U.S. Labor Supply in the Twenty-First Century

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The American labor force will be transformed as the twenty-first century unfolds, a change that will confront policymakers and business firms with new challenges and new opportunities. The impending slowdown of labor force growth that will accompany the retirement of the baby boom generation already is playing a central role in national debates over the future solvency of Social Security and Medicare, as well as U.S. immigration policies. But labor supply changes will be influenced by other dimensions as well. In the coming decades, American workers are likely to be, on average, older and better educated than today's labor force. The globalization of labor markets is already opening new employment opportunities for some Americans and changing the wage rates paid to others. The production technologies and personnel policies adopted by tomorrow's firms will undoubtedly reflect the numbers and types of workers available for employment.

To explore the labor-supply trends that will affect economic policymaking in the twenty-first century, the Federal Reserve Bank of Boston chose "Labor Supply in the New Century" as the theme for its 52nd Annual Economic Conference held in June 2007. In analyzing these future trends, it is helpful to consider how these changes will affect both the *quantity* of workers in the U.S. labor force and the *quality* of their skills. In terms of the policy implications, the supply of American workers is of obvious importance to the Federal Reserve System, because the size of the U.S. labor force is a direct input to the Fed's estimate of the nation's potential economic output. Moreover, in the short run, the Federal Reserve needs to understand the various ways in which the quantity of labor

supply adjusts to changes in labor demand during business cycles. But while business cycle expansions and recessions exert powerful short-run impacts on labor-market outcomes, long-run living standards are determined by the quality of skills in the aggregate labor force and the types of human and physical capital that workers can use when performing their jobs. The worker-quality dimension to labor force trends, and the impact that these trends have on capital accumulation, are therefore fundamental to policies designed to raise living standards or to expand economic opportunity throughout the population.

The conference's six papers and its keynote address by Eugene Steuerle provide a broad overview of the quantity and quality implications of labor-supply trends. The first paper, by Bruce Fallick and Jonathan Pingle, carefully documents the extent of the upcoming slowdown in labor force growth due to the aging of the population. Alicia Munnell and Steven Sass, co-authors of the second paper, investigate the likely labor-supply behavior of older workers, including the baby boomers born between 1946 and 1964, the oldest of whom are now approaching traditional retirement ages, based on the behavior of past cohorts. The third paper, by David Autor, discusses the rising income inequality in the U.S. labor market over the last 15 years, and highlights the domestic and international forces that will affect wage inequality in the future. Robert E. Hall, author of the fourth paper, discusses how domestic labor supply adjusts to fluctuations in labor demand during the typical business cycle. The fifth paper, jointly written by Dale Jorgenson, Richard Goettle, Mun Ho, Daniel Slesnick, and Peter Wilcoxen, outlines the likely U.S. trends in both labor supply and labor demand up to 2030; the authors predict that these trends point to much lower growth in future aggregate output.

I. Quantity and Quality Dimensions of Labor Force Trends

Labor Quantity and the Aging of the American Labor Force

A recurrent theme in the conference sessions is the widespread impact that the aging of the U.S. population will have on the nation's workforce. Among the conference participants, there was a clear consensus that the demographics of aging will have a quantitatively important effect on the future size of the U.S. labor force. But how large might this aging effect

actually be? And how effective will public policy be in shaping and controlling the outcomes of this effect?

Population aging will reduce the aggregate labor force participation rate, defined as the fraction of all U.S. residents at least 16 years old who are either employed or actively searching for work. As Fallick and Pingle point out, increases in the fraction of the population reaching traditional retirement ages will reduce the overall labor force participation rate. But several other factors are working to increase the age at which American workers are likely to retire. Munnell and Sass contend that benefit changes in Social Security and private pension plans will reduce the adequacy of retirement income derived from these sources. These reductions will encourage some older individuals to keep working, at least part-time, beyond traditional retirement ages. Stanford Ross explores additional institutional changes that might reduce early-retirement incentives, while several conference discussants note that the labor force participation rates of older women may increase in the future. Throughout their lives, women in the baby boom generation have had higher participation rates that did earlier cohorts of women, and this trend might continue as baby boomer women enter their 60s.

Moreover, work lives could be prolonged by recent changes in the nature of employment and the characteristics of today's older workers. The physical demands of work that older generations routinely confronted have generally decreased; jobs in offices are typically easier, from a physical standpoint, than those performed in factories or on farms. The health of older Americans has also improved, so prolonging one's working life may be feasible even in more demanding positions. Policy changes might also prompt older individuals to increase their labor supply. Ross notes that the current legal framework is favorable to taking early retirement, but that this policy orientation could change to promote greater labor force participation among older workers.

Quantity effects stemming from the aging of the population may also have more subtle effects on the labor market. Autor hypothesizes that as the elderly's share of the population increases, so too will the demand for personal services, like home aides or healthcare workers, jobs typically performed by relatively less-educated workers. As a result, population aging may help shore up the low end of the U.S. wage distribution and

provide increased incentives for labor force participation among low-skilled workers. Munnell and Sass discuss a different effect that aging will likely have on the wage structure: the increased relative supply of older workers will act to decrease the premium paid for labor market experience.

