

# The Distribution of Skills in the Labor Force: Policy Implications for Human Capital Formation and Economic Development

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## CONCEPTUAL FRAMEWORK

It is a well-known fact that the higher the proportion of skilled personnel in the labor force of a region or an economy, the faster is the economic growth of the region or economy. In other words, the higher the level of human capital, the higher productivity gains and the growth of gross domestic product. The significant positive relationship between human capital and rate of economic growth has long been acknowledged (Harrod, 1948, Schultz, 1961, Becker, 1975). Empirical studies have shown a strong positive relationship between rate of growth of human capital and of economic prosperity (Azariadis & Drazen, 1990, Romer, 1990, Barro, 1991).

What is less well-known is that the distribution of skills in the labor force of a region or an economy also play an important role as the determinant of rate of economic growth. Easterlin (1981) hinted at this indirectly when he argued that education of the elite without mass education is unlikely to foster economic growth. Another indirect reference to this is the realization that rapid economic growth is often accomplished by a more equal income distribution (Ranis, 1977, Pascharopoulos, 1985), since human capital is closely associated with income. Lester (1999) formulates a mathematical framework in which the input of labor consists of different grades of human capital. He then goes on to show an empirically significant negative relationship between skewness of the distribution and economic growth in a sample of American, European and Asian countries.

While the empirical work refers to development of countries at a macro level, the

framework can be applied to a micro level as well. If a group in an organization has a team of workers with a sharp disparity in qualifications and skills, it leads to lower productivity. This is best illustrated in DeMarco (1996), where the replacement of one of the five engineers in the network protocol group of Hewlett-Packard with one with less specific knowledge and skill about the functions of the group requires an enormous shadow investment and lowering of productivity.

In the middle of these two macro and micro situations falls the relationship between labor productivity and economic growth issue of a region or a sub-region. If the premises, set forth in the first two paragraphs, hold at the two extremes (micro and very macro levels), they must be important at the middle. The purpose of this paper is to analyze the labor statistics of the State of Indiana and place it in the conceptual perspective referred to above.

A major objective of this paper is:

- to examine the distribution of human capital in Indiana in comparison to other states and regions in the country.

A second objective of this study is:

- to derive policy implications given the existing distribution of human capital.

The level of skills of the labor force is typically considered exogenous as a determinant of labor productivity. But there is an element of endogeneity. The distribution

of human capital is both a cause and consequence of labor productivity and economic development. A skewed distribution of human capital leads to lower productivity and lower economic development, which in turns causes the skewness to increase; contributing to further declines in labor productivity and economic development.

## 2. Labor Force Data Analysis

In this section, different aspects of labor force statistics are analyzed in order to draw inferences about the distribution of human capital in the State of Indiana in comparison with other parts of the USA.

### **Educational Attainments**

The educational attainment of the population is a reasonable proxy for the level of skill or human capital, as a first approximation. The following chart (Chart 1) shows the percentage of non- high school graduates amongst the population over 25 for selected States of the USA. This category of non- high school graduates represents a proxy for the lowest skill level. The State of Indiana is close to the national average. Compared to its neighboring states, the concentration of labor force in the lowest skill level in Indiana is somewhat more than that of the neighboring states of Michigan and Ohio, slightly more than that of Illinois and significantly less than that of Kentucky. All in all, Indiana has a slightly lower proportion of labor with the lowest skill level than USA as a whole.

