



## IMPACT OF THE FINANCIAL CRISIS ON LONG-TERM GROWTH

Barry P. Bosworth

CRR WP 2015-8

Submitted: October 2014

Released: June 2015

Center for Retirement Research at Boston College  
Hovey House  
140 Commonwealth Avenue  
Chestnut Hill, MA 02467  
Tel: 617-552-1762 Fax: 617-552-0191  
<http://crr.bc.edu>

Barry P. Bosworth is the Robert V. Roosa Chair in International Economics at the Brookings Institution. The research reported herein was performed pursuant to a grant from the U.S. Social Security Administration (SSA) funded as part of the Retirement Research Consortium. The opinions and conclusions expressed are solely those of the author and do not represent the opinions or policy of SSA, any agency of the federal government, The Brookings Institution, or Boston College. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of the contents of this report. Reference herein to any specific commercial product, process or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply endorsement, recommendation or favoring by the United States Government or any agency thereof.

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## **Abstract**

This study examines the potential impact of the 2008-2009 financial crisis on economic growth. Expectations of future growth are critical to evaluating of the sustainability of overall budget trends and the financial condition of the Old-Age Survivors and Disability Insurance (OASDI) and Medicare trust funds. The paper includes an assessment of the experience of other industrial economies with similar situations in earlier decades. The Nordic countries achieved a relatively complete recovery within a period of 5-10 years, but the slump in economic growth in Japan has continued for over a quarter century. The analysis of the current experience in the United States focuses on recent changes in the supply of labor and capital and changes in the growth of total factor productivity (TFP). The large decline in the labor force participation rate is largely the result of demographic changes and not the recession. Similarly, the growth of TFP has slowed in recent years, but most studies perceive it as predating the onset of the recession.

The paper finds that:

- Even though they may not be directly due to the financial crisis, expectations have been cut back in a wide range of analyses of future growth prospects.
- The recent decline in labor force participation is dominated by demographic changes that will continue in future decades. Only a small portion appears to be related to cyclical factors.
- The growth in TFP has also slowed, but the change predates the financial crisis and is also likely to continue in future years.

The policy implications of the findings are:

- The economic assumptions that underlie current projections of government expenditure programs are likely to be overly optimistic, particularly because the changed expectations are not cyclical or temporary in nature.

## **Introduction**

The economic slowdown that began with the 2008-09 financial crisis is now in its sixth year with modest signs of recovery. The unemployment rate is well below the peak of late 2009, but largely because of a substantial decline in the labor force participation rate rather than a rise in the proportion of the working age population with a job. The employment-population ratio remains at its recession low. The utilization of potential GDP has recovered a couple of percentage points, but again only because the Congressional Budget Office (CBO) has progressively lowered its estimate of potential output for 2014 by 7 percent since the onset of the recession. The economic losses seem increasingly permanent and not just a transitory business cycle phenomenon.

The failure to recoup the losses from the recession represents a major break with the experience of past U.S. business cycles. In a paper that included an extensive review of prior studies, Kim and Murray (2002) concluded that three-fourths or more of a typical recession was transitory, with only weak evidence of any permanent impact on the long-run growth path. Most recently, Papell and Prodan (2012) argued that even severe recessions have only transitory effects on the path of long-run growth. Bernanke (2011) also reasoned that the long-run growth potential of the United States should not be materially affected by the crisis. However, other studies that focus specifically on the international experience with financial crises reach more pessimistic conclusions (Reinhart and Rogoff, 2009).

The basic question of whether the recession will have a permanent effect on the future path of the economy has obvious significance in terms of its implication for future improvements in living standards, but it has special importance for policy makers who are concerned with projections of the future sustainability of government programs. Both CBO and the Social Security Administration make long-term economic projections for purposes of evaluating overall budget trends (CBO) and the financial condition of the Old-age Survivors and Disability Insurance (OASDI) programs. The CBO makes projections out over a 75-year horizon, but emphasizes a 25-year horizon for its assessment of the overall budget situation, while the trustees of the OASDI programs make somewhat greater use of 50- and 75-year projections because the longer interval is roughly representative of the combined work life and retirement of a new entrant to the programs.

Thus far, both organizations, in the aftermath of the recession, have revised down the *level* of the GDP that they project for the near future, but there is little systematic change in estimated *growth rates* after 2020. While the CBO has progressively reduced its estimate of the current level of potential GDP by 7 percent compared to the value published before the crisis in 2007, it has raised its estimate of the long-term growth rate, so that the projected levels of GDP in 2050 and 2075 are substantially above the values assumed in 2007.<sup>1</sup> The projected level of GDP for 2020 published by the Trustees of the OASDI programs has been reduced by 3.5 percent, with a largely unchanged rate of growth in subsequent decades.<sup>2</sup>

The following sections provide an evaluation of the potential long-term effects of the financial crisis from several perspectives. First, the next section summarizes a rapidly growing empirical literature on the long-run consequences of financial crises. Section 2 reviews past financial crises in several other high-income economies whose experiences might be judged as relevant to the United States. Section 3 focuses more explicitly on the ramifications of the crisis on long-term growth in the United States.

## **Existing Literature**

There are an extensive number of empirical studies that focus on the question of whether past U.S. recessions, without regard to their specific causes, had permanent or transitory effects on the long-run growth path of GDP. Kim and Murray (2002) provide a useful overview of the prior literature and interpret it and their own research as suggesting that recessions have had only small permanent effects on both the level and rate of growth of GDP. They suggest a post-recession acceleration of growth that returns output to its pre-recession trend path. Most recently, Papell and Prodan (2012) reached a similar conclusion, though they did find a rather long intermediate period of reduced output following severe recessions.

