

Employment Growth and Labor Force Participation: How Many Jobs Are Enough?

JULIE L. HOTCHKISS

The author is a research economist and policy adviser in the regional group of the Atlanta Fed's research department and an associate professor of economics in the Andrew Young School of Policy Studies at Georgia State University. She thanks Robert Moore and John Robertson for helpful comments and suggestions and Andy Bauer and Nicholas Haltom for research assistance.

There are two basic reasons to be concerned about the rate at which the U.S. economy is creating jobs. The first is what has captured the public's attention coming out of the 2001 recession: the creation of enough jobs to provide work for people who want it. The lackluster job creation following the end of the recession led to the recovery being dubbed "jobless." Analysis of post-recession job creation has spawned much discussion and debate about how many jobs are enough to provide work for the willing and able.

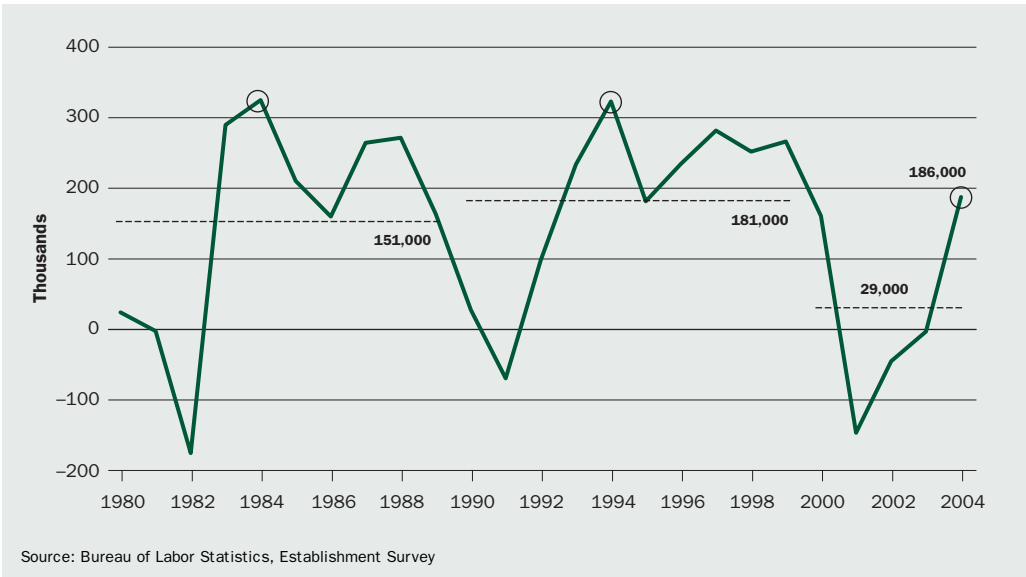
The second source of interest in job creation is not how many jobs are needed to employ the willing but how many jobs are needed to fuel a desired growth in overall economic output. There may be enough jobs to employ most of the people who want jobs, but that does not necessarily mean there are enough people working to supply a growing level of production that leads to more goods, less expensive goods, and an improved standard of living.

The purpose of this article is to provide an analysis of just how many jobs are needed to keep unemployment in check, to consider whether the current rate of labor force growth is enough to supply the desired growth in gross domestic product (GDP) (or total economic output), and to ponder what the future holds for labor force growth.

The Job Creation and Unemployment Paradox

The White House Council of Economic Advisers predicted that the economy would generate about 300,000 jobs per month in 2003 and 2004. In December 2002, the Macroeconomic Advisers consulting group projected an average monthly job creation of about 184,000 in 2003 and 224,000 in 2004. And, ever since the recession was declared over, numerous economists have expressed disappointment whenever monthly job creation fell below 150,000. In a historical context, most of the job growth expectations were not necessarily unrealistic (see Figure 1). The 1980s averaged

Figure 1
Average Monthly Employment Change



a creation of 151,000 jobs per month, and the 1990s averaged a creation of 181,000 jobs per month. From the beginning of 2000 to the end of 2004, however, the U.S. economy added only 29,000 jobs per month on average.

How can the less-than-hoped-for job creation that has occurred since the 2001 recession be expected to affect the unemployment rate?¹ In answering this question, one might typically assume that job creation needs to grow at the same rate as the population in order to keep unemployment in check. From the beginning of 2000 through 2004 the U.S. non-institutional population (people not in prison or other institutions) experienced an average annual growth rate of 1.27 percent. Furthermore, by the end of 2004 there were approximately 132 million nonfarm jobs in the economy.² Applying the population growth rate to this employment base means the economy needs to create 1.67 million jobs per year, or an average of about 139,000 jobs per month, to at least keep unemployment from rising. Job growth, then, on the order of what was projected by the administration and other forecasters would have resulted in a large decline in the unemployment rate.³

Between June 2003 and the end of 2004 the economy has created an average of only 126,000 jobs per month, which, on the basis of the above calculations, should have caused the unemployment rate to rise.⁴ The apparent paradox is that over this same time period the unemployment rate (depicted in Figure 2) has declined steadily.