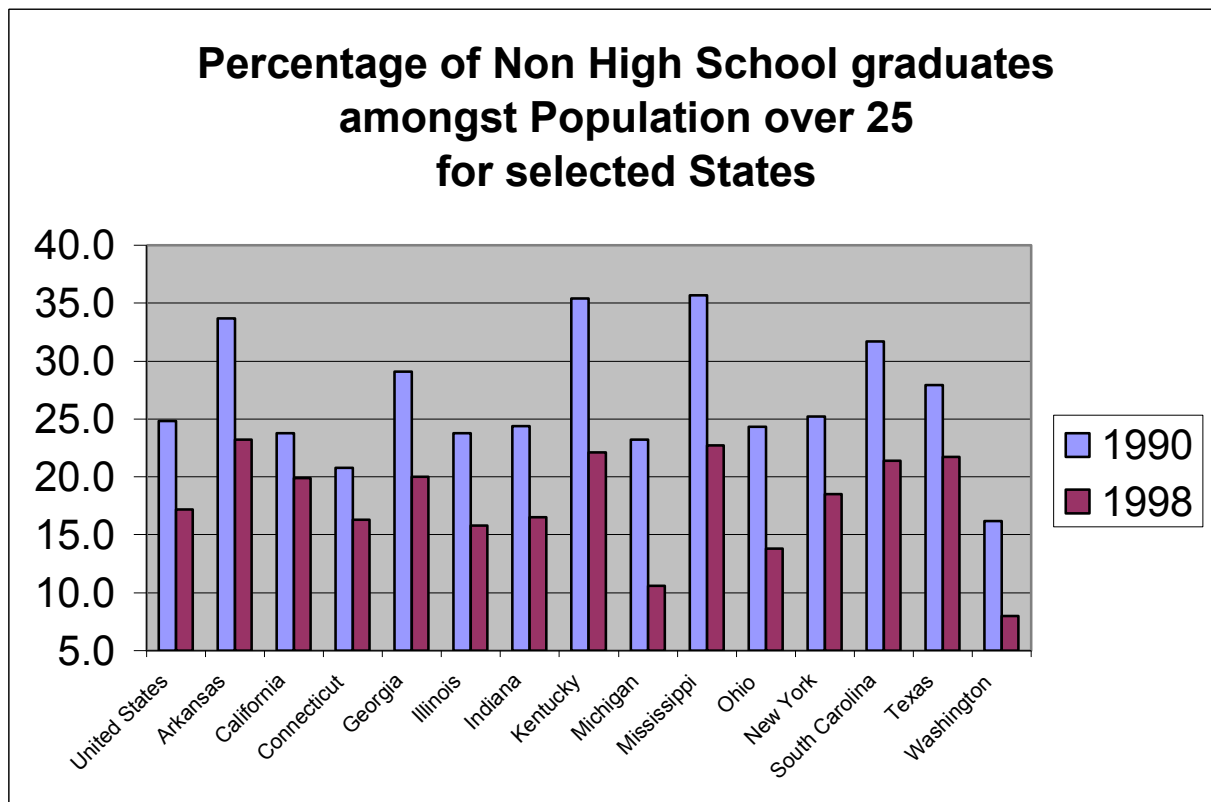
Almost everywhere in the United States there have been reductions in the percentage of the over 25 population who are non-high school graduates between 1990 and 1998. If anything, the improvement in Indiana is not as significant as in most States. Amongst the neighboring States, the improvements in Kentucky, Michigan and Ohio far surpass that in Indiana. The improvement in Illinois is about the same as in Indiana.

Chart 2 in the next page shows the percentage of the population over 25 who have graduated from high school but do not have a college degree, for selected States of the USA. This category corresponds to the second lowest level of skills and knowledge. For most of the United States, this category constitutes the bulk of the adult population. Indiana has a significantly higher than average percentage of its labor force in this category. This fact, coupled with the fact that Indiana is close to the average percentage in the non High school category, implies that Indiana must be significantly lower than the average in percentage of its labor force in the category of higher educational attainment (see Chart 3).

Chart 3 in the next page shows that the proportions of the labor force in selected States in the USA who have a bachelor's degree or higher qualification. In this category, Indiana is well below average. It is also well below the neighboring States (except Kentucky).

The change from 1990 to 1998 is perhaps more important. Indiana has lagged behind all its neighbors (as well as most of the United States) in the increase in the percentage of college graduates in the labor force in the last decade.

**Chart 1** <sup>(1)</sup>



**a) Employment by Industry Category**

A readily available source of data is the employment by major industry categories. Considering only the non-farm labor force, the distributions across major industry categories as of January 2000 for selected States are shown in Table 1 in the next page. As we move across the industry categories, the skills and knowledge required, on an average, change broadly. More importantly, the projected growth in the next decade or so varies greatly across the industry categories. For example, a disproportionate number of the labor force in an industry with potential for rapid decline implies the need for massive retraining.