However, other studies that focused more specifically on the effects of financial crises and rely on a more internationally-dominated data set find more substantial impacts. Reinhart and Rogoff (2009) provide an extensive documentation of past financial crises and demonstrate

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<sup>1</sup> The revisions to the 10-year projection of potential GDP are detailed in CBO (2014c). CBO's revisions reflect a combination of the effects of the crisis and a reassessment of other underlying trends. CBO's projections of GDP out for 75 years are published as part of the supplemental data for each of the annual publications of the long-term budget outlook: <http://www.cbo.gov/publication/45471>

<sup>2</sup> In the immediate aftermath of the recession, the CBO assumed a relatively rapid recovery to the prior trend path of potential GDP, but in subsequent years it revised the potential GDP estimates down by progressively larger amounts.

that the economic consequences are more severe and longer lasting than typical recessions. Cerra and Saxena (2008) analyze financial crises for a large sample of 190 countries over the period of 1960 to 2000 and conclude that the crises have large and persistent effects on GDP extending out to a 10-year horizon. Furceri and Mourougane (2009) limit their analysis to a sample of 30 high-income OECD countries over the period of 1960 to 2007 and argue that the average financial crisis will permanently reduce potential output by about 1.5 percent. Further restricting their analysis to the most severe financial disruptions (and thus more similar to the 2008-9 crisis), they estimate a long-term cost equal to 4 percent of potential output.

Moreover, a chapter in the IMF's World Economic Outlook in the fall of 2009 focused on the medium-term consequences of financial crises and distinguished among countries of differing levels of GDP. It reports an average output loss equal to 10 percent of trend output seven years after the crisis, and roughly equal contributions from reduced capital accumulation, lower employment, and changes in total factor productivity. There was, however, a wide variation in outcomes about the average.

Finally, Reifschneider, Wascher, and Wilcox (2013) adopt a production function framework to analyze the effects of the current U.S. recession on aggregate supply. They argue that the cumulative effects of reduced capital accumulation since 2007, slower than anticipated multifactor productivity gains, and an unexpectedly large exit of workers from the labor force have reduced aggregate supply by about 7 percent below an extension of the 2000-07 trend. That estimate is nearly identical to the amount by which the CBO has scaled back its estimate of potential GDP. They are very ambivalent about the future and outline alternatives for growth that imply at best a gradual return to the pre-crisis projected growth rate, but with no diminution of the loss to the level of potential GDP.

### **International Experience with Financial Crises**

The greatest limitation of a focus on financial crises, as opposed to recessions in general, is the limited number of significant crises in advanced economies that can be judged as comparable in severity to the crisis of 2008-09. In fact, Reinhart and Rogoff identified only five such events within the OECD that they classified as severe: Spain (1977), Norway (1987), Finland (1991), Sweden (1991) and Japan (1992). The three Scandinavian crises overlapped in timing and with similar causes of overheated economies that led to the bursting of bubbles in real

estate and equity markets. However, even this small sample offers some interesting contrasts in outcomes.

*Nordic Financial Crises.* The three Nordic countries of Finland, Norway, and Sweden suffered severe financial disruptions in the early 1990s that have some parallels with the current crisis. They had their origins in the financial liberalization of the late 1980s that removed quantitative restrictions on bank lending and led to excessive flows of funds into real estate and equity markets. The resulting rise in asset prices touched off booms in each country that ultimately ended in busts. Changing domestic and external circumstances forced the central banks to raise interest rates in an effort to moderate inflation and head off speculative attacks on their fixed exchange rate regimes. The higher interest rates led in turn to severe debt financing problems and sharp declines in domestic asset prices and loan defaults.

Norway was impacted first in 1988, and its banking problems were triggered in part by a sharp fall in the price of oil, a large trade deficit, and the need for high interest rates to defend the exchange rate (Vale, 2004). The bank failures were initially concentrated among the small banks, but when the crises erupted in Sweden and Finland, Norway was faced with a broader systemic failure of its banking system. Given its strong financial condition, the government could act quickly to inject capital into the problem banks and there were no major withdrawals of funds. The costs to the economy as a whole were also relatively modest as unemployment increased temporarily from 2 percent to 5.7 percent of the labor force in 1991 and 1992, before dropping back to 3 percent the end of the 1990s. However, the government did end up owning a significant portion of the banking system.

The basic causes of the crises in Sweden and Finland were very similar to that of Norway as financial deregulation in the late 1980s unleashed a surge of bank lending and a run-up of asset market prices.<sup>3</sup> The situation in Sweden became more complicated in the early 1990s when the government sought to contain growing inflation pressures with a monetary policy that targeted a fixed exchange rate as a measure of its credibility. It had to progressively tighten credit in 1991 to maintain the exchange rate against the German mark that was rising as part of the increasing financial costs of German reunification. High interest rates led to sharp falls in asset-market prices, but speculative pressures on an obviously over-valued exchange rate

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<sup>3</sup> The interpretation of events in Finland and Sweden is largely based on Jonung, Kiander, and Vartia (2008).

continued until the government gave in and devalued the currency in the fall of 1992, moving to a floating exchange rate. The shift in policy occurred too late as a widespread banking crisis was well underway. The country suffered an intense recession, and the unemployment rate soared from 2 percent in 1990 to 11 percent in 1994.

A similar story applies to Finland, but it was also impacted by a sharp fall in its trade with a disintegrating Soviet Union. It joined Sweden in pegging its exchange rate to the European Currency Unit at an overvalued level, forcing an increase in interest rates to defend against a series of speculative attacks. It had a first round devaluation of 10 percent in late 1991 that was not enough to stabilize exchange markets, and ultimately it followed Sweden in 1992 with an additional 30 percent depreciation and adoption of a floating rate. Its recession was even more severe than that of Sweden, and the unemployment rate rose from 4.5 percent in 1990 to 17.5 percent in 1994.

Both Sweden and Finland experienced rapid recoveries of output after the initial recession, fueled primarily by the depreciation of their exchange rates and substantial growth in exports. The strong export performance in turn created space to undertake a series of fiscal reforms and a restructuring of the industrial sectors of both economies. The high levels of unemployment eliminated any inflation concerns, which permitted a sustained period of low interest rates. Both countries quickly adopted monetary regimes marked by an independent central bank and inflation-targeting, but Finland returned to a fixed exchange rate system by joining the Eurozone in 1999.