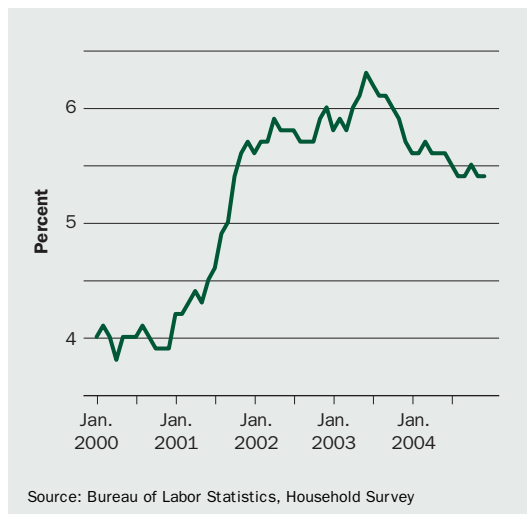
Paradox Resolved: Labor Force Participation

The “employment growth = population growth” estimation has typically provided a reasonable lower bound target for policymakers. This simple formula, however, works only if the labor force participation rate is either increasing or, at least, not decreasing over time. In 2004, only 66 percent of the population was actually in the labor force (working or actively looking for work). And, indeed, it is not really the population growth that the labor market needs to absorb but, rather, the growth in the labor force.⁵ If the percentage of the population in the labor force remains con-

stant over the time period for which one calculates population growth, it does not matter what the percentage of participation is (adjusting each component in a percentage change calculation by the same number does not change the result; the population growth rate will equal the labor force growth rate). However, if the labor force participation rate is declining, leaving it out of the calculation means population growth will overestimate the growth in the labor force and, thus, overestimate the number of jobs needed to lower the unemployment rate. Indeed, the labor force participation rate has been declining steadily since 2000, when it averaged 67.1 percent. While this rate is only 1.1 percentage points higher than the 2004 labor force participation rate, when this difference is multiplied by a noninstitutional population of 220 million, the resulting percentage change in the labor force can be quite different from the percentage change in the population.

Thus, the average annual percentage increase in population from 2000 through 2004, as stated above, was 1.27 percent.⁶ Adjusting the population levels in 2000 and 2004 by their respective labor force participation rates results in an estimated average annual growth in labor force participants of 0.8 percent. Using this percentage growth as a more accurate target, and from a base of 132 million jobs (in 2004), the more appropriate job creation target to keep unemployment under control is 1.11 million jobs per year, or about 93,000 jobs per month. The actual average job creation of

Figure 2
Seasonally Adjusted Unemployment Rate



1. The popular press has been mulling over these issues, as well. See Porter (2004) and Lowenstein (2004).
2. See the Bureau of Labor Statistics, Current Employment Statistics, <www.bls.gov/ces/home.htm> (March 21, 2005).
3. The monthly job growth goal reported most often in the media has been on the order of 150,000 (for example, see *Wall Street Journal* 2003 and Kanell 2004). This goal is consistent with population growth experienced between 2000 and 2003. Population growth was slower between 2003 and 2004, lowering the projected need for job growth. A more recent media report placed the job growth goal at 125,000 (Maher 2005).
4. These numbers reflect U.S. Bureau of Labor Statistics (BLS) adjustments to jobs numbers made through January 2005.
5. Technically, in order for the unemployment rate to not change, the percentage change in employment must equal the percentage change in the labor force, or

$$Urate_t = Urate_{t-1} \Rightarrow \frac{LF_t - LF_{t-1}}{LF_{t-1}} = \% \Delta LF = \% \Delta E = \frac{E_t - E_{t-1}}{E_{t-1}}$$

This relationship, though fairly transparent, is proved in the appendix.

6. Estimating population levels is one of the more difficult tasks of the U.S. Bureau of the Census. The numbers reported by the bureau are taken as accurate although adjustments are made from time to time to incorporate new information. Details of recent adjustments to population estimates can be found in *Employment from the BLS household and payroll surveys: Summary of recent trends* (Population control adjustments to the household survey) <www.bls.gov/cps/ces_cps_trends.pdf>.