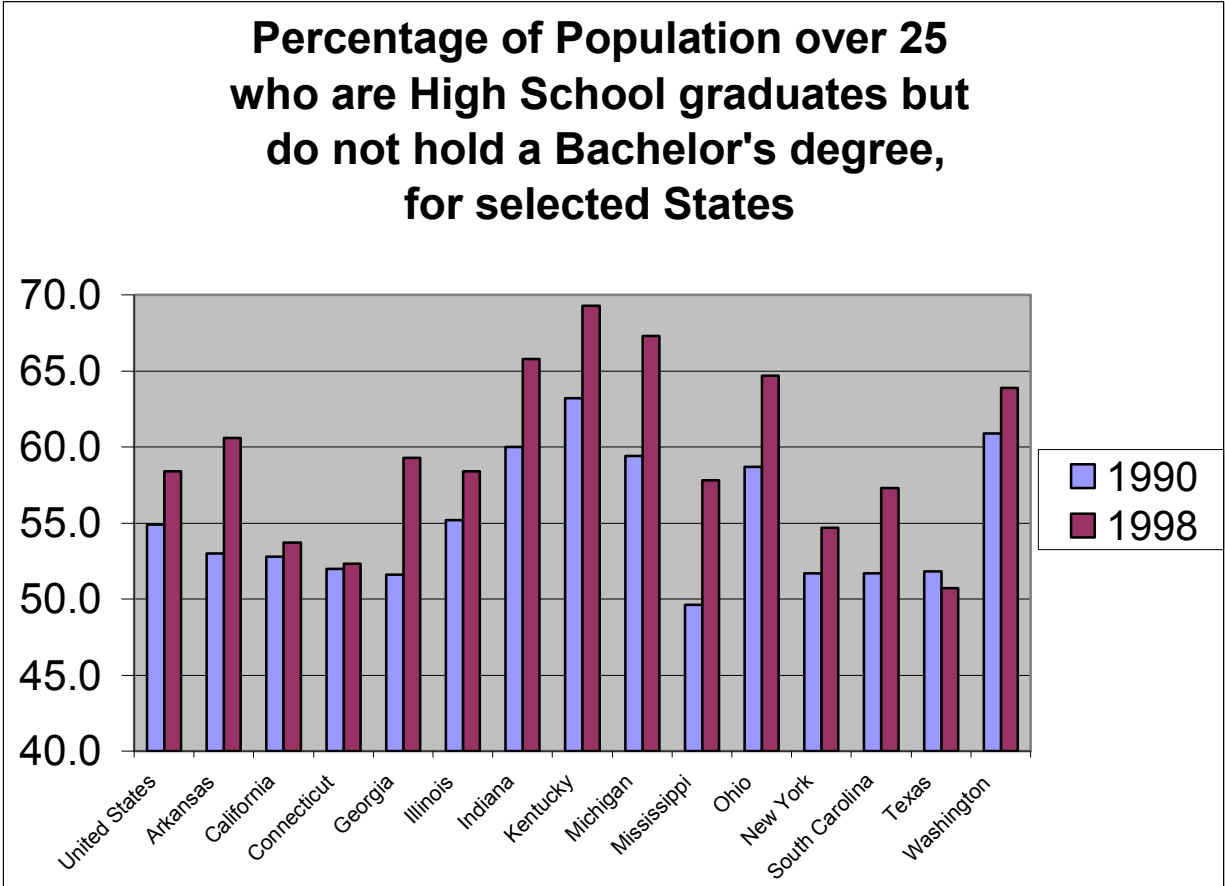
Similar information on the distribution of the labor force across major industry categories for Central Indiana is

<sup>1</sup> Data for Chart 1 are derived from U.S. Census Bureau, Statistical Abstract of the United States, 1999

presented in Table 2. Marion County dominates the other counties in Central Indiana in population simply because of the presence of the capital city of Indianapolis,