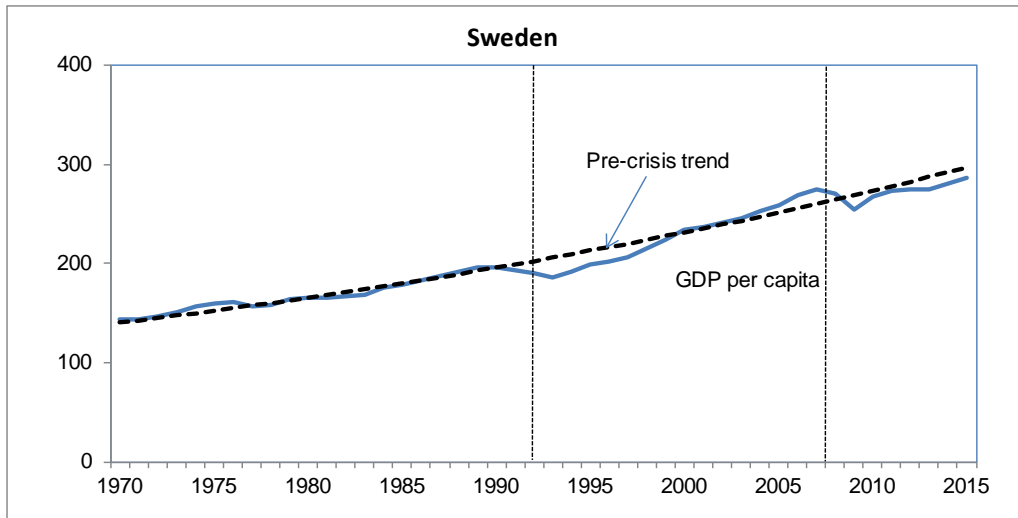
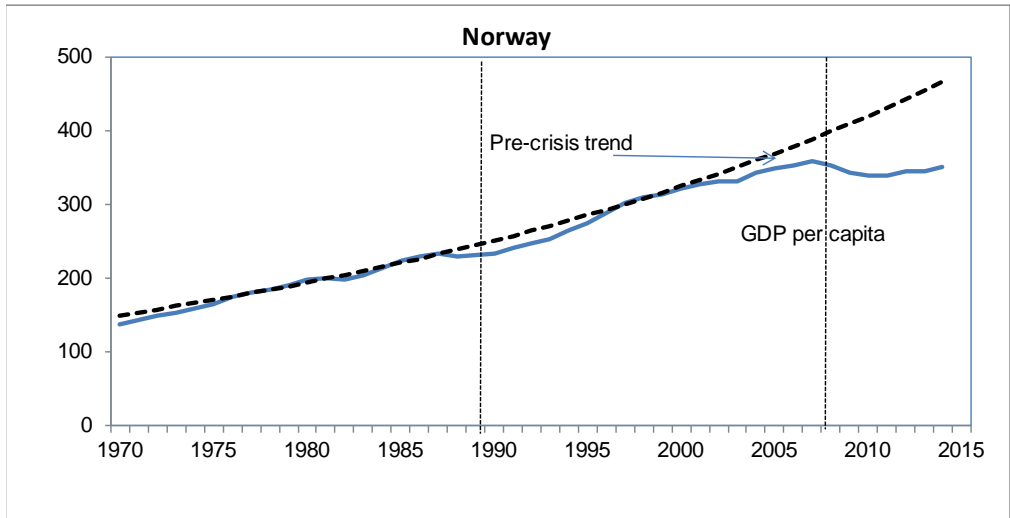
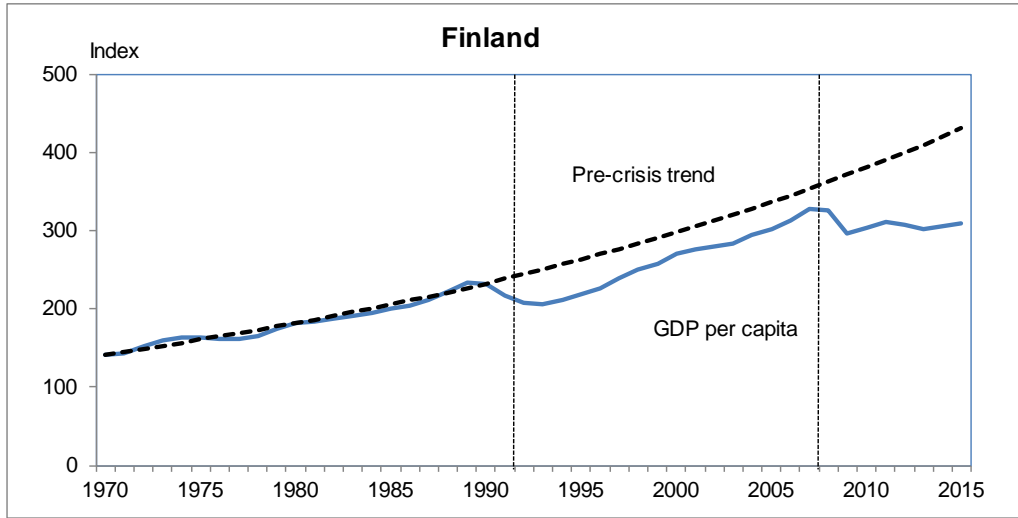
The long-term costs of the crises were measured by fitting a trend to the growth of per capita GDP for the decade prior to the downturn and extending it into the future. The measure of population in the denominator is the population of labor force age and it is intended to produce measures of potential GDP that exclude induced variations in rates of employment and labor force participation.<sup>4</sup> The procedure is shown in Figure 1 for each of the three countries.

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<sup>4</sup> The 10-year trend was not greatly different from an average extending over the past 20 years.



**Figure 1. Pre and Post-Crisis Growth in GDP per Capita**



Source: OECD Economic Outlook, Indexed data, 1960 =100. Trend growth is set equal to the average of the 10 years prior to each country's crisis.

Finland had the worst recession. Output declined 18 percent below its trend level in 1993, but then began to recover at a growth rate well above that of the pre-crisis years and the gap narrowed to 7 percent of trend GDP by 2007 (top panel). However, with the onset of the recent crisis in the United States and the Euro Zone, growth has stagnated and fallen back well below the trend. Furthermore, the labor force participation rate declined sharply with the onset of the Finnish crisis, and it has not returned to the pre-crisis rate. Although Finland has encountered no serious financial difficulties in recent years, it has lost its competitive position in electronics and overall labor productivity has stagnated.