Figure 3
Labor Force Participation Rate

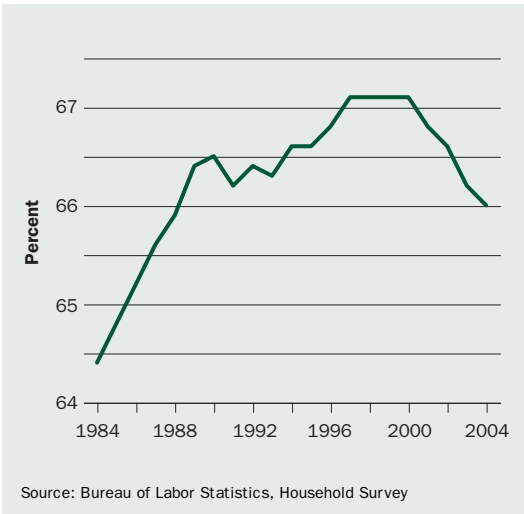
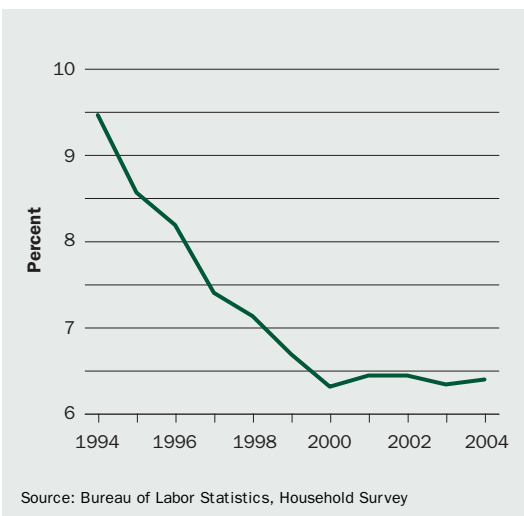


Figure 4
Percent of Labor Force Nonparticipants Who Want a Job



126,000 per month between June 2003 and the end of 2004, then, was enough to have produced the observed steady decline in the unemployment rate over the time period.⁷

A Closer Look at the Decline in Labor Force Participation

The negative relationship between the labor force participation rate and the unemployment rate is well known. In order to be counted as unemployed, one has to be actively searching for employment. The number of people unemployed, then, can decline if the unemployed transition into employment or if the unemployed stop looking for work. In the latter case, the resulting decline in the unemployment rate is not accompanied by an increase in employment but, rather, only by a decline in the total labor force.

There has been some concern about the decline in the labor force participation rate that leads to the lower projected job growth needs calculated above (for example, see Andrews 2004). Figure 3 depicts this decline graphically and also puts it into perspective. The percentage of the population working or looking for work in 2004 was, on average, 66 percent, which is roughly the same rate of labor force participation as in 1988.

The labor force participation rate is primarily a function of the age distribution of the population (with older people being less likely to enter the labor market—this distribution will be explored further below), individual preferences, and the economic prospects in the economy. It is possible that the labor force participation rate in

the 1990s was artificially inflated; it actually happened, but it was perhaps an anomaly of the times rather than any change in trend. In other words, that time period provided extraordinary economic opportunities, pulling people into the labor market who might not have otherwise entered. Analogously, part of the labor force participation rate decline was also likely a response to fewer job opportunities as a result of the 2001 recession. A similar decline in the participation rate can be seen in the 1991–92 recession, as well. However, the recent decline, and even its acceleration, began well before the 2001 recession, suggesting other, noncyclical, contributors (such as changes in preferences) to the decline. What exactly those contributors might be is difficult to identify, but analysts are not willing to rule out the potential of a new trend in labor force participation.⁸

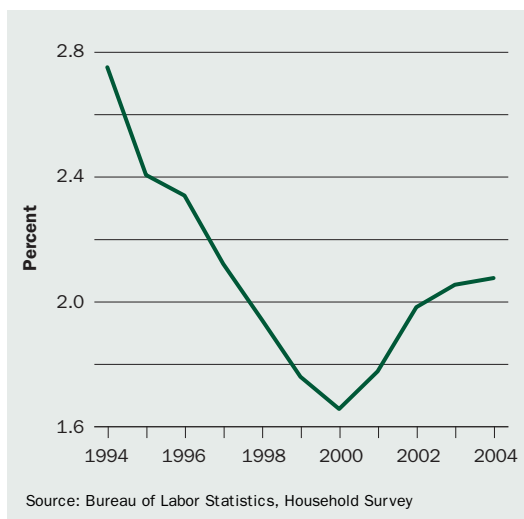
Types of labor force nonparticipants. There are basically two types of labor force nonparticipants: (1) those who do not want a job (retirees, for example) and (2) those who would like to have a job but who for some reason have stopped looking. The bulk of labor force nonparticipants (roughly 90 percent or more) do not want a job. Figure 4 shows that the percentage of nonparticipants who want a job declined steadily between 1994 (the first year such a question was asked in the BLS household survey) and the middle of 2000. It has stayed roughly constant at about 6 percent since that time.