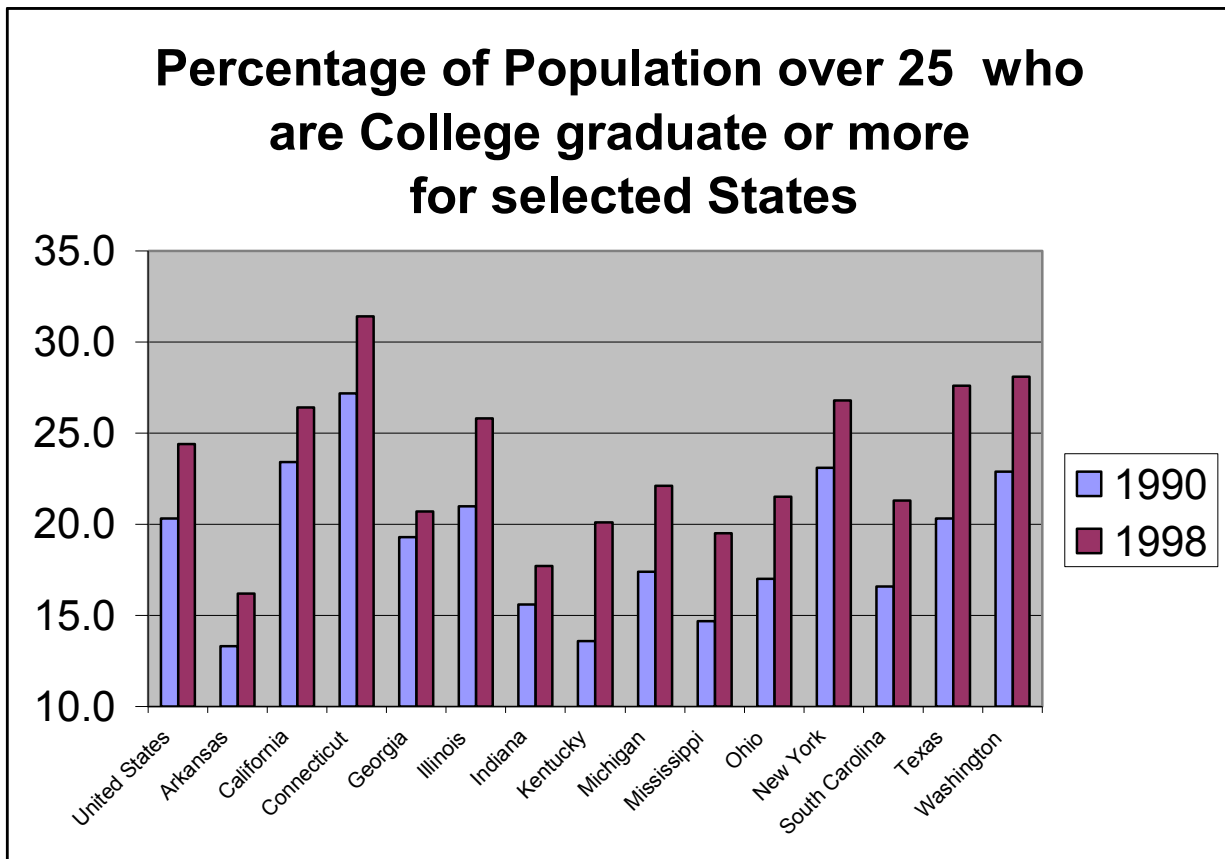
which falls in Marion County. The distribution is very different for Marion County in comparison with that of the rest of Central Indiana.

**Chart 2** <sup>(2)</sup>



<sup>2</sup> Data for Chart 2 are derived from U.S. Census Bureau, Statistical Abstract of the United States, 1999

**Chart 3** <sup>(3)</sup>



<sup>3</sup> Data for Chart 2 are derived from U.S. Census Bureau, Statistical Abstract of the United States, 1999

**Table 1** <sup>(4)</sup>

Percentage of Non-farm Labor Force in Major Industry categories  
in Jan 2000 for selected States

	Const- ruction	Manu- facturing	Govt.	Trade	Services	Transport- ation & Public Utilities	Finance, Insurance & Real Estate
Arkansas	4.58%	21.83%	16.35%	23.09%	23.74%	6.07%	4.07%
California	5.02%	13.52%	16.01%	22.72%	31.56%	5.18%	5.85%
Connecticut	3.77%	15.75%	14.19%	21.50%	31.64%	4.69%	8.37%
Georgia	5.04%	15.24%	14.92%	25.11%	27.61%	6.71%	5.13%
Illinois	4.25%	15.98%	13.89%	22.50%	30.50%	5.85%	6.84%
Indiana	4.91%	23.24%	13.67%	23.66%	24.62%	4.87%	4.82%
Kentucky	4.97%	17.71%	16.72%	23.74%	25.77%	5.98%	3.93%
Michigan	4.27%	21.31%	14.76%	23.54%	27.50%	3.89%	4.57%
Mississippi	4.86%	20.96%	19.78%	21.70%	23.64%	4.91%	3.66%
New York	3.84%	10.42%	16.89%	20.19%	34.89%	8.82%	4.91%
Ohio	4.28%	19.41%	14.04%	23.91%	28.16%	4.40%	5.57%
South Carolina	6.32%	18.53%	17.25%	24.14%	24.41%	4.79%	4.45%
Texas	5.82%	11.66%	16.84%	23.81%	28.43%	6.19%	5.70%
Washington	5.87%	13.30%	17.88%	24.25%	28.12%	5.27%	5.10%