Despite the duration of the financial crisis in Norway (1988-92), its economic losses were small, and output per capita recovered to its trend level by 1997 (middle panel). The post-crisis growth rate remained close to that of the pre-crisis period. It also avoided any significant losses from the recent financial crisis in the United States and the European Union. The slowdown in real GDP growth is entirely attributable to lower petroleum production with little consequence for the short-term welfare of households as measured by the fact that employment and unemployment have remained unchanged.

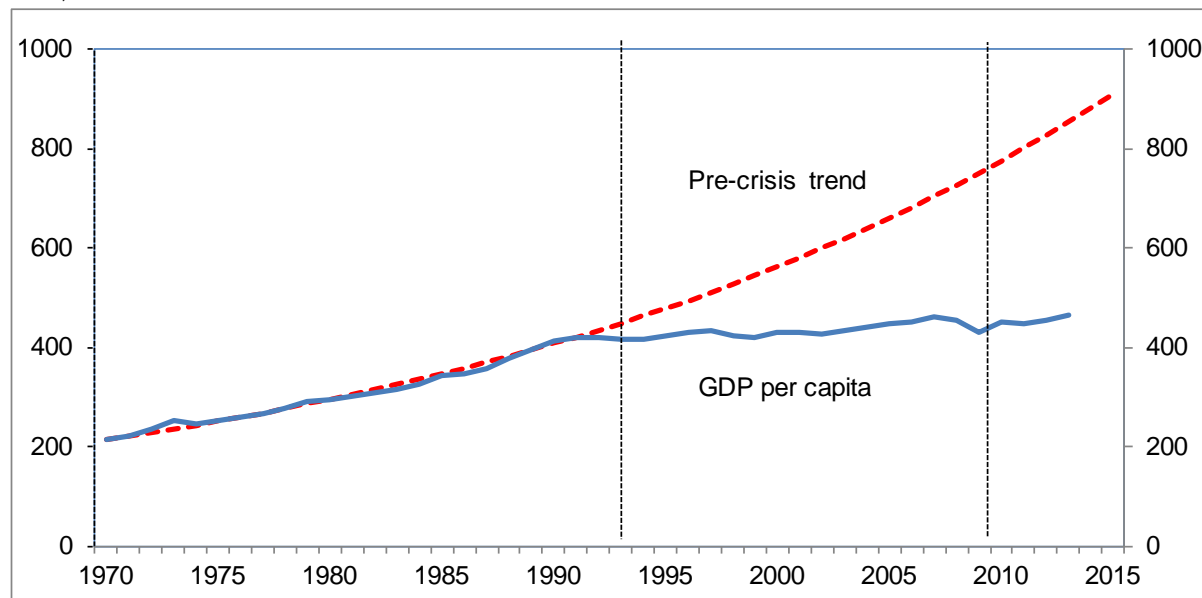
The initial output losses from its financial crises were large in Sweden, but they were offset in subsequent years by a strong improvement in labor productivity that was sustained into the mid-2000s. GDP per capita recovered to its trend level by 2000 (third panel). However, as with Finland, there was a sharp and apparently permanent fall in the labor force participation rate. Furthermore, the unemployment rate never fell back to the low levels that Sweden had enjoyed before its crisis. In effect, the crisis left Sweden with strong gains in labor productivity, but reduced labor supply and higher unemployment. The financial system and the economy have also proved resilient to the 2008-09 financial crisis in the United States and the rest of Europe.

*Japan.* Japan's financial crisis, which began in 1991, marks a huge shift in the country's economic performance. Over the prior two decades, GDP growth averaged a steady 4.5 percent per year. On purchasing power parity basis, GDP per capita rose from 63 percent of the US level in 1970 to 87 percent in 1991 and moved ahead of that of all the other major countries in the OECD. With the financial crisis, real GDP never actually fell, but the growth rate dropped immediately and has averaged less than -0.5 percent per year over the ensuing quarter century. GDP per capita has fallen back to only 73 percent of the United States' level.

Even if we adjust for the slower growth in the population of labor force age and use GDP per person of working age, the growth rate is less than a sixth that of the prior 10 years and the current GDP is only 55 percent of what would have been expected in 1991 for 2013 (Figure 2). The labor force has been largely unchanged, and while the workweek has been shortened, the reduction is in line with the prior trend. Hence, the slowing of growth is concentrated in labor productivity (GDP per working hour). Given that Japan had caught up with Europe in terms of income per capita (though not the United States) some slowing could have been anticipated. However, its magnitude and suddenness are surprising. Unlike the Scandinavian countries, there was no large initial loss of output, but there is also no return to trend growth levels or rates.