An even smaller percentage of nonparticipants that are of the greatest concern are those who not only want a job but have also looked for a job during the previous year and are available to take a job if one were offered. These people, given that they have exerted some effort to find a job in the past year, are considered to have demonstrated a commitment to the labor market. The fact that they have stopped looking is of interest because it may reflect their negative assessment of overall job prospects. While as of 2004 this group represents only 2 percent of all nonparticipants, that percentage has grown steadily since 2000 (although the increase has flattened out since 2002) (see Figure 5).

There are several reasons why one may have stopped looking for work but would want a job and would take one if it were available to them. The survey answers given for not currently looking for work include family responsibilities (such as child-care difficulties), being in school, being in poor health, or being discouraged; there is also an undefined “other” category. The one reason that has received most of the attention coming out of the 2001 recession is “discouraged.” A discouraged worker is one who has given up the job search because of perceived poor prospects—that is, the chance of getting a job is not worth the effort one would have to exert to find it. In 2004 these people averaged 30 percent of nonparticipants who want a job, searched in the previous year, and are available for work now (see Figure 6). They represent less than 1 percent of all nonparticipants.

Discouraged workers and employment growth. While representing only 1 percent of all nonparticipants, the number of people classified as discouraged amounted to an average of 466,000 in 2004. If indeed these people were still actively

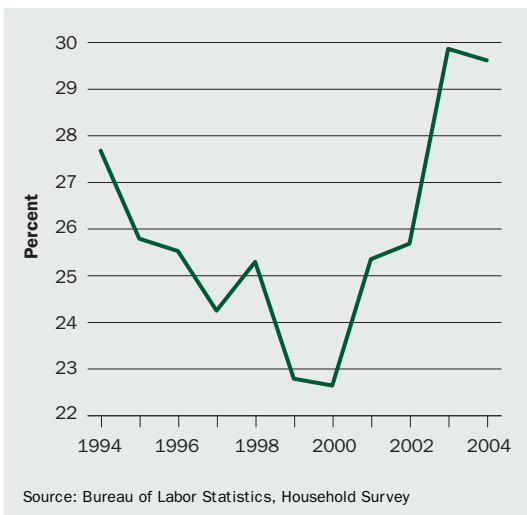
Figure 5
Percent of Labor Force Nonparticipants Who Want a Job, Searched in the Previous Year, and Are Available to Work Now



7. These job growth estimates by the BLS are merely estimates, and the numbers reported here are not intended to reflect a degree of accuracy that does not exist. Details on the accuracy of the monthly employment numbers can be found in the technical appendix on any “Employment Situation” news release. For example, see <www.bls.gov/news.release/empstoc.htm>.

8. Federal Reserve Board Vice Chairman Roger Ferguson considered both cyclical and noncyclical components to the recent decline in labor force participation rates in a recent speech (Ferguson 2005). He argues that while a trend change cannot be ruled out, cyclical influences are the most likely culprit for the declining labor force participation.

Figure 6
Discouraged Workers as a Percent of Labor Force Nonparticipants Who Want a Job, Searched, and Are Available



searching for work, the total number of unemployed in 2004 would have been 8.6 million, and the unemployment rate for 2004 would have averaged 5.8 percent (instead of 5.5 percent). Figure 7 plots the unemployment rate between January 2000 and December 2004 as reported by the BLS and what the unemployment rate would have been if those classified as discouraged had not stopped looking for work.⁹ The two series obviously track each other very closely, with the largest difference between the two series being roughly 0.4 percentage points.

Adding the discouraged workers to the official count of the unemployed, however, would not likely alter the view of the labor market, which is generally believed to be gaining strength. Furthermore, if the additional number of discouraged workers each month were counted in the labor

force (as unemployed), the average number of jobs that would have needed to be created between June 2003 and the end of 2004 to absorb these additional workers increases to 109,000 per month (as opposed to only 93,000 per month without including the discouraged workers). The bottom line is that the 126,000 average monthly increase in jobs between June 2003 and December 2004 was enough to accommodate labor force participants and discouraged workers.

As the unemployment rate continues to fall, however, people reassess the best use of their time and are more inclined to enter or reenter the labor market. This cyclical increase in the labor force participation rate occurred following the 1990–91 recession (see Figure 3). Not only will those currently classified as discouraged likely reenter the labor force, but, in a different, more lucrative economic environment, nonparticipants who currently say they do not want a job also may enter. Of course, if these events occur, the creation of an average of 126,000 jobs per month may not be enough to keep the unemployment rate from rising. Over the next several years, however, a natural downward pressure on labor force participation will occur as the baby-boom generation reaches retirement age.