An additional effect of population aging on the labor market will operate through the nation's social insurance programs. Even if some of the policy changes currently being contemplated are enacted, Social Security and Medicare will constitute a growing share of federal expenditures and national economic output. Payroll taxes may need to be increased to help reduce long-run structural deficits in these programs, potentially exacerbating tax distortions that affect labor supply. Benefit generosity may also be further reduced, amplifying the retirement income adequacy effects discussed by Munnell and Sass. The increasing size of social insurance expenditures may tie the hands of future government policymakers, leaving little room for increased expenditures on programs serving the young. This indirect effect resulting from population aging could have an important impact on the future U.S. labor market by limiting the extent of programs, such as early childhood education, designed to increase workforce quality.

Trends in Labor Quality

While the conference consensus is that demographic shifts will undoubtedly lead to slower growth in the quantity of labor supplied, the outlook for labor quality is more encouraging. An increase in workforce quality is expected to offset, to some degree, the quantitative decline in labor force growth. The American workforce is considerably more educated today than it was twenty years ago, and education levels among American workers are expected to continue rising. Higher educational attainment is encouraged by the faster wage growth that college-educated workers have recently experienced, a development that itself reflects the ongoing shift in labor demand toward the high end of the skill distribution.

The precise size of the expected "quality offset" to lower labor-supply growth is difficult to gauge. As Autor documents, the pace of increase in college enrollments and completion rates has slowed in recent years. Since, as Autor says, "the gap in college attendance by parental income, race, and ethnicity remains large," there is room to increase the overall quality of the U.S. labor force in at least two ways. First, policies should facilitate pre-school investments in human capital, and second, policies should promote college enrollment among low- and moderate-income families. Gary Burtless, one of the paper's discussants, explores the reasons that men in the United States have lower college completion rates than men in other rich nations. He suggests that less-affluent parents have few resources available to influence their children to take a far-sighted view of the future payoffs that higher education brings. Hence, children from these families are less likely to make the investments of time and money that obtaining a college degree requires. In addition, Autor notes that immigration policy can provide an additional lever to further raise the skill and education levels of the U.S. labor force.

By incorporating labor quality into their model of the U.S. economy, Jorgenson, Goettle, Ho, Slesnick, and Wilcoxen account for changes in both the education and experience of the U.S. labor force. The authors assume that the educational composition of the U.S. population will eventually stabilize. This assumption leads labor quality to continue to rise for some time, but with the increases gradually diminishing during the next 25 years. According to this model, the quality-adjusted effective labor force continues growing more rapidly than the working-age population, but only modestly so. Even after accounting for increasing quality in the American workforce, the authors are only slightly more positive than Fallick and Pingle—who account only for quantity changes—about potential growth in the U.S. economy in the next several decades.

II. Conference Summary

Session 1: The Outlook for Labor Supply in the United States

The first session's paper provides an overview of the effects of demographic change on aggregate U.S. labor force participation, assessing shifts in age and gender mix as well as historical and possible future changes in participation rates for age by gender subgroups. Bruce Fallick and Jonathan Pingle argue that a key factor driving aggregate changes in labor force participation in coming years will be the evolution of the age distribution of the population—specifically, the movement of the

distribution's baby boom "bulge" from older working ages into their retirement years, traditionally assumed to start at age 55 and beyond. The authors note that increases in within-group participation rates can offset some of the downward pressure from population aging, but avoiding a decline in the aggregate labor force participation rate would require very substantial—and unlikely—increases in participation rates across all age groups.

The age mix of the U.S. population will change substantially during the next 35 years. For example, the Census Bureau projects that the portion of individuals aged 35 to 44 years will shrink from about 18 percent of the population to about 15 percent, while the fraction of those aged 65 years and older will rise from about 16 percent to 25 percent. Applying current (2005) participation rates by age and gender to these shifting age shares, Fallick and Pingle provide a simple forecast of the aggregate U.S. labor force participation rate that declines from about 66 percent in 2005 to about 63 percent around 2020, and to less than 60 percent by 2033 and years thereafter. The authors then compare population share projections made by the Social Security Administration with those forecast by the Census Bureau, and note that taking account of increased longevity, especially among older women, causes the Census Bureau's population projections to imply a lower aggregate U.S. labor force participation rate. Similarly, differing assumptions about future immigration also change the projected age mix of the population, as immigrants are typically concentrated in age groups with high labor force participation rates; in addition, immigrants may be more likely to be labor market participants than native-born individuals, conditional on age. Fallick and Pingle simulate the effects of various immigration assumptions, and note that even fairly substantial increases in immigration, accompanied by above-average participation by immigrants, only modestly offset future declines in aggregate labor force participation rates. They note, however, that the effects of changing immigration flows or life expectancy on the *size* of the labor force (calculated as the participation rate multiplied by population size) will be more positive than these effects on the aggregate participation rate.