**Figure 2. Pre and Post-Crisis Growth in Japan's GDP per capita**

Index, 2000 = 100

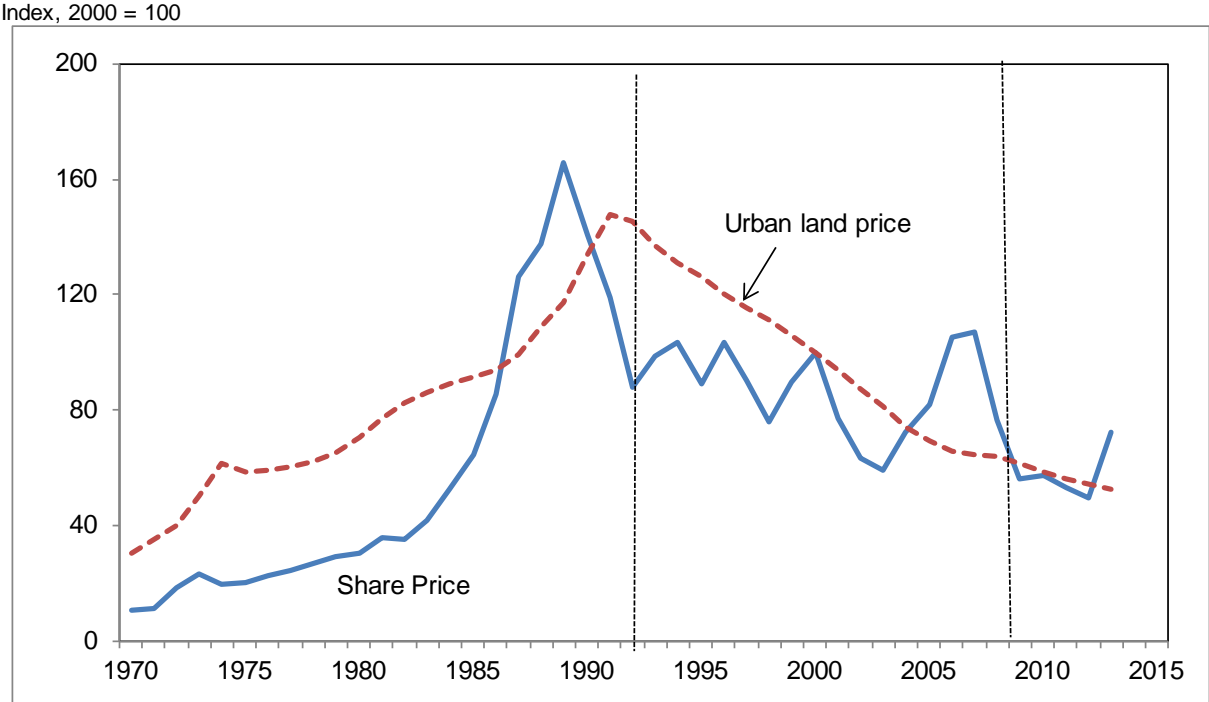


Source: OECD Economic Outlook, Indexed data, 1960 =100. Trend growth is set equal to the average of the 10 years prior to the financial crisis.

The buildup of large price increases in asset markets in the 1980s and the bursting of the bubble in the early 1990s was a central cause of the financial crisis (Fujii and Kawai, 2010). In addition, bank loan portfolios were overly concentrated in construction and real estate and collateralized by land whose values plummeted after the crisis. Banks were also allowed to hold equities on their balance sheets, leading them to over-expand when stock prices were rising and destroying their capital base when the bubble burst. Finally, the fall in asset prices resulted in a large rise in nonperforming loans, further destroying the banks' capital base (Fukao, 2007). As

shown in Figure 3, real estate and stock market prices surged during the 1980s but fell to less than half their peak values by 2010, a long downward slide stretching over a decade for share prices and two decades for land prices. The Japanese government was slow to take decisive actions to resolve the crisis: the insolvency of the banking system lingered throughout the 1990s, and the economy entered a sustained period of deflation. The economy settled into a new low-growth equilibrium marked by low rates of capital investment and modest productivity improvements that continues to the present time.

**Figure 3. Japan's Share Price Index and Urban Land Prices, 1970-2013**



Sources: Tokyo share price index from OECD, *Monthly Economic Indicators*, and Urban Land Price Index from the Japan Real Estate Institute.

Japan’s experience stands in sharp contrast with that of the Scandinavian countries. The initial drop in economic activity was far smaller, and the absence of any sense of crisis led to very little effort to clean up bank balance sheets and undertake other reforms. Particularly in Sweden, the financial crisis initiated quick action to clean up the banking system, and the crisis appears to have served as a catalyst for a series of additional reforms that promoted future growth. Sweden also had considerable room for maneuver by reducing interest rates from the elevated levels that initiated the collapse and a large depreciation of the real exchange rate. Even

so, the contrasting outcomes of Sweden and Japan would seem to highlight the importance of early and decisive policy action.

### **Impact of the Crisis on U.S. Output**

The estimates of potential GDP constructed by CBO provide a useful framework for thinking about how to evaluate the effects of the financial crisis on aggregate supply. The crisis' impact on the trend of long-term growth is examined through its effect on the three primary channels that affect long-term growth: the supply of labor, the stock of capital, and total factor productivity. The CBO recently published a review of its revisions to potential output since the onset of the recession in 2007 (CBO, 2014c). The current estimate of potential GDP for 2017 is 7.4 percent below the estimate published in 2007. In its report, however, the CBO attributes only a small portion of the downward revision (1.8 percentage points) to the recession and weak recovery. The largest change is the result of a reassessment of prior trends in factor inputs and productivity (4.8 percentage points), which CBO does not associate directly with the recession. However, I shall use the CBO framework to explore the impact on the crisis on labor supply, capital accumulation and productivity.

*Labor Supply.* The aggregate labor force participation rate has fallen dramatically since the onset of the financial crisis, from 66.3 percent in 2007 to 64.9 percent in 2009, and 63 percent in 2013. While labor market statistics have long included a category of discouraged workers – those who are not in the labor force because they believe no jobs are available for them – the general view of labor economists has been that labor force participation, particularly that of prime-age workers, was only weakly affected by business cycle conditions. Hence the magnitude of the drop in the labor force participation in the latest recession has been a surprise to many. And there is a considerable debate about the extent to which the loss is permanent.

A substantial portion of the decline, however, can be attributed to the effects of demographic change as the large baby-boom generation moves into older ages with lower rates of labor force participation. This can be easily illustrated in Figure 4 by holding labor force participation rates within 5-year age brackets constant at the values of 2000, the peak year for the overall participation rate and tracing out the effects of changes in the age distribution of the non-institutional population. As shown in the figure, about two-thirds of the 3.2 percentage point

