

# U.S. Labor supply and demand in the long run

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Available online 9 May 2008

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## Abstract

In this paper we model U.S. labor supply and demand over the next 25 years. Despite the anticipated aging of the population, moderate population growth will provide growing supplies of labor well into the 21st century. Improvements in labor quality due to greater education and experience will also continue for some time, but will eventually disappear. Productivity growth for the U.S. economy will be below long-term historical averages, but labor-using technical change will be a stimulus to the growth of labor demand. Year-to-year changes in economic activity will be primarily the consequence of capital accumulation. However, the driving forces of economic growth over the long term will be demography and technology.

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*Keywords:* Labor supply; Labor demand; Household preferences; Demographic transition

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## 1. Introduction

In this paper, we model U.S. labor supply and demand in considerable detail in order to capture the enormous heterogeneity of the labor force and its evolution over the next 25 years. We represent labor supplies for a large number of demographic groups as responses to prices of leisure and consumption of goods and services. The price of leisure is an after-tax wage rate, while the prices of goods and services reflect the supply prices of the industries that produce them. By including demographic characteristics among the determinants of household preferences, we

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incorporate the expected demographic transition into our long-run projections of the U.S. labor market.

The U.S. population will be growing older and elderly households have very different patterns of labor supply and consumption. Our projections thus incorporate the expected fall in the supply of labor per capita. These changes in labor supply patterns are the consequence of population aging, rather than wage and income effects. Despite the anticipated aging of the U.S. population, moderate population growth will provide growing supplies of labor well into the 21st century. Improvements in the quality of U.S. labor input, defined as increased average levels of educational attainment and experience, will also continue for some time, but will gradually disappear over the next quarter century.

We represent labor demand for each of 35 industrial sectors of the U.S. economy as a response to the prices of productive inputs: labor, capital, and intermediate goods and services. In addition, labor demand is driven by changes in technology. Technical change generates productivity growth within each industry. Rates of productivity growth differ widely among industries, ranging from the blistering pace of advance in computers and electronic components to the gradual decline in construction and petroleum refining. In addition, changes in technology may be biased. Labor-saving technical change reduces demand for labor for given input prices, while labor-using change increases labor demand.

Productivity growth for the U.S. economy as a whole will be below long-term historical averages. However, productivity growth in information technology equipment and software will continue to outpace productivity growth in the rest of the economy. The output of the U.S. economy will continue to shift toward industries with high rates of productivity growth. Labor input biases of technical change are substantial in many industries. Labor-using, rather than labor-saving, biases predominate. Labor-using technical change will continue to be a stimulus to the growth of labor demand and differences in the biases for different industries will play an important role in the reallocation of labor.

We incorporate the determinants of long-term labor supply and demand into a model of U.S. economic growth. We refer to this model as IGEM<sup>1</sup> for Inter-temporal General Equilibrium Model. Markets for labor, capital, and the output of the economy equilibrate through the price system at each point of time. In the labor market, for example, wage rates determine the labor supplied by the current population and the labor demanded by employers in the many sectors of the economy. In the model and the U.S. economy year-to-year changes in the level of economic activity are primarily the consequence of the accumulation of capital. However, over a quarter century the driving forces of economic growth are demography and technology—as encapsulated in the neo-classical theory of economic growth.

In IGEM, capital formation is determined by the equilibration of saving and investment. We model household saving at the level of the individual household. Consumption, labor supply, and saving for each household are chosen to maximize a utility function, defined on the stream of future consumption of goods and leisure, subject to an inter-temporal budget constraint. The forward-looking character of savings decisions allows changes in future prices and rates of return to affect current labor supply. The availability of capital input in the U.S. economy is the consequence of past investment. This backward-looking feature of capital accumulation links current markets of capital input to past investment decisions.

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<sup>1</sup> Detailed information about earlier versions of IGEM and a survey of applications are available in Jorgenson (1998).

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