With their baseline projection of a 6 percentage point drop in the aggregate participation rate over the next 30 years, Fallick and Pingle next

examine the possible effects of changes in specific age-by-gender group labor force participation rates. They compare the participation rate projections of the Bureau of Labor Statistics, the Social Security Administration, and their own cohort-based model. In terms of the gender-and-age interactions, a key question is whether older Americans, or a subset of older Americans, will begin to work longer than similar age groups did in the past. Most forecasters expect that better health, increased life expectancies, changing preferences, or changing inducements provided by government and business will lead many older Americans in coming decades to remain in the labor force longer. Such a change may have important effects on aggregate participation because this shift would occur in a fast-expanding segment of the population; indeed, Fallick and Pingle indicate that increases forecasted in participation among older women, meaning those aged 65 years and above, would offset roughly one-quarter of the projected total decline in labor force participation attributable to aging. For prime-age workers, those men and women who are 25–54 years old, the three forecasts differ substantially: the Bureau of Labor Statistics estimate is the most optimistic about future prime-age increases, while the Social Security Administration's forecast is in the middle of the pack, and the Fallick and Pingle model predicts a continuation of current participation rate trends, which reflect long-term declines in the participation rates of prime-age American men, and recent declines for prime-age American women. Teenagers, while a small fraction of the U.S. population, have contributed substantially to recent aggregate declines in labor force participation, and also to differences among the three forecasts. All in all, these forecasts of aggregate labor force participation "diverge noticeably," according to Fallick and Pingle; nonetheless, all three indicate that "likely" changes in the participation rates of various subgroups will only partially offset the aging-related declines in aggregate participation rates or even, according to the authors' own projections, possibly exacerbate these declines.

Fallick and Pingle examine potential policy changes, such as increases in Social Security's "normal retirement age" and "delayed retirement credit," which might alter the likely future path of labor force participation among older Americans. While such changes could have important effects on future participation rates, they note that policy changes for

Social Security have been gradual in the past, and are impossible to forecast in the future. Fallick and Pingle conclude their analysis by predicting that "the outlook is for slower growth in U.S. labor supply from 2007 onward than was the norm in the 1965–2000 period."

The paper's first discussant, Chinhui Juhn, takes issue with the Fallick and Pingle forecast of older Americans' future labor force participation rates. She argues that increased participation by older women, through complementarity of spouses' leisure, may have accounted for over one-third of the increase in older men's participation rate during the 1996–2006 period—and that this effect may manifest in similar ways in the future. Furthermore, Juhn notes that recent and ongoing declines in employer-provided retiree health insurance are likely to push up the participation rates of the 55–64 year old age group nearing the Medicare eligibility age, as well as those for adults aged 65 years and older. She questions Fallick and Pingle's forecast of continued declines in prime-age women's labor force participation, noting that steeper recent declines in the participation rates of never-married women and women without children provide "little evidence that the trend among married mothers—the group that fueled the increases in the earlier decades [the 1970s and 1980s]—has actually reversed and begun to decline."

Instead, Juhn argues, the pervasiveness of recent declines in participation rates among prime-age women points to time effects—specifically weak labor market conditions—not to cohort effects. She then explores what she views as a problem with the cohort-based model that underpins the Fallick and Pingle forecasts, specifically the assumption that the coefficients on time-varying variables such as cyclical factors, education, fertility, and marriage are constant over time. Juhn contends that it is likely that these coefficients are shifting, introducing error into the estimated cohort effects and hence into the forecasts. Her final comment notes that this paper's topic, the future size of the U.S. labor force, is very important because, in conjunction with labor productivity, the size of the nation's workforce affects the economy's potential growth. But to fully understand the predicted declines in the size of the labor force and these ramifications, she argues that we need to pay more attention to the *types* of labor that are forecast to shrink, and we must also sort out the degree to which current labor force trends reflect cyclical supply versus demand shifts.

Lisa Lynch, the second discussant, focuses on two aspects of the Fallick and Pingle paper: their analyses of likely changes in immigration and in labor force participation by prime-age women. She questions whether the authors' simulations of the impacts of "high" immigration—adding 200,000 immigrants annually beyond current flows—is actually so high. Lynch appeals to the Congressional Budget Office's recent estimates that proposed immigration legislation would add 180,000 workers each year for the next ten years, and she also notes that immigrants tend to participate in the labor force at above-average rates, conditional on age. In addition, Lynch contends that even though immigrants' effects on aggregate participation rates are muted by their addition to both the numerator and denominator, they do increase the overall labor supply; furthermore, immigration policy may shift the skill mix of immigrants, with corresponding effects on their contributions to economic growth.

She challenges Fallick and Pingle to ask *why* men's participation rates have been declining before assuming these declines will continue, and raises a number of questions about the authors' assumption that prime-age women's participation rates will decline in coming years. First, the fact that women's *level* of participation is not equal to that of men raises questions about why the pace of decline in women's participation should be similar to men's. Second, labor force participation is positively associated with educational attainment, and since the early 1990s women's college-enrollment rates have been rising faster than men's. In addition, Lynch argues that technological changes have contributed to increases in women's age at the birth of their first child, with implications for their labor force attachment before becoming mothers as well as likely lifetime participation patterns. Finally, like Juhn, Lynch notes that interest in future labor force participation—at least among monetary policymakers—centers on its implications for future output growth; in this context, the increased average "experience" of an older workforce should enhance labor productivity and more than proportionally add to output gains.