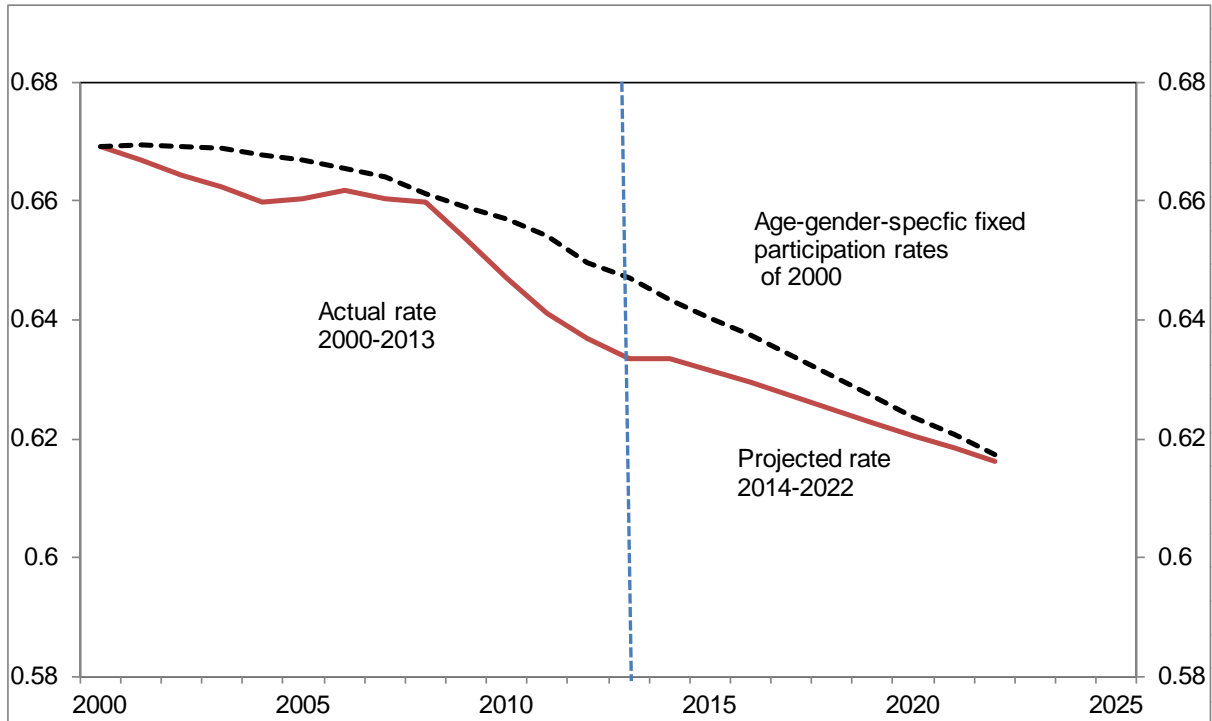
drop in the participation rate between 2000 and 2013 can be attributed to a simple shift in the composition of the working-age population toward older workers with lower rates of labor force participation. That pattern is projected to continue into the future, with a further demographically-induced fall in the participation rate of 3 percentage points by 2022.<sup>5</sup> The figure suggests that the latest BLS projections will match the simple extrapolation of fixed participation rates by 2022.

However, the demographic change can be foreseen with a high degree of accuracy and should not have been a surprise. Any uncertainty results from the fact that the demographic changes also occur against a backdrop of shifting secular patterns of labor force participation within various subgroups of the population. For example, participation rates of teenagers and young adults have been declining for many years, but the drop was particularly large after 2000. Within the prime age groups (25-55), the male participation rate has been slowly falling for some time, but the prior pattern of a rising participation rate of women began to slow in the 1990s and actually turned down in the 2000s. Finally, the participation rates of older men and women have been rising, and that pattern accelerated after 2000. Changes in the overall participation rate are a function of four factors: demographic changes in the composition of the population, the secular changes within specific groups, possible cyclical influences, and purely random effects. Most of the recent surprise has been the result of unforeseen shifts in the group-specific participation rates described above and disagreements about the extent to which they reflect the short-term – hopefully cyclical – deterioration of the labor market or more permanent changes.

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<sup>5</sup>The precise meaning of the term demographic effects can cause confusion. In this case, it is limited to changes in the composition of the population since the age-specific participation rates are held at their 2000 values. However, other analyses could reasonable allow for trend changes in the participation rates of subgroups while still excluding any behavioral response to economic determinants.

**Figure 4. Actual and Demographically-Adjusted Labor Force Participation, 2000-2022.**  
ratio



Source: the actual labor force data are from BLS, and the projections are from Toossi (2013). The demographic adjusted rate is computed by the author from BLS data on the labor force and population in 5-year age groups using fixed participation rates of 2000.

The Bureau of Labor Statistics (BLS), the CBO, and the Social Security Administration (SSA) all have maintained active programs of labor market research that produce periodic projections of future changes in labor force participation rates.<sup>6</sup> All of these research programs go beyond the simple assumption of fixed gender- and age-specific participation rates and develop models to account for trend and cyclical influences on the participation rates for key subgroups. They also allow for cohort influences that are defined as lasting differences across birth cohorts that persist as they age. Their projections are compared in Figure 5 for years before and after the financial crisis as an indicator of the extent to which the crisis has altered expectations of future changes in the aggregate labor supply. In particular, do they view the recent changes as cyclical responses to the recession or enduring into the future?

<sup>6</sup> For recent examples see Toossi (2013), CBO (2011, 2014), and the references that they cite.

A 2006 study (Aaronson and others), undertaken prior to the crisis, reported 10-year projections for the above three agencies together with the study's own estimates. The three agency forecasts embodied quite similar patterns of gradual decline with overall participation rates in 2013 in a narrow range of 65-66 percent that were in retrospect too high. The Aaronson and others study was closer to the actual outcomes because it predicted significantly larger declines for the young and prime-age workers. In subsequent years, BLS (panel A of Figure 5) and CBO (panel B) brought down their projections, treating the lower than expected participation rates as a permanent phenomenon.<sup>7</sup> With each projection, they begin with the last known value and project the participation rate to fall further in future years. Thus, both CBO and the BLS have lowered their 10-year projections by the amount of the recent shortfall, and the BLS incorporated the downward revision into its long-term projections out to 2050 (panel A). In their latest projections, CBO and BLS are in basic agreement through 2024 in anticipating continued declines in the participation rate of about two percentage points over the next 10 years.