<sup>4</sup> Data for Table 1 are derived from Monthly Labor Review, June 2000 published by the  
U.S. Bureau of Labor Statistics

**Table 2** <sup>(5)</sup>

Percentage of Non-farm Labor Force in Major Industry categories  
in 1995 for selected parts of Indiana

	Const- ruction	Manu- facturing	Govt.	Trade	Services	Transport- ation & Public Utilities	Finance, Insurance & Real Estate
Marion County	4.69%	16.64%	11.45%	25.83%	26.64%	6.19%	8.56%
Rest of Central Indiana	3.81%	28.32%	17.03%	23.40%	19.92%	3.45%	4.06%
Central Indiana as a whole	4.45%	19.82%	12.97%	25.17%	24.81%	5.44%	7.34%

The preceding two tables show that Indiana has a larger percentage of the labor force in manufacturing and a smaller percentage in the services and financial, insurance and real estate sector. The situation is worse for Central Indiana (excluding Marion County) as compared to Indiana as a whole. Both tables show that the composition of the non-farm labor force with its emphasis on manufacturing, is less favorable to growth and expansion of industry in the 21<sup>st</sup> century. Further, the level of skills required in the manufacturing sector is, in general, lower than the level of skills required in the services and financial sectors. The latter two are the

growth sectors which are expected to be the drivers of labor force demand in the next decade (Thomson,1999). Not only will these sectors grow, but the demand for the level of skills will be increasing as well. Clearly, the labor force composition of skills in Central Indiana need to be moved to a higher level, to keep up with the demands of the new economy and increase the proportion of the labor force in services, finance, real estate and insurance.

<sup>5</sup> Data for Table 2 have been compiled from information in Indiana Facts published by John Clements (1995)

### c) Patents granted

Further evidence, although very indirect, of relatively low investment in high-end knowledge and skills is the small number of patents in the State of Indiana in comparison with the other States. In terms of per capita patents, Indiana is well behind most of its neighboring states.

### 3. Major Inferences from the Analysis

All evidence presented in the last section seems to indicate that the labor force composition in Indiana in terms of skills can be summarized in the following general terms: first the distribution of skills is to the left of most other states in terms of the level of skills

and second, the distribution for Indiana in terms of skills is more positively skewed in comparison to other states as the diagram (Chart 4) below shows. Both these have negative implications for economic development. The lower level of skills and the shortage of skills at the upper level impede the development of the new growth sectors and contribute to an increase in skewness which further lead to lower productivity and lower growth.

**Table 3** <sup>(6)</sup>

Annual number of Patents granted per million of non-farm Labor Force in 1980-97 for selected States

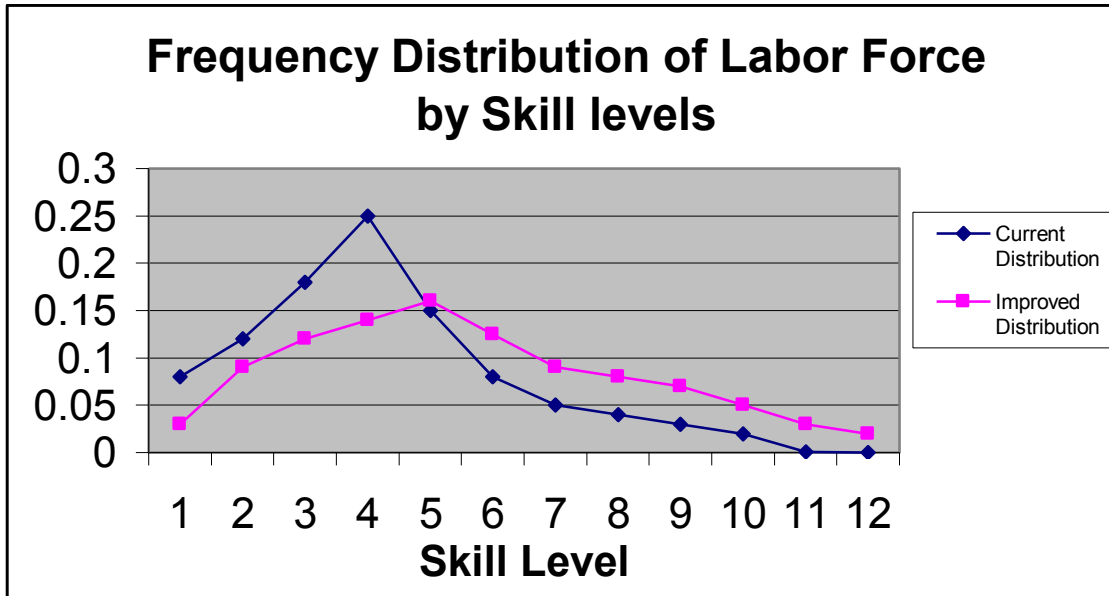
California	908	Michigan	676
Illinois	595	New York	634
Indiana	446	Ohio	587
Kentucky	192	Texas	478

### Chart 4

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<sup>6</sup> Data for Table 3 have been compiled from information in the U. S. Census Bureau, Statistical Abstract of the United States, 1999.





In the diagram above, the improved distribution is an improvement over the current one because of three reasons:

- (i) The mean of the distribution shifts to the right, implying higher level of human capital as a whole,
- (ii) The distribution is less skewed in the sense that there is not a large amount of mass to the left (low levels of skill),
- (iii) There is reasonable (instead of negligible) mass at the high-end of the skills spectrum. It is at this end that rapid increase is going to take place in the next decade.

#### 4. Policy Prescriptions

- Significant investments are needed to create a larger proportion of the labor force with knowledge and skills at the high end (Education at the 4-year college level and above). This will reduce the skewness in the distribution of skills and increase labor productivity. This is particularly important if we want the labor force composition to tilt towards the

high-growth sectors such as finance, real estate and services in general and away from manufacturing.

- Investment in human capital are required, to move the bulk of the population to levels of skills beyond high school attainment to shift the distribution of skills to the right. Industrial growth in the next decade requires higher levels of skills attainment and without careful planning and creation of incentives, there will be shortage of labor force skills in Central Indiana.
- In order to change the composition of the labor force, economic development agencies and planners should examine means of attracting and retaining engines of growth. Aggressive marketing policies and incentive schemes should be used to target and invite service industries with demand for skilled labor.
- Business, education and planning need to work together to improve both the level of skills attainment in general and reduce the lack of skills at the upper end of the skills distribution. Incentives in the form

of better compensation and prospects need to be offered by employers in order to encourage the acquisition of higher levels of skills.

## REFERENCES

- Azariadis, C., and A. Drazen, (1990). Threshold externalities in economic development, *Quarterly Journal of Economics*, 105: 501-526
- Barro, R.J., (1991). Economic growth in a cross-section of countries, *Quarterly Journal of Economics*, 106: 103-125
- Becker, G. (1975). *Human Capital*, University of Chicago Press, Chicago.
- Clements, John (1995). *Indiana Facts*, Clements Research Inc., Dallas.
- DeMarco, T. (1996). Human Capital—Unmasked, *New York Times*, April 14: F-13.
- Easterlin, R.A. (1981). Why isn't the whole world developed? *Journal of Economic History*, 41: 1-19
- Harrod, R.F. (1948). *Towards a Dynamic Economics*, Macmillan, London.
- Lester, B. Yang. (1999). The distribution of Human Capital and Economic Growth, Unpublished paper presented in the Midwest Business Economics Conference, Chicago.
- Paschaopoulos, G. (1985). Returns to education: A further international update and implications, *Journal of Human Resources*, 20: 583-604
- Schultz, T.W. (1961). Investment in human capital, *American Economic Review*, 61: 1-17
- Thomson, Allison (1999). Industry output and employment projections to 2008, *Labor Review*, November: 33-48.
- U.S. Census Bureau (2002). *Statistical Abstract of the United States*, 2002.
- U.S. Bureau of Labor Statistics (2003). *Monthly Labor Review*, June 2003, Vol 126, No.6.