Session 2: The Labor Supply of Older Americans

Alicia Munnell and Steven Sass examine the labor supply of older Americans, a group they define as those aged 55 years and up, paying particular attention to men in this age group. Munnell and Sass point to several

changes in the American retirement income system that are making it necessary for people to continue labor force activity at later ages than was the norm among older cohorts in the second half of the twentieth century. Social Security's Full (Normal) Retirement Age has been gradually increasing from 65 to 67, resulting in an effective cut in benefits for workers retiring at any given age. In the coming years, rising Medicare premiums and increased taxation of Social Security income are virtually certain, and further cuts in Social Security benefits to restore the System's long-term fiscal balance are possible. Private pensions have also been transformed over the last two decades, with defined contribution plans, such as 401(k)s, largely replacing traditional defined benefit plans. Unfortunately, to date workers' defined contribution account balances have generally fallen short of the funds needed to generate the retirement income amounts typically provided by defined benefit plans. Personal non-pension savings, the third leg of the retirement income stool, have diminished in recent years and cannot make up for shortfalls in public or private pension plan funds. Munnell and Sass conclude that if people are going to maintain their living standards in retirement, then retirement ages will need to be increased; in other words, Americans will need to participate longer in the workforce than has traditionally been the case.

Until recently, the trend was toward retirement at younger ages. The increased affluence accompanying economic growth during the twentieth century made it feasible for people to spend an increasingly long period of time toward the end of their lives enjoying more leisure, a phenomenon reinforced by early retirement incentives in many private defined-benefit pension plans and by the availability of Social Security benefits starting at age 62. The trend toward older men aged 55–64 years taking early retirement ended in the mid-1980s, and since then has been partially reversed. Munnell and Sass attribute this reversal to several factors, including changes in Social Security, changes in employer-sponsored pensions, the elimination of a mandatory retirement age, shifts in employment toward less physically demanding jobs, and the decreasing availability of employer-provided retiree health insurance.

Accompanying the trend toward later retirement, Munnell and Sass document the changing employment patterns of older workers. In the United States, older workers are now less likely to remain with a long-

term employer as they approach retirement than was previously the case. The decrease in job tenure among older workers places these workers at increased risk of job displacement. Munnell and Sass show that older workers are generally at low risk of displacement, but this is because older workers are more likely than young workers to have accumulated substantial tenure on their jobs. Yet age alone does not protect workers; holding tenure constant, older workers are actually at greater risk of displacement than are young workers.

Increased life expectancy and improved health among the older U.S. working-age population, along with decreasing physical demands in the workplace, bode well for the ability of most people to extend their careers beyond retirement ages that were typical in the past. However, Munnell and Sass note that there is still a significant share of Americans in their late 50s and early 60s who would find continued participation in the workforce difficult due to poor health or disability. Other obstacles to extended work lives they discuss include many employers' resistance to part-time employment and the continued early availability of Social Security benefits at age 62. On net, however, Munnell and Sass conclude that labor force participation rates of men in their late 50s and 60s are likely to continue to increase.

In his comments, Robert Hutchens notes that the Munnell and Sass paper is very relevant to the current policy debate on how government transfer programs serving older Americans should be reformed. If older Americans can easily find decent jobs and remain physically capable of working, then solving Social Security's fiscal problems by reducing the growth of benefits below that mandated by current law would be much more palatable than it would be under an alternative scenario, where many older Americans are either unable to find work or become too frail to work as they age.

Hutchens believes that we need additional information in order to answer two important questions regarding the changing labor market for older people. First, how do the trends in labor force participation differ by educational attainment? Less-educated workers might be suffering disproportionately from changes in Social Security and private pensions, but also likely have job prospects that are less favorable than are those for individuals with more education. Second, how will employers

respond to the increased supply of older workers? Will firms be able to accommodate older workers' changing needs and allow them to stay in long-term career jobs, or will older people largely end up in a spot market for non-career jobs and lose the job-specific human capital that they had previously accumulated?

Joyce Manchester focuses her comments on two reasons for being optimistic regarding the prospects for delayed retirement and increased retirement income: trends in the early claiming of Old-Age Social Security benefits, and older women's labor force participation. Manchester presents evidence from the Social Security Administration's records showing that people who claim benefits before age 65 tend to have weaker attachment to the labor force, and lower earnings, before claiming benefits than do those who claim at 65. The full retirement age for Social Security benefits is being gradually increased from 65 to 67 under current law, and the penalty associated with claiming benefits at 62 rather than at the full retirement age is increasing. Manchester shows that this change in Social Security appears to be discouraging benefit claims at age 62, with the implication that we can expect further delays in retirement as the Social Security full retirement age continues to increase.

Turning to the issue of the labor force participation of older women, Manchester notes that women nearing retirement age increasingly do so after spending much of their adult lives in the labor force. As a result, older women are more likely to receive Social Security benefits based on their own earnings record, rather than receiving spousal benefits, and will also be more likely to have their own private pensions and health insurance than were women in earlier cohorts.

Session 3: How Structural Shifts in Labor Demand Affect Labor Supply Prospects

David Autor's paper explores the interaction of labor demand and labor supply, and its implications for the wage structure and future labor supply responses in the United States. Autor documents that the widely recognized growth in U.S. earnings inequality can be usefully divided into two stages. During the 1970s and 1980s, real wages fell at the bottom of the earnings distribution and rose moderately at the top. In contrast, during the 1990s and early 2000s there was strong growth of real wages

at the top of the distribution, and modest real growth in the bottom tier, with the middle of the wage distribution experiencing the least income growth.

Autor then turns to the question of how shifts in labor demand likely influenced these changes in the U.S. wage structure. A simple model that divides workers into high school graduates and college-educated equivalents does well in explaining changes in wages from 1963 through 1992, and implies that there was a strong shift in demand toward college-educated workers. However, a more complex model is needed to explain the data from 1993 onward, the period in which Autor argues that wage growth "polarized," with wages at the top and bottom of the distribution rising faster those in the middle.