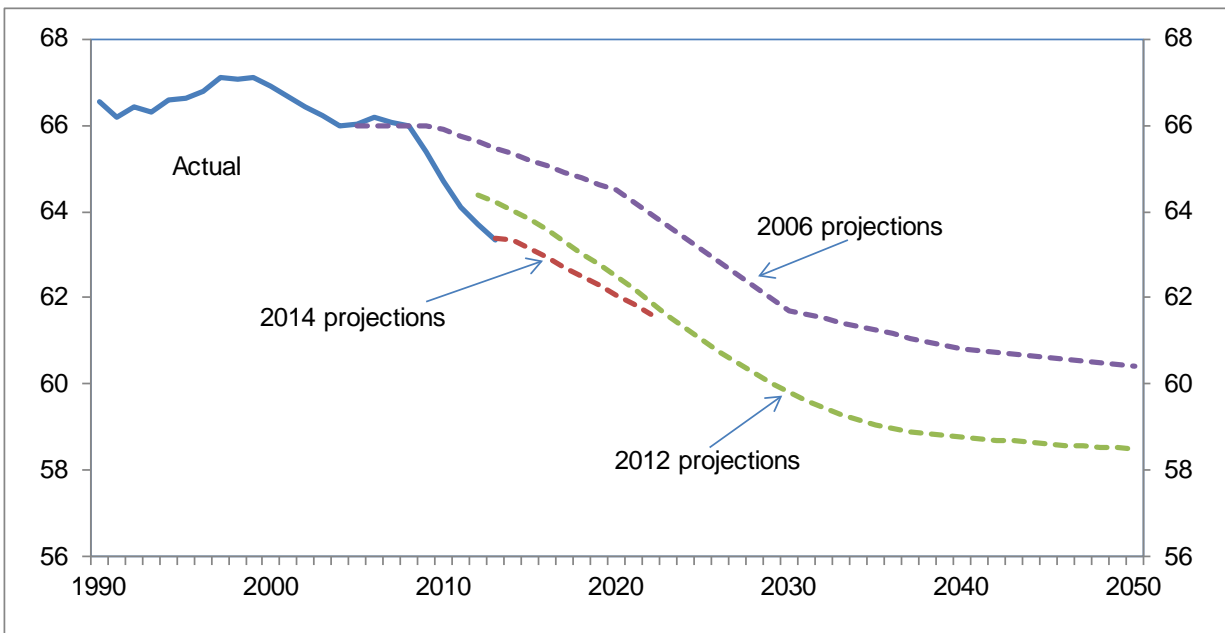
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<sup>7</sup> See also Canon and others, 2013.

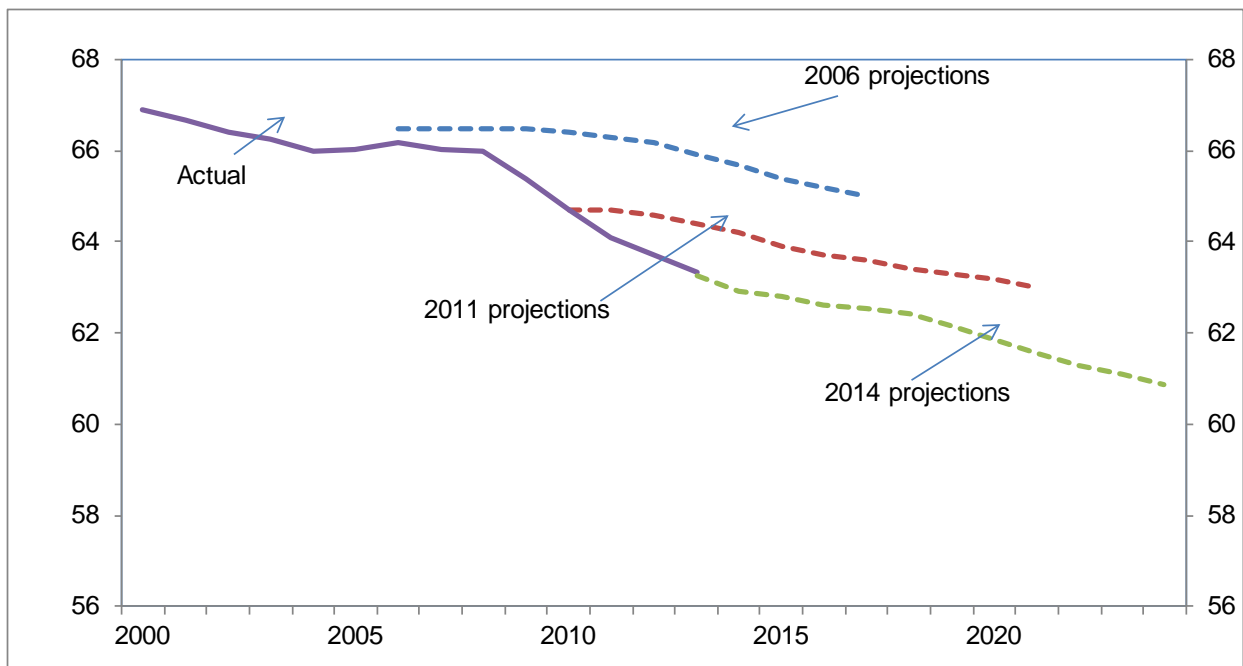


**Figure 5. Labor Force Participation Rates, Alternative Projections**

Panel A: BLS Projections, 2005-2050



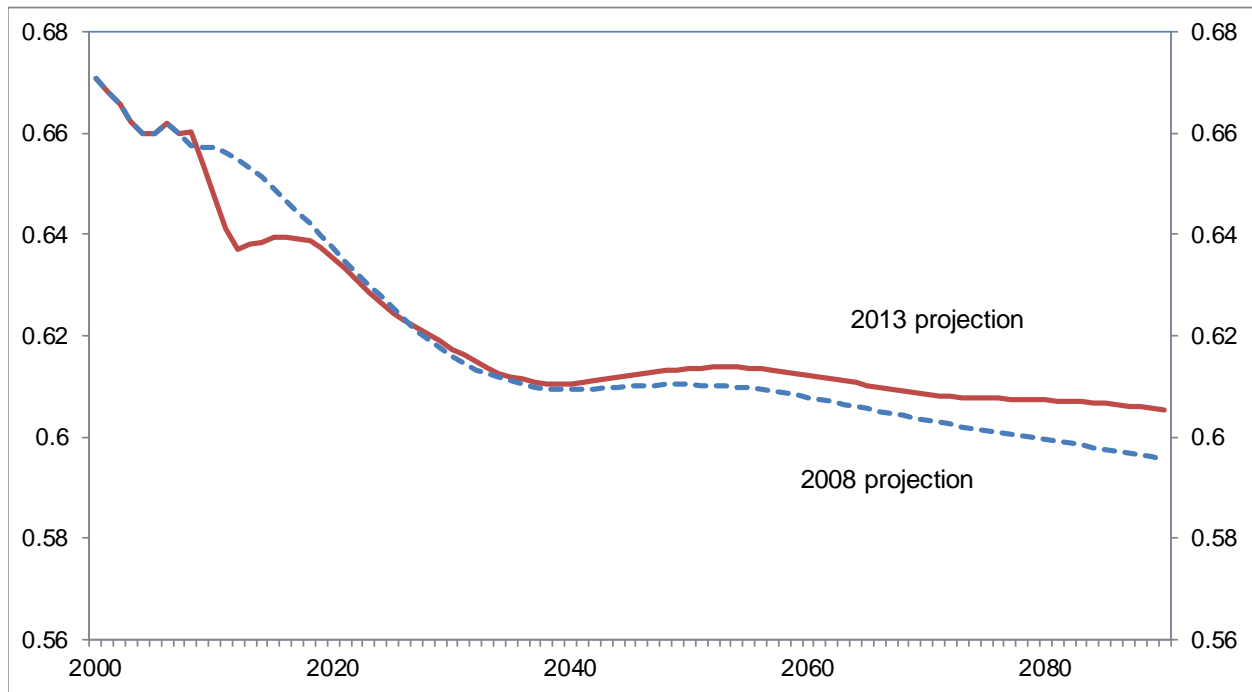
Panel B: CBO Projections, 2005-2024



The SSA is an exception in that it has not assumed that the recent shortfall in the labor force participation will be long-lasting (panel C). Thus, the projections in the 2013 Trustees' report imply a return by 2020 to the path they assumed in the 2008 report. However, the 2013

report does embody more significant revisions than it might appear because a sharply reduced level of labor force participation for the young is offset by a higher participation rate for older workers. The result is that the Trustees' report has actually raised its long-run projection of the overall participation rate due to the growing participation of older workers. In 2050, the last year of overlap between the two agencies' reports, the projected participation rate of SSA is about 3 percentage points above the 2012 projection of BLS (61.4 percent versus 58.5 percent).<sup>8</sup>

Panel C: SSA Projections, 2008-2090



Sources: Data obtained from Mitra Toossi of BLS, CBO data files, and J. Patrick Skirvin of SSA.

The SSA position of a projected recovery in the participation rate is supported by some other studies that argue that a major portion of the fall in the rate is cyclical and should recover. Erceg and Levin (2013) claim to provide compelling evidence from state-level data that cyclical factors account for the bulk of the recent decline in the labor force participation rate since the onset of the recession in late 2007 and all of the decline for prime-age adults (25-54). Van Zandweghe (2012) and Bengali and others (2013) adopt a slightly less extreme position in arguing for a 50-50 division between trend and cyclical influences. Surprisingly, however, all

<sup>8</sup> I am indebted to J. Patrick Skirvin, Lead Economist of SSA, for supplying the projected values of the labor force participation rates.

these studies end with projections of the overall participation rate that are not far from those of the CBO and BLS because large negative trend factors offset the benefits of cyclical recovery.

In addition to lowering its predictions of the future labor force, CBO has reduced estimated hours per worker in 2017 compared to the projections that it prepared in 2007. However, the change is small, amounting to about 1.5 percent. Similarly, the SSA adopted an even more gradual reduction in its assumption of the future average work week, -.05 percent per year, in contrast with the pre-2012 assumption of a constant number of hours. These changes seem very small relative to the uncertainty that surrounds the magnitude of future change in the participation rate.<sup>9</sup> It seems surprising that the recession has not had a greater effect on hours per employee despite the frequent references to the increase in the number of workers who are involuntarily working part-time while seeking full-time employment.

*Productivity.* Whereas we can explain large portions of the change in labor supply as the product of variations in the demographic structure of the population of labor force age, projections of future developments in productivity seem inherently more uncertain. In fact, measures of productivity growth are constructed as residuals after taking account of the contributions of changes in the quantity and quality of the inputs, and some have characterized it as a measure of our ignorance (Abramovitz 1956). Variations in the measurement of the factor inputs (capital and labor) and the extent to which they are adjusted for quality changes has resulted in a range of estimates for the growth in total factor productivity (TFP) and thus differing views of its precise definition. However, this paper relies of the basic Solow growth model framework used by CBO, which uses a straightforward measure of labor hours and the national accounts definition of the capital stock to account for the factor inputs. Hence, TFP embodies the influence of technological change, improvements in the quality and efficiency with which the inputs are used, economies of scale, and other miscellaneous influences. The Social Security Administration uses an even simpler framework which collapses the role of capital deepening into its measure of labor productivity. Neglecting a direct role for capital in making the projections, however, has a minor effect because the measured increase in capital deepening has advanced at a steady pace of about 0.7 percent per year over the past half century.

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<sup>9</sup> CBO based its analysis on the nonfarm business sector whereas SSA computes hours for the total economy. The most important difference involves employment in the government sector.

As observed by Gordon (2012, 2014), productivity growth has been slowing in the United States for many decades. In the historical data for the nonfarm business sector used by CBO, the cyclically-adjusted measure of TFP growth slowed from an average of 1.9 percent per year in 1950-73 to only 1 percent in 1973-95 (column 4 of table 1). There was then a revival lasting up to 2004 that has been widely attributed to the explosive growth of information and communication technologies (ICT) and annual increases in TFP averaged 1.7 percent. However, in the 10 years after 2004 the CBO measure of TFP growth has again slowed to 1.2 percent, in part because the production of ICT products has been moved out of the United States. The latest CBO projections assