the value of the time savings. The value of time saved per mile is a function of three things: 1) the difference in speed between an interstate highway and an other principal arterial highway, 2) the number of people in the vehicle, and 3) the value of the time of people in the vehicle.

Compared to arterial highways, drivers and passengers in vehicles on an interstate highway save time every mile they drive because they travel at a higher speed. The speed limit on interstate highways in Kentucky is 65 miles per hour, while the speed limit on other principal arterial highways is 55 miles per hour. Using these figures, it is easy to calculate that it takes drivers on arterial highways 1 minute and 5.5 seconds to drive one mile while it takes drivers on interstate highways 55.4 seconds to drive one mile. Thus, a vehicle saves 10.1 seconds per mile in driving time by traveling on an interstate highway rather than an other principal arterial highway.

To calculate the reduced travel time costs per mile driven, this time savings per mile must be multiplied by the value of time per vehicle mile. This value of time per vehicle mile in turn will depend on the number of people in each vehicle and the value of their time. Data on the number of passengers and drivers in an automobile and truck can be calculated from the *1990 National Personal Transportation Survey Databook*. Based on that source, there are on average 1.75 persons in an automobile for each mile driven and 1.2 persons in a truck. The value of time per person depends on the person's average hourly wage and whether individuals are in their vehicle for work or for other purposes. Consistent with the literature on the value of travel time, Miller (1989) finds the value of time for drivers and passengers at work is equal to their hourly wage and benefits. The value of time for drivers and passengers on a leisure trip is worth some fraction of their wage.

TABLE 1

Costs Per Mile Driven on Interstate Highways and Other Principal Arterial Highways, 1995

Cost Category	*Interstate Highways*		*Arterial Highways*		*Difference*	
	Trucks	Autos	Trucks	Autos	Trucks	Autos
Travel Time	$0.36	$0.25	$0.43	$0.29	$0.07	$0.04
Accident Costs	$0.07	$0.07	$0.20	$0.20	$0.13	$0.13
Vehicle Operating Costs	$0.69	$0.19	$0.87	$0.21	$0.18	$0.02
TOTAL	$1.12	$0.51	$1.50	$0.70	$0.38	$0.19

Miller's values of time at work and leisure imply that the value of a person's time saved is different for automobiles and trucks. This is because drivers of large trucks earn a higher hourly wage than the average worker and because persons on truck trips are much more likely to be working than individuals on automobile trips. The value of time for individuals in trucks is estimated to be $19.64 per person in 1998. The value of time for persons in an automobile in Kentucky on average is estimated to be $9.24 in 1998.

TABLE 2

Number of Accident Events Per 100 Million Vehicle Miles Driven

Accident Event	*Interstate Highways* (per 100 MVM)	*Other Principal Arterial Highways* (per 100 MVM)
Fatalities	0.8	1.8
Injuries	45.8	169.4
Property Damage-Only Accidents	77.0	253.5
Unreported Accidents	78.0	280.4

The value of time per vehicle hour traveled can now be calculated given information on the number of persons in vehicles and the value of each person's time in automobiles and trucks. The value of an hour of truck travel time saved is $23.56, and the value of automobile travel time saved is $16.18. These values and the time required to travel a mile imply that the travel costs per mile driven are $0.36 for trucks on an interstate highways and $0.25 for automobiles, as is shown in Table 1. The travel costs per mile on an other principal arterial highway are $0.43 for trucks and $0.29 for automobiles. Overall, there is a travel time savings of $0.07 cents per mile by trucks that switch from an arterial highway to an interstate highway and a $0.04 cents per mile savings by automobiles.

Benefits from Reduced Accident Costs

Drivers on interstate highways face a lower risk of accidents than drivers on other principal arterial highways. Driving on interstate highways is safer for a number of reasons. Interstate highways typically are wider, have more lanes, and are straighter then arterial highways. But, most importantly, interstate highways have controlled access through on-ramps, while access onto many other principal arterial highways is typically uncontrolled. Vehicles entering these other highways from side roads provide a traffic hazard as they accelerate to driving speed.

This lower risk of accidents naturally leads to lower comprehensive accident costs for drivers on interstate highways than on other highways. These accident costs per mile driven are reported in Table 1. The data reveal that comprehensive accident costs are $0.13 less per mile on interstate highways for both automobiles and trucks. This demonstrates another substantial savings for drivers on interstate highways.

To calculate these accident costs, two types of information are necessary: 1) the number and severity of accidents which occur per mile driven on interstate highways and other principal arterial highways and 2) the costs of each type of accident. Data on the number of accidents per mile driven are primarily available in the Federal Highway Administration's annual publication *Highway Statistics*.[1] This source contains data on the number of fatalities and injuries in accidents per mile driven. As for fatalities, there are 0.8 fatalities for each 100 million miles driven on interstate highways and 1.8 fatalities per 100 million miles driven on other principal arterial highways.

Similar figures are shown in Table 2 for injuries, non-injury accidents, and unreported accidents. These data indicate that there are on average 45.8 injuries, 77.0 property damage-only accidents, and 78.0 unreported accidents per 100 million miles driven on interstate highways. On other principal arterial highways, on average there are 169.4 injuries,

253.5 property damage-only accidents, and 280.4 unreported accidents per 100 million miles driven.

The value for each type of accident event in 1998 dollars would be $3,321,632 per death, $65,931 per injury, $6,232 per property damage-only accident, and $5,753 per unreported accident. These values are based on Miller (1991). These accident costs not only reflect the costs of vehicle repair but in the case of injury accidents and deaths, they also include emergency service costs, longer-term medical bills, and lost work wages. Besides these costs, there are substantial accident costs due to the substantial pain and suffering of the injured persons.

The frequency of each type of accident per mile can be multiplied by the cost of each accident to yield the total accident costs per mile on interstate highways and other principal arterial highways. This yields a total accident cost per mile driven of $0.07 per mile on interstate highways and $0.20 per mile driven on other principal arterial highways, as is reported in Table 1.

Benefits from Reduced Vehicle Operation Costs

The cost of operating automobiles and trucks differs in several important ways on interstate highways versus other principal arterial highways. These differences make it unclear whether vehicle operation costs are lower on interstate highways than on other principal arterial highways. To see this, consider that operating costs are a function of the average speed at which a vehicle travels on a road and the frequency with which the vehicle must change speeds (by slowing down and accelerating) or change directions (while the road follows a winding rather than a straight path). These factors tend to cause fuel costs to be higher on interstate highways because vehicles travel faster on interstate highways. These factors also tend to cause fuel costs to be lower, however, on interstate highways because vehicles change speed and direction less often on these wider, controlled access highways. There is a similar tension regarding other types of vehicle operation costs, such as tire wear. Costs from tire wear rise with both average speed and the frequency of speed and direction changes. Overall, these factors indicate that it is not certain that vehicle operation costs are lower on interstate highways than on other principal arterial highways.

To determine whether vehicle operation costs are lower on interstate highways, it is necessary to have a comprehensive model of vehicle operating costs which can weigh all of these competing cost factors on interstate highways versus other principal arterial highways. The Highway Performance Monitoring System is such a model. It was used to calculate the relative vehicle operating costs on interstate highways. This model is not only held and operated by the Federal Highway Administration, but it is also operated by many state transportation agencies, including Kentucky's.

Using the Highway Performance Monitoring System, vehicle operating costs per mile in Kentucky are slightly less for automobiles on interstate highways than on other principal arterial highways, and are substantially less for trucks. As seen in Table 1, vehicle operating costs per mile driven by automobiles are $0.19 on an interstate highway and $0.21 on other principal arterial highways. While this difference is modest, the difference for trucks is substantial. Vehicle operating costs per mile driven by trucks are $0.69 on an interstate highway and $0.87 on other highways. This may reflect the fact that the stresses of slowing down, speeding up, and changing directions, which happens less frequently on interstate highways, is greater for trucks than for automobiles.

Comparing Benefits with Highway Construction Costs

The data summarized in Table 1 indicate that driving a mile on an interstate highway is $0.19 cheaper than driving on an other principal arterial highway for automobiles and $0.38 cheaper for trucks. Given the millions of miles driven on highways in rural Kentucky counties in any year, this finding suggests that there are enormous potential savings to rural Kentucky residents from

building more interstate highways in the state. The magnitude of these savings may even be great enough to compare favorably with the substantial cost of building interstate highways, which can run $10 to $15 million a mile.

Benefit cost analysis is a formal way to compare potential benefits from building a new highway with project costs. This analysis will determine if the benefits of the highway investment would be greater than the costs, and thus, a good idea for the economy. The benefit cost method determinines the total benefits and costs for the entire project duration. For benefits, this means determining the total benefits of a project each year.

Roughly speaking, these benefits would be $0.38 multiplied by the total number of miles driven by trucks that would switch to driving on interstate highways rather than other principal arterial highways if the interstate is built. This number would need to be added to $0.19 times the number of automobile miles that would switch in order to yield total annual project benefits. Annual benefits from each year the highway operates can be added together to yield total project benefits. These benefits could be compared with the cost of building the interstate plus a small annual cost for maintaining the highway. If the potential benefits of the highway exceed the costs, then the new interstate highway might be an appropriate investment that would increase the efficiency of the economy.

Impact on Employment and Earnings

Besides road user benefits, employment and earnings growth are the other impacts that rural counties hope to receive when a new interstate highway runs through the county. Typically, these impacts will occur in conjunction with the time savings, accident reduction, and reduced vehicle operation costs enjoyed by many road users. These impacts occur because businesses and residents in the region are the main beneficiaries of the reduced cost of travel associated with the new interstate. These savings create incentives for local economic growth. In particular, manufacturing businesses facing lower transportation costs will be able to lower their costs relative to their competitors, thereby allowing these manufacturers to expand. Lower transportation costs to the region should also strengthen local tourism and increase the quality of life for residents. This higher quality of life and lower travel costs should encourage more people to move to the region, which should increase population and employment.

All of these factors can cause employment and earnings to increase in counties that receive a new interstate highway. But, it is also clear that not all industries will expand equally. As implied by the discussion above, manufacturing businesses, tourism-related businesses, and industries serving local residents such as retail stores, the health care industry, and the like should expand the most.

That certain industries should expand more than others suggests that a county's level of growth will depend on its industrial makeup. If the county has a large number of manufacturing plants, or a strong tourism industry, then it should expand more rapidly than other counties. In addition, counties closer to urban areas could see greater residential growth as urban residents move to these counties because of better transportation.

To summarize, the impact that a new highway has on employment and earnings in a county depends a great deal on the characteristics of the county itself. It is not possible to simply identify some standard growth effect of a new highway that can be applied to all counties. To estimate the impact on employment, it is necessary to have a model that can identify the specific impact likely to occur in each county and should reflect the particular industrial structure in a county.

The model should also reflect how much traffic the new highway will carry in the county on a typical day. The amount of traffic, naturally, indicates how close the county is to nearby towns or cities with larger populations, or at least, if the county is centrally located between large and important, but more distant cities.[2] The Center for Business and Economic Research has developed such a model. The model calculates the employment and earnings impacts that occur in a county receiving a new

interstate based on the county's industrial structure and traffic flow on the new highway.

Hypothetical Impact in Five Kentucky Counties

The CBER economic impact model was utilized to estimate the impact on five rural counties in the state if a new highway was built through those counties. These five counties, located around the state, were chosen as representative examples. These are not necessarily counties that will be receiving a new interstate highway in the near future.

The counties chosen were Adair, Hickman, Letcher, Mason, and Meade. These counties were chosen due to their geographical location and because none of the counties currently has an interstate highway running through it. Figure 1 shows the location of these counties in Kentucky.

Table 3 shows the CBER model estimates of the impact on employment and earnings in the five counties due to the location of a new interstate highway. These impacts are the average annual impact for the years 1998 through 2020. Note the substantial difference in economic impact in the five counties: Employment impacts range from roughly 50 jobs per year in Hickman County to 800 jobs per year in Mason County. The earnings impacts are similar, ranging from $360,000 dollars a year in Hickman County to $19 million in Mason County.[3] These differing impacts in part reflect the current size of the counties, as illustrated by the 1996 population data presented in Table 3. Hickman County is by far the smallest county and has the smallest economic impact. This relationship with the size of the county is not surprising. The impact of a highway is greater in a county where there are already many residents and businesses to benefit from the highway. Further, the fact that counties are already larger suggests that these counties already possess characteristics attractive to business and residents.

TABLE 3

Average Annual Employment and Earnings Impacts of a Hypothetical New Highway, 1998 - 2020

County	*Average Annual Employment Impact*	*Average Annual Earnings Impact ($1992)*	*1996 Population*
Adair	221	$5,825,412	16,460
Hickman	51	$360,605	5,306
Letcher	423	$7,672,099	26,744
Mason	787	$19,322,738	16,891
Meade	234	$5,185,450	27,522

Source: University of Louisville Center for Population Research (population estimates)

FIGURE 1

Location of Five Counties

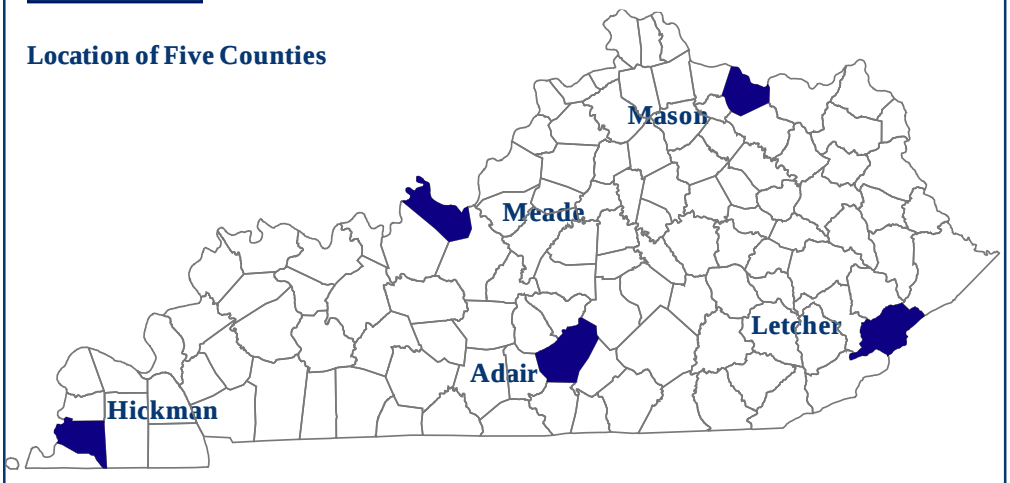

TABLE 4

Share of 1998 County Earnings in Selected Industry Sectors

County	*Share of 1998 Earnings* Farming	Manufacturing	Retail Trade	Services	*Average Annual Employment Impact* All Industries
Adair	9.7%	23.8%	8.3%	25.8%	221
Hickman	14.9	16.8	7.0	15.1	51
Letcher	0.1	1.0	11.9	28.1	423
Mason	4.2	35.7	10.0	16.5	787
Meade	3.1	26.7	14.9	14.9	234

Source: Woods and Poole Economics, Inc. (earnings data)

TABLE 5

Average Annual Employment Impact for Selected Industry Sectors of a Hypothetical New Highway, 1998 - 2020

County	*Average Annual Employment Impact* Farming	Manufacturing	Retail Trade	Services
Adair	-369	242	47	342
Hickman	-89	69	12	58
Letcher	-10	17	101	322
Mason	-297	581	140	340
Meade	-78	104	63	175

County size, however, is clearly not the only factor influencing the size of the economic impact. Mason County, after all, is only the third-largest county in terms of population, but it has the largest economic impact. Clearly, economic structure is also important, as is illustrated in Table 4. As mentioned, counties with a substantial share of employment in industries that benefit the most from the location of a highway, such as manufacturing, will see the largest economic impact. The location of a highway would have the greatest impact on Mason County because it has substantial manufacturing employment. Counties with less potential for manufacturing employment, such as coal-dependent Letcher County, will benefit relatively less in terms of growth of the manufacturing sector. A greater impact also results in counties with a large share of employment in the service and retail industries, since these industries benefit from the overall growth of the economy and increases in tourism that can occur.

As seen in Table 4, the employment impact was less in counties with a higher concentration of employment and earnings in farming. Results from the CBER model indicate that the farming industry experiences a loss of employment with the location of a new highway. Such a loss likely occurs because highways improve growth in manufacturing and service industries in counties, which provide more off-farm work opportunities. This tends to draw workers out of the farming industry into these other industries. The location of a highway also increases access to employment opportunities in adjacent counties, further drawing workers out of farming.

Table 5 verifies these trends by showing the employment impact due to the location of an interstate highway in each county in farming, manufacturing, retail trade, and services. Substantial job growth in manufacturing does account for the substantial job growth in Mason County. Low job growth in Hickman County occurs due to employment losses in farming negating employment gains in manufacturing.

Conclusion

The construction of a new interstate highway can have a substantial impact on the economy of a rural county. This impact can be viewed in terms of the substantial savings in travel costs that occur as drivers switch from traveling on smaller rural

highways to traveling on wider, straighter interstate highways. These travel costs savings average $0.19 per mile for automobiles and $0.38 per mile for trucks and reflect savings in travel time, accident costs, and vehicle operating costs. This can lead to substantial savings to individuals and businesses when it is considered that over any given year millions of miles of driving can be switched to an interstate route when a new interstate is built. The reduction in travel costs associated with a new highway also can lead to hundreds of new jobs in a rural county.

These substantial impacts in terms of travel costs savings and new employment and earnings can provide a substantial economic justification for new investment in rural interstate highways. The travel cost savings, however, must be compared with the substantial costs of building and maintaining interstate highways. These costs make many potential interstate highway projects economically infeasible despite substantial travel costs savings and new employment. In general, those proposed new interstate corridors that will be most heavily traveled will be the most economically feasible because road user benefits will be greatest in these cases.

Endnotes

1 *Highway Statistics* has information on fatalities and injuries per mile driven. Data on the number of property damage only vehicle accidents per mile driven come from Agent and Pigman (1995). Data on the number of unreported accidents per mile come from Blincoe (1996).

2 A county receiving a new highway will be even more attractive to manufacturers if it is located near or between the major markets in large cities. Counties near to larger towns and cities also will have more potential for residential growth once a highway is located.

3 These employment and earnings impacts are another way to view the impacts of the reduced costs of travel which result when a highway is built. This means that it would be inappropriate to add the impact on worker earnings to road user benefits when conducting a benefit cost analysis of building a new highway. To do so would be double counting.This is why employment and earnings impacts are not typically considered during the benefit cost analysis phase of an economic justification project. To give an example of why double counting should be avoided, consider the case of a local manufacturing firm in a county that receives a highway. This firm will be able to provide its goods to outside markets more cheaply with the new highway present. This result will be seen in lower travel costs for the firm which will be captured in measurements of road user benefits. The result also will be seen in an increase in the wages that the firm will be able to pay its workers either by adding more workers or paying existing workers more. Measuring the road user benefits and the wage increase would be a different way of measuring the impact of the same event, the lower cost of transportation for the manufacturing firm. Adding the value of these two impacts together would be double counting.

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