Taking the Age Distribution into Account

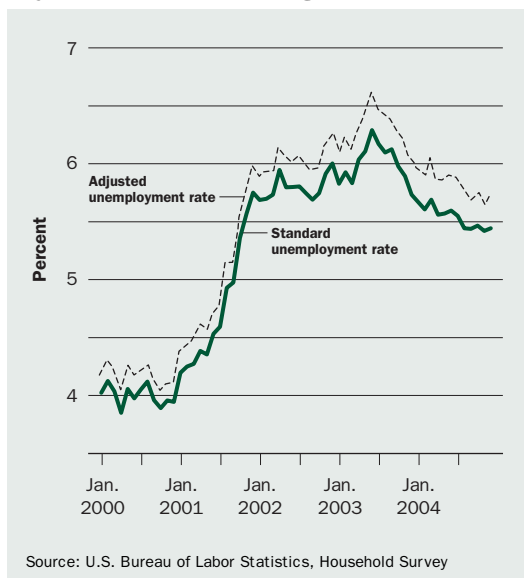
It was stated earlier that an average of 66 percent of the population was in the labor force in 2004. In fact, the percentage of the population participating in the labor market varies quite dramatically across the age distribution. For example, in 2004, 61.1 percent of those between the ages of sixteen and twenty-four, 82.7 percent of people between twenty-five and fifty-four years old, and 36.2 percent of those fifty-five years and older participated in the labor market.

In addition, the population growth in each of these age categories has varied considerably. Specifically, from 2000 through 2004, the population of people between the ages of sixteen and twenty-four grew an average of 1.6 percent per year, the population between twenty-five and fifty-four grew an average of 0.6 percent per year, and the population fifty-five and older grew at an average of 2.5 percent per year.

As a percentage of their respective populations, the labor force participation rate has been changing in different ways across the age distribution. Adjusting the population growth in each age category by the labor force participation rates in each age category, the labor force of those aged sixteen to twenty-four is estimated to be decreasing at an annual average rate of 0.03 percent, the labor force of those twenty-five to fifty-four years old is increasing annually by 0.06 percent, and the labor force of those fifty-five years and older is increasing by 1.9 percent. Taking these different growth rates in the labor force across age groups into account, the estimate of the number of jobs needed to keep unemployment under control is refined further and turns out to be an average of 95,000 jobs per month.¹⁰

In the future, the age distribution is expected to shift quite substantially, with baby boomers retiring (increasing the number of people in the lowest labor force participation age bracket) and the number of workers in their prime working years (twenty-five to fifty-four) declining.¹¹ A rough estimate of the average number of jobs that must be created per month just five years from now can be made by imposing the age distribution that will exist in 2010 on today's labor market.¹² The result of this exercise suggests that just the shift in the age distribution alone will decrease the number of jobs that need to be created to about 91,000 per month on average. This smaller number of jobs needed to absorb the labor force is a direct result of a slowing in the population growth of working-age (twenty-five- to fifty-four-year-old) adults (from 0.6 percent per year to -0.1 percent per year) and a large increase in the segment of the population with the lowest rate of labor force participation; the number of individuals in the fifty-five and older age bracket is expected to grow at 3 percent per year between 2004 and 2010.

Figure 7
Standard Unemployment Rate and
Adjusted Rate for Discouraged Workers



9. These data are available from the Bureau of Labor Statistics at <www.bls.gov/Webapps/legacy/cpsatab12.htm>.

10. The entire February 2004 issue of the *Monthly Labor Review* is devoted to projecting GDP, employment, and labor force growth. Each of the articles assumes the same average annual rate of growth in total population (there is a slight projected difference in the 16+ population) and total labor force between 2002 and 2012 as was seen between 1992 and 2002. Furthermore, there is no accounting in the macroeconomic models for changes in labor force participation rates among different age categories.

11. This projection, of course, assumes that other infusions into the labor force are held constant. The potential role of increased immigration will be discussed below.

12. This estimate assumes that labor force participation rates stay the same (something just demonstrated to be problematic) and that technological advancement is such that the same number of base jobs exists five years from now. These are, obviously, both very crude assumptions. Estimates of population growth are obtained from population projections estimated by the U.S. Census Bureau (www.census.gov).

Supplying Job Growth Potential

It's important to understand that the focus so far has been on the number of jobs that need to be created to keep unemployment in check. Nothing discussed here has anything to do with growth in consumer demand, labor productivity growth, or any other factors that may affect how many jobs are actually created or what the U.S. economy's job creation potential is. It may be in the interest of policymakers to set goals for job creation in the United States, but it is also important to realize that not meeting those goals does not necessarily mean more people are out of work; the job numbers presented earlier in this article should be considered a lower-bound target for policymakers.

Sustaining a desirable overall growth in the U.S. economy, however, may require a rate of job creation that exceeds this lower-bound target. A recent report by the Organisation for Economic Co-operation and Development (OECD) (2003) indi-

One source of interest in job creation is not how many jobs are needed to employ the willing but how many jobs are needed to fuel a desired growth in overall economic output.

icates that differences in economic growth across developed economies can largely be explained by differences in labor utilization.¹³ In other words, countries in which employment rates and hours of work were among the lowest also experienced the slowest growth in GDP. It was also found

that weaknesses in labor utilization were not offset by faster growth in labor productivity (Baily 2003, 66; OECD 2003). While the recent labor productivity growth in the United States is a likely culprit for explaining the unprecedented lack of employment coinciding with enviable levels of GDP growth, the OECD report points out that there are limits to the ability of labor productivity growth to sustain growth in GDP. Ensuring continued output growth will eventually require an infusion of labor to support it. Several options have been suggested as to how the United States can fuel its economic growth in light of the projected natural decline in the growth of its labor force.

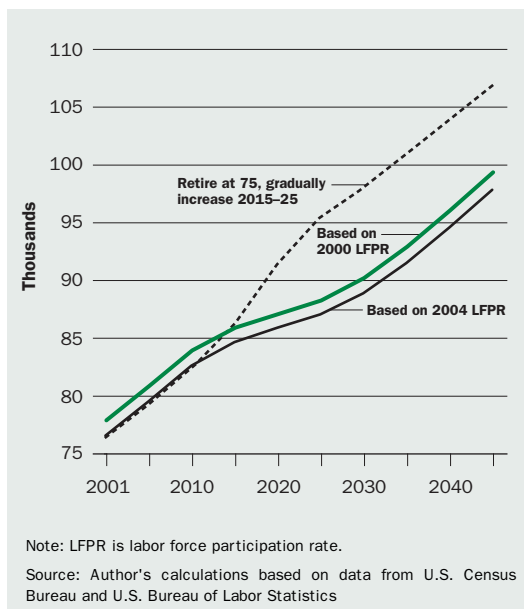
Social Security reform. One suggestion that is unpopular with many workers and policymakers is the encouragement of later retirement ages through modification of Social Security and Medicare policies. Since the mid-1990s Alan Greenspan, the chairman of the Board of Governors of the Federal Reserve System, has noted that the Social Security system, as currently constructed, will not be financially able to support all future retirees at the level promised in current law (see, for example, Greenspan 1997, 2005). He has noted that benefit cuts are almost surely to be part of the solution, and increasing the age at which one can qualify for Social Security is one possible way to accomplish that. Greenspan has raised the possibility, for example, of adjusting the normal age of retirement to “keep the ratio of retirement years to expected life span approximately constant” (see Greenspan 1997). To see how this adjustment might work, consider the following illustrative example. Life expectancy at birth in 1946 (the first year of the baby-boom generation) was 66.7 years. The ratio of retirement years to expected life span, then, for someone born in 1946 is 0.025 (= $[66.7 - 65]/66.7$). If this same ratio is applied to someone born in 1964 (the last year of the baby-boom generation), the retirement age for that person should be 68.4 years (= $70.2 - [0.025 * 70.2]$).¹⁴

So how effective will raising the retirement age be in generating greater labor supply? Some evidence on this point is provided by seeing what happened to the incidence of retirement when the United States introduced an early retirement age. Beginning in 1961, workers were allowed to start receiving Social Security benefits

at age sixty-two. Early-retirement Social Security payments are actuarially adjusted, based on life expectancy, so that expected total Social Security wealth for an early retiree is the same as if the person had waited to retire at the normal age. As a result of this change, the probability that a worker retired at age sixty-two increased from about 2 percent in 1960 to about 7 percent in 1970 to over 20 percent in the late 1990s.¹⁵ An additional contributor to the tendency of U.S. workers to retire earlier and earlier is the growth of private employer-provided pension plans, which typically have an earlier benefit eligibility age than Social Security. The bottom line is that people respond to incentives, and if the incentives are appropriately structured the U.S. economy would benefit from more able-bodied elderly contributing to the labor force.¹⁶

Figure 8 illustrates three scenarios for what the labor market can expect over the next forty years regarding male labor force participants under a couple of different scenarios.¹⁷ The first scenario depicts the expected growth in the labor force using the population projections from the U.S. Census Bureau and the labor force participation rates for different age groups in 2004. The flattening of growth in labor force participants seen between 2010 and 2030 exactly corresponds to the retirement among baby-boomers when they reach sixty-five years of age. The second scenario corresponds to the same population projections but assumes a return of labor force participation rates to their 2000 levels. This profile is the same shape, with numbers slightly higher. The third scenario simulates a delay in the age of Social Security eligibility. Again assuming the same population projections, this profile depicts a delay in eligibility by five years, in five-year increments, starting in 2015.¹⁸ Delaying the age of eligibility has the effect of changing the structure of the labor force growth profile, retaining its pre-2010 trajectory.

Figure 8
Projected Growth in Male Labor Force:
Three Scenarios



13. Also see Altavilla, Garofalo, and Vinci (2004), Baily (2003), and Rhoads (2002).

14. Note that the life expectancy of someone born in 1940 (the first year Social Security benefits were paid on a regular basis) was sixty-three years, two years before he (typically) could start receiving Social Security payments.

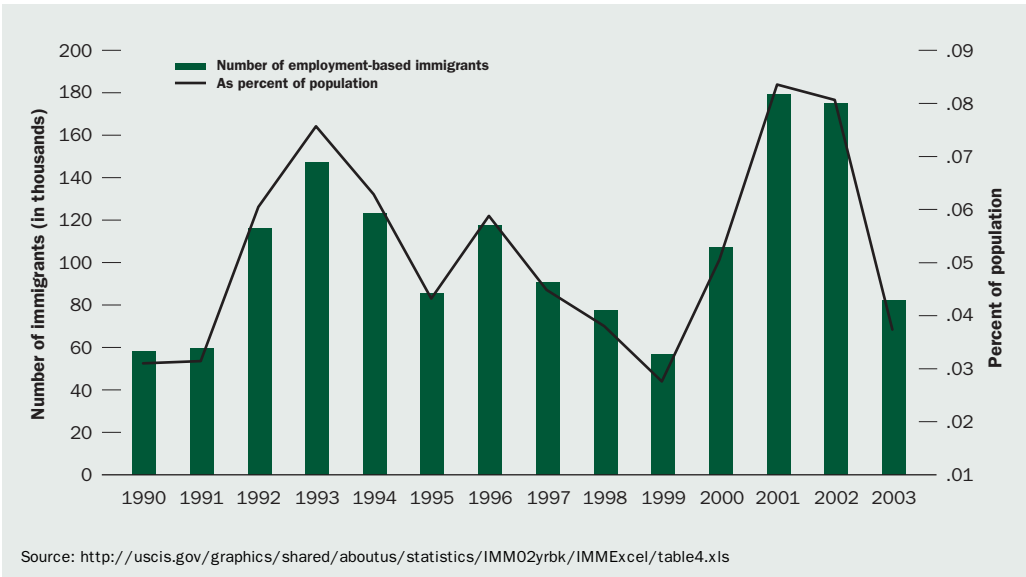
15. See Gruber and Wise (1997), who document the same retirement disincentive effects of early retirement provisions in Social Security programs in other countries.

16. More evidence on the power of the incentives of Social Security provisions can be found in Cole and Gruber (2000). One consideration with more elderly workers participating in the labor market is potentially higher health and disability costs for all workers because these older workers would still likely be included in their employer-provided health and disability plans.

17. The trends discussed here for men are the same for women, but total numbers are always lower because men have a higher labor force participation rate at every age.

18. This assumption of a change every five years in five-year increments is for the sake of simplicity since the population and labor force participation rates are reported for five-year age ranges.

Figure 9
Employment-Based Immigration Levels and Percent of Population



Increased immigration. Another identified potential source for contributions to the declining native labor force in the United States is immigration. Industry lobbyists have been among the most vocal proponents for easing immigration restrictions to supply their skilled labor needs.¹⁹ Immigration policy has gone through many changes over the years as the flow of foreigners to the United States is affected by political constraints, social forces, and economic need. Figure 9 depicts the recent trends in employment-based immigration to the United States, both the number and percent of population. These two statistics follow the same path and show an increase in immigration since 1999 followed by a sharp decline, likely as a result of post-9/11 Homeland Security policies.²⁰

The most recent effort to change immigration policy is a guest-worker-type program President Bush is promoting. This program would allow foreign nationals to work for three years in the United States and would ease their transition to permanent residency.²¹ While some argue this program is motivated by security concerns and a desire for the United States to better document the many workers who are in the country illegally, the effect would still be to increase the pool of workers from which industry could draw.²²

There are two main criticisms of the immigration plan to fuel U.S. labor force growth (see, for example, Ip 2004). The first is that there are not enough young, educated workers in the developing world to supply all of the growing labor force demands in the West. Not only is the population of the United States aging, but the populations of all major developed economies are going through roughly the same changes in their age distributions (for example, see Gregor 2004). Furthermore, lower fertility rates in some countries (particularly in eastern and southern Europe) provide an even greater threat to longer-term declines in labor force growth than those faced by the United States.²³ In other words, competition will be fierce for luring would-be immigrants to the United States to supply this country's employment demands. The second criticism of relying on immigration to make up labor force shortfalls is that, by

importing skilled workers from other countries, those countries of origin are being deprived the human capital they need to grow and develop. The concern about “brain drain” is not limited to the developing world. Saint-Paul (2004) documents the extent to which immigration to the United States from Europe during the 1990s has deprived European countries of some of their most talented resources.

Offshore outsourcing. The unpopular later retirement ages and the potential infeasibility of relying on immigration lead us to a the third possible source of supplying growing labor needs in the United States: offshore outsourcing. Making use of labor that stays in its own country could provide needed labor inputs to fuel production in the United States while the returns to that human capital stay in the country of origin. In this context, the use of offshore outsourcing should be viewed as an opportunity to replenish an anticipated decline in a domestically produced factor input (that is, labor).

While the productivity gains to outsourcing in this circumstance would arguably be larger than if outsourcing resulted in the substitution of foreign labor for domestic labor, this third solution is not without its critics. Benefits and costs to outsourcing would not be equally distributed because it is not possible to outsource all types of production processes. For example, those that require customer contact, such as education, health care, and tourism (hotels and restaurants), cannot be outsourced overseas and will continue to require domestic infusion of labor. It is also important to realize that while some jobs flow offshore, the economic growth this source of labor might fuel would generate demand for domestic products and could result in the creation of jobs we cannot even yet imagine. “Logistics,” for example, is a service industry that provides high-paying domestic employment to keep track of and direct the flow of products and services that are being supplied all over the world.

Conclusions

The technological advancements through the 1990s are likely what has allowed the U.S. economy to grow at a respectable pace coming out of the recession of 2001 without generating the numbers of jobs such growth typically creates. This lack of anticipated job creation, along with a continued decline in the unemployment rate, has created some confusion about the number of jobs that need to be created versus the level of job creation that is desirable.

While this article has explained the first part of this confusion, it has merely made suggestions about the second part. In other words, while the current rate of job

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19. For example, see Aeppel (2004) and Machalabe (2004), who detail the shortage of truck drivers in the United States. Also see Lowell (2000).
 20. These statistics overcount the number of workers added to the labor force through immigration because they include the spouse and children of the immigrant who is coming to the United States for employment. A report produced by the Federal Reserve Bank of Dallas (Orrenius 2003) suggests that post-9/11 policies affected immigration more indirectly (for example, through stricter background checks, fee increases, and longer wait times) than directly through stricter quotas. However, Orrenius also points out that after 2001 the H-1B visa cap of 195,000 was allowed to revert to the 1992 level of 65,000.
 21. Details of the Bush administration’s proposal can be found at “Fact Sheet: Fair and Secure Immigration Reform,” (January 7, 2004) <www.whitehouse.gov/news/releases/2004/01/20040107-1.html>.
 22. A recent estimate is that there are 6 million undocumented immigrants in the U.S. labor force (Passel, Capps, and Fix 2004).
 23. See <www.prcdc.org/summaries/worldpop/worldpop.html>.

creation appears to be able to sustain the expected growth in the labor force for the time being, it is not clear that it is enough to sustain the rate of economic growth that will be desirable in the long run. This article has touched on several options available to policymakers in affecting this trend of slower labor force growth, but any one of them will take time to implement and adjust to, suggesting that serious and immediate discussion of their respective merits is in order.

Appendix

Algebraic Requirement for a Constant Rate of Unemployment

It is possible to demonstrate algebraically that the unemployment rate staying constant from one period to the next must necessarily imply that the percentage change in the labor force equals the percentage change in employment across the two periods.

Let the subscript 1 correspond to the first time period and the subscript 2 to the second time period. UR is the unemployment rate, LF is the labor force, and E is employment. Then

$$UR_1 = UR_2 \Rightarrow \frac{LF_1 - E_1}{LF_1} = \frac{LF_2 - E_2}{LF_2}.$$

Multiplying this out ($LF_2 LF_1 - LF_2 E_2 = LF_1 LF_2 - LF_1 E_1$) and subtracting $LF_2 LF_1$ from both sides and dividing by -1 yields

$$LF_2 E_2 = LF_1 E_1.$$

Subtracting $LF_1 E_1$ from both sides and rearranging produces

$$E_1(LF_2 - LF_1) = LF_1(E_2 - E_1).$$

Finally, dividing both sides by $E_1 LF_1$ results in

$$\frac{LF_2 - LF_1}{LF_1} = \frac{E_2 - E_1}{E_1},$$

which reflects the equivalence of the percentage change in the labor force and the percentage change in employment.

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