Autor considers a number of candidate explanations for this polarization. Decreases in the real value of the minimum wage, which some studies have found to be a major source of growing income inequality in the United States, cannot explain why wages in the middle of the distribution have stagnated more than those at the bottom. Autor believes that a more promising explanation is that technological change and off-shoring have increased the demand for strong cognitive and interpersonal skills typical of highly educated professionals and managers, and decreased the demand for routine analytical and mechanical skills typical of middle-tier workers. Technological change and off-shoring have relatively little impact on low-level service jobs, which are currently difficult to automate or trade across international borders. Autor points out that the aging of the U.S. population will likely increase the demand for such services in the future, as may growing demand for services by high income households. So, continued polarization of the U.S. wage distribution seems likely.

How might labor supply respond to the recent changes in wage structure? Autor points to evidence showing that barriers to college attendance by youth from low- and moderate-income families remain substantial, and suggests that reducing these barriers would help increase the supply of highly educated workers, and attenuate further increases of inequality at the high end of the wage distribution. Liberalized immigration policies for highly educated workers would also help to reduce high-end inequality.

In his comments on Autor's paper, Jared Bernstein takes issue with the augmented version of the skill-biased technical change explanation for

growing inequality put forth by Autor. While applauding the movement away from the less-nuanced version of the skill-biased technical change story, Bernstein still has doubts about the centrality of skill bias in explaining changes in the earnings distribution. Although he does not deny the existence of complementarity between technology and skills, Bernstein cites his own research with Lawrence Mishel that raises doubts regarding whether the pace of skill-biased technical change has accelerated sufficiently over time to explain the growth of earnings inequality. Bernstein believes that a promising alternative, or perhaps complementary, explanation is change in economic policies and institutions, a hypothesis put forward in recent research by Frank Levy and Peter Temin. However, Bernstein notes that there is no "smoking gun" evidence for the centrality of either skill-biased changes in technology or changes in institutions as an explanation for growing inequality. The policy implications of the two explanations differ significantly—enhanced education and job training are the primary policy tools to address skill-biased technological change, while if institutional change is the primary source of growing inequality, a broader set of policies governing labor relations is prescribed.

Gary Burtless also notes that institutional change has played a role in the growth of inequality. Decreases in private sector union coverage and shifts in pay-setting norms have contributed to growing inequality. Most of Burtless's comment, however, focuses on the supply side of the labor market. He notes that although there were substantial increases in the educational wage premium during much of the time since 1980, there have been only relatively modest increases in college attendance and degree attainment. Men, in particular, seem to have barely responded to the increased economic rewards that accrue to postsecondary schooling. Burtless questions why educational attainment has responded so weakly to the increase in its economic return. He presents data showing that most other OECD countries have experienced substantial increases in postsecondary schooling over the past 20 years, while the United States has not. One possible explanation explored by Burtless is that many low- and moderate-income families in the United States lack the means to effectively push their children to attend college. Paying for their children's tuition and fees may seem unaffordable to such families, and they may not be fully informed about the possibility of financial aid. In many other high-income countries, in contrast, students face little or no out-of-pocket tuition expenses. This hypothesis is consistent with data showing that recent increases in college attendance have been concentrated among young adults from relatively affluent families.

Session 4: The Cyclical Sensitivity of Labor Supply

In the conference's fourth paper, Robert E. Hall analyzes the responsiveness of labor supply to business-cycle influences. He starts by noting that macroeconomists generally believe that short-run business-cycle movements in wages and employment stem primarily from changes in labor demand, not labor supply.[1] The macroeconomist's task is to learn how changes in labor demand interact with workers' labor-supply preferences to generate observed changes in wages and employment. For example, if labor supply is inelastic, workers are relatively willing to accept wage cuts in order to keep their jobs. A decline in labor demand will then bring about a sizeable drop in wages and little change in employment. On the other hand, a more elastic model of labor supply would generate large changes in employment and small changes in wages when labor demand declines. This latter, elastic pattern is closer to what we see in the macroeconomic data, but explaining it runs into a fundamental problem: most microeconomic studies find that workers are relatively unwilling to substitute work for leisure (or vice versa) when wages change. This unwillingness makes their individual labor-supply schedules inelastic, not elastic. Given the inelasticity of the labor-leisure trade-off among individual workers, it is hard to see how changes in aggregate labor demand could raise or lower employment for the entire economy.

To solve this puzzle, a number of economists are working to expand the labor-leisure trade-off assumed in traditional labor supply models. These researchers argue that a third activity—job search while unemployed—should be added to the worker's list of potential uses of time. If unemployed workers must take time to search for new jobs, then there will be a pool of potential workers that could be added to the employment ranks when labor demand increases (or subtracted from the measure of employment when demand falls). This addition would make "labor supply" for the aggregate economy more elastic than that of individual workers. For job-search considerations to be important, however, the size

of this unemployed pool of workers must be sensitive to labor demand. Total labor input must change in recessions and expansions primarily due to changes in the unemployment rate, not because more workers are choosing to participate in the labor market (the participation margin) or because workers who are working decide to spend more or less time on their jobs (the hours margin). The central goal of Hall's paper is to show that unemployment is sufficiently sensitive to labor demand for this to be the case.

Hall starts with a careful examination of the data he will use for this exercise, discussing how employment, hours, and participation are measured in the United States. He argues that the Current Population Survey's measure of employment generated by a survey of households is preferable to a measure generated by a survey of firms conducted by the Current Employment Statistics program (sometimes called the Establishment Survey). Using the household-based measure of employment is preferred because this measure is more likely to be consistent with the hours and participation measures, which also come from the household survey. Hall's next step is to obtain a direct measure of shifts in labor demand. He does this by using statistical theory to extract a common measure of labor-market cyclicality from three fundamental correlates of the health of the labor market: unemployment, average weekly hours, and real personal disposable income per capita.

Once this measure of labor demand is constructed, Hall measures its correlation with the three potential margins on which labor input can adjust over the business cycle: unemployment, participation, and hours. He finds that about 56 percent of the variability in total labor input is due to fluctuations in unemployment, with 12 percent coming from the participation margin and the remaining 32 percent coming from the hours-per-worker margin. The results suggest that unemployment is sufficiently cyclical to support the new theoretical work on job search as a formal alternative use of time in models of the business cycle. Hall concludes that: "More than half of the extra labor input in a cyclical upswing is drawn from the ranks of the unemployed. No model of the cycle in the labor market can claim any realism unless it takes this finding seriously."

Katharine Abraham begins her discussion of Hall's paper by reviewing three potentially important characteristics of his new labor-demand index. First, the index is based on common variation in the fundamental correlates (weekly hours, real personal disposable income, and unemployment). The common business-cycle variation in these correlates is assumed to be unrelated to their long-term trend movements, which are modeled as separate fourth-order functions of time. Yet detrending the data with fourth-order trends (rather than some other type of detrending procedure) may also remove useful business-cycle variation from the data. Second, using real personal disposable income as one of the fundamental variables may contaminate the measure as a pure labor-demand index, because this income variable also includes proprietors' income and government transfers, in addition to wage payments. Third and perhaps most importantly, Abraham says that Hall may want to use total hours as one of the fundamental correlates, rather than using both weekly hours and the employment rate separately. Hall's procedure allows the *common* variation in weekly hours and employment to contribute to his labor-demand index. But firms probably think about variation in hours and employment as distinctly different margins of adjustment, because hiring a new worker includes fixed costs (such as health insurance). These additional costs for new hires are not accrued when varying the hours of workers whom a firm already employs. As a result, the common variation in hours and employment does not have a clean interpretation.

Abraham then discusses how Hall's labor-demand index correlates with the three potential margins of adjustment (unemployment, per-worker hours, and participation). She notes that these margins may be correlated with the index at various time lags, which are not accounted for in Hall's analysis. Also, he finds the correlation between per-worker hours and the labor-demand index to be surprisingly large; this may reflect Hall's treatment of hours and employment as separate fundamental variables, as noted earlier. Finally, Abraham agrees that the difference between employment totals from the Bureau of Labor Statistics' separate payroll and household surveys remains a puzzle. The answer may involve a better understanding of business-cycle variation in "off-the-books" employment, or a rethinking of the population weights in the household survey.

Susanto Basu starts his comments by outlining the differences between the workhorse Keynesian model of the labor market and the newer search-based framework to which Hall is contributing. The Keynesian

view argues for pervasive "stickiness" in both prices and wages over the business cycle. Because both variables are about equally sticky, as a result there is little cyclical variation in real wages in the standard Keynesian model. The approach favored by Hall instead argues that real-wage inflexibility results from search considerations. Once a firm and worker make a good match, they are loath to destroy it simply because the real wage has not changed in exactly the way that a frictionless model of the business cycle would imply. As of yet, there is little evidence in the data to distinguish between the older Keynesian approach and the newer search-based approach. Both models not only accept the presence of involuntary unemployment (unlike more neoclassical models), but also explain this unemployment as a function of inflexible real wages. Only the explanation for real-wage rigidity differs in the two models. Eventually, distinguishing between the Keynesian and search-based frameworks in the data will likely result in a better understanding of how these models respond to specific types of shocks.

Basu then takes issue with one assumption of Hall's exercise; namely, that most of the observed short-run changes in hours and unemployment are due to shifts in labor demand rather than in labor supply. Basu pointed out that changes in government spending typically raise employment, but this cannot be because the labor-demand curve shifts to the right, since there have been no corresponding changes in the fundamental determinants of labor demand (such as the amount of capital per worker, or total factor productivity).

Session 5: Labor Supply and Labor Demand in the Long Run

The fifth paper of the conference was written by Dale W. Jorgenson, Richard J. Goettle, Mun S. Ho, Daniel T. Slesnick, and Peter J. Wilcoxen (henceforth JGHSW). The paper presents a formal model of future U.S. labor supply and demand, derived from a fully specified neoclassical growth model. At its heart, the model presented is the famous growth model developed by Nobel Prize winner Robert Solow in the late 1950s. It is meant to be a long-run characterization of an economy, so it assumes away the short-run business cycle movements that lie at the heart of the analysis in the previous paper by Hall. The neoclassical growth model focuses instead on the determinants of potential long-term growth, which

are the rate of population growth and the rate of technological progress. From these variables, a long-run rate of capital accumulation is endogenously determined. Finally, the contributions of population growth, technological progress, and capital accumulation are added together to obtain the growth rate of potential output.

This characterization of the neoclassical growth model would be familiar to most undergraduate economics students. But the JGHSW paper delves deeply into the inner workings of the neoclassical model to provide more specific predictions about where the U.S. economy is headed. For example, the authors do not merely assume that the amount of labor services available to produce output is simply proportional to the working-age population. Rather, the authors use various measures of "labor quality" (such as education and experience) to adjust the labor input according to how productive it is likely to be. Along the same lines, the model does not assume a single overall rate of technological progress for the entire economy. Instead, it uses sophisticated econometric tools to measure the rate of technological progress in a number of individual industries, and then models how these rates are likely to change in the future. Additionally, the techniques allow the authors to determine whether technological progress in any specific industry is likely to be "labor using" or "labor saving."

The central message of this bottom-up forecasting approach to predict future output is that the U.S. economy will grow much more slowly during the next quarter-century than it has since 1960. Overall GDP growth will slow from 3.2 percent in the 1960–2004 period to 1.6 percent in the 2004–2030 period. In large part, this decline is driven by well-anticipated declines in the growth of labor input. Labor services grew at an annual rate of 1.73 percent in the 1960–2004 period, but will grow at less than half this annual rate (0.74 percent per year) from 2004 to 2030. Importantly, the decline in labor input growth is less severe than the decline in the growth of the working-age population, because labor quality will continue to rise, albeit more slowly than in the past. The rate of technological progress will be essentially unchanged across the two periods, slightly less than 0.50 percent per year. "In summary," the authors write, "the potential growth of the U.S. economy will be slowing considerably between 2004 and 2030, and monetary policy will have to adapt to the new environment."

Richard Berner begins his discussion by noting that the gloomy productivity predictions in the JGHSW paper may turn out to be too pessimistic. Projecting future productivity growth is exceptionally difficult, in large part because of data limitations. As an example, official measures of productivity in the construction industry imply that it has been on a decades-long *decline*, which is hard to believe given the boom in construction that has characterized much of this period. Part of the reason that measuring productivity is so difficult is that the productivity data are based in part on compensation data, and the Bureau of Labor Statistics' procedures may not be keeping up with the changing ways that workers are rewarded in the modern American labor market.

Berner then turns to the authors' assumptions about future labor supply. He notes that labor supply among older workers appears sensitive to government policy; as an example, many older workers stay on the job just long enough until they qualify for Medicare. Changing the eligibility age for Medicare would therefore change the labor supply of older workers. Policies on immigration also affect the number of available workers in ways that the JGHSW paper cannot predict. Berner concludes by noting that the globalization of labor markets will undoubtedly affect returns that workers can expect in the U.S. labor market. Globalization will thereby influence labor-force participation decisions among American residents. Without understanding the relationship between wages and various components of globalization (such as outsourcing), it is hard to predict future labor-supply behavior. Indeed, looking around the world, we find very different labor-supply behaviors even within the small group of affluent industrialized/advanced economies; France chose to enjoy more leisure as its productivity levels rose, while the United States chose to work more.

Eric Brynjolfsson's discussion starts with two comments about the stability of the relationships on which the JGHSW paper is based. First, the model requires some predictions for future consumption patterns, which are essentially extrapolated from consumption patterns today. But some items in today's consumption bundles, which contain cell phones and iPods, were not even around 25 years ago. How can we possibly know what people will buy in 2030? A second concern about the model's stability echoes Berner's comments: it is difficult even to measure past or current productivity, let alone predict it decades from now. Official productivity figures show big changes from year to year, and even productivity levels for the same year can change dramatically as different revisions of the data are made. While applied researchers must use the productivity data currently available, the intense volatility and large revisions in these data should caution us to take productivity predictions with a grain of salt. Brynjolfsson then pointed out that the authors face difficult statistical issues that are common to many economic models. The authors make extensive use of prices (as well as quantities) to infer changes in technology, so they face classic issues of simultaneity: if a price drops, is this because supply increased, or demand declined? The authors use well-established statistical techniques to deal with this issue, and they verify that these techniques are appropriate. But some results in their paper suggest potential problems, including their finding that particular inputs appear to be used more intensively when their prices rise.

Brynjolfsson then turned to the paper's assumption that business productivity increases as soon as new machines are installed. His own research has shown that for most firms, the installation of a new information technology (IT) system is just the "tip of the iceberg" in improving productivity. After a new IT system is purchased, firms must then train their employees to use it. Occasionally, they have to rework their entire mode of operation to make the best use of the new technology.

The authors' pessimistic assumptions seem hard to square with Brynjolfsson's intuitive understanding of how tomorrow's businesses will make use of future technology. In a matter of decades, advances in computing power will allow machines to mimic and perhaps surpass the computational power of the human brain. He concludes by noting that as various computing thresholds are reached and then exceeded, technology will probably play an even bigger role in the productivity of the American economy than we can predict today.

Current and Future Challenges for Policy and Research

A wide-ranging panel discussion addressed various ways to increase the quality and versatility of the U.S. workforce as one offset to slowing growth in the quantity of prime-age labor supplied in the coming years. At the upper end of the working age distribution, however, as pointed out

repeatedly in earlier sessions, the private sector behavior of individuals and firms is highly influenced by the current rules regarding the eligibility ages for Social Security and Medicare. Thus, it seems that the government will have to drive changes in behavior by instituting changes in these programs.

Public Policy and the Labor Supply of Older Americans

Stanford Ross argues that the current legal framework in the United States is highly favorable to early retirement, and addresses the issue of whether and how the Social Security laws, U.S. tax laws, and laws governing private pensions and individual savings can be changed to provide fewer incentives to retire early and more encouragement to work longer. Ross suggests that the Social Security system was not intentionally designed to favor early retirement, but these incentives developed from "almost random" political decisions and changing circumstances. While several changes made recently have reduced the incentives to take early retirement, the changes are so gradual that potential retirees are essentially unaware that the incentives have shifted. Furthermore, once these changes to Social Security's normal retirement age and delayed retirement credit are fully in place, the regime will continue to be highly favorable to early retirement.

Ross says that while it would be possible to speed up some of the legislated transitions and change the benefit formula to provide enhancements for continued work, the major change that could make a difference would be to move the early eligibility age from 62 years to 65 years. Such a change would almost necessarily have to be part of a larger package of changes along many dimensions (such as raising minimum benefits for lower-wage workers and/or providing tax credits to employers of older workers), and probably would entail further increases in the normal retirement age. To be politically feasible, a comprehensive package would need to reflect bipartisan efforts, which is currently unrealistic.

Even without a major overhaul, however, the government might enact marginal changes that will affect retirement incentives, particularly by acting on health care. Beyond that, Ross argues that economic changes are more likely to influence the behavior of individuals and firms than are changes in laws. For example, if the economy falters and wealth prospects are diminished, resulting in workers feeling more insecure about their retirement, that could provide an impetus for working longer. On the employer side, if major labor shortages emerge, perhaps because immigration is curtailed and outsourcing is restricted, firms may need to adjust to a diminished labor supply by taking steps to employ older workers. But currently, neither employers nor aging workers seem particularly motivated to seek such changes.

The Seven Deadly Sins in Aging Policy and Research: A Cautionary List for Policymakers and Prognosticators

C. Eugene Steuerle, the conference's keynote speaker, provides a useful alternative perspective by addressing some potential inadequacies of current policy-relevant research on population aging. By casting these issues as the "seven deadly sins," Steuerle establishes a counterpoint to the rest of the conference sessions that offers a fitting end to this summary and book. Steuerle reminds us that while anticipating the future and planning for it as best we can is important, we may be eliding some considerations along the way. In other words, a little less hubris and a little more humility may be in order as we grapple with how the U.S. labor supply may unfold in the following decades.

Steuerle contends that the first "deadly sin" of aging policy research is paying "too little attention to the labor side of the aging debate." He believes that changes in retirement behavior have received too little attention as a potential solution to economic problems associated with population aging. The second sin is "policymaking without any real targets." The fundamental objectives underlying policy proposals such as preserving the current Social Security system or creating individual accounts within this system, as the Bush administration proposed in 2005, are scarcely discussed and analyzed. The third deadly sin is "limiting the debate so as to be politically correct." As an example, Steuerle cites the structure of family benefits embedded in the current Social Security framework that are at odds with contemporary social realities in the United States. Most observers would agree privately that the current system makes little sense, but would shy away from proposing bold reforms because of potential political controversy.

The fourth deadly sin is misuse of the term "aging." Steuerle notes that we persist in measuring the old-age threshold as starting at a fixed number of years, such as age 65, even though people at given ages today generally are much healthier and have longer life expectancy than did their counterparts in past generations. If instead we gauged the concept of old age as corresponding to a given remaining life expectancy, then we would have a very different perspective on the problems associated with population aging. The fifth deadly sin is "ignoring the balance sheet." As an example, Steuerle notes that calculations of the effect of changes in retirement behavior commonly extend to changes in Social Security benefits and payroll tax revenues, but rarely, if ever, extend to the effects on national output and general tax revenues. The sixth deadly sin is "assuming away arbitrary aspects of the status quo." Although status quo policies are often arbitrary or accidental, policy analysts tend to view these as having resulted from rational policymaking decisions taken when these policies were implemented, and display reluctance to recommend radical changes. A recurring idea throughout the conference has been the need for bold new thinking on these issues.

Finally, the seventh, and according to Steuerle, the most deadly sin of all is "hubris about knowing the future." In the aging field, we tend to design our policies to fit our current views at the future expense of preventing "our children from following other visions for how their society evolves." By putting in place rigid programs that promise transfer payments into the indefinite future, we essentially tie the hands of future policymakers. This runs the risk of binding future generations to policies inappropriate to their situation and values.

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It is clear that the coming few decades will be accompanied by major changes in the U.S. labor supply and pose challenges to the U.S. economy, particularly in connection with the baby boom generation's transition into what traditionally have been considered retirement years. How the United States deals with the implications of these changes will help set the nation's economic and political course for the twenty-first century. This volume, consisting of papers first presented at the conference and then revised for the book, showcases some of the important considerations involved in addressing these trends, and the opportunities that may arise if we confront these challenges creatively and forthrightly.

Note

1. The primacy of labor-demand shocks as drivers of business cycles implies that employment declines in recessions because firms find it less profitable to hire employees, not because workers suddenly decide to work less. To use more formal economic language: Hall assumes that in a supply-and-demand model of the labor market, the labor-demand curve shifts along an unchanging labor supply-curve when a recession or expansion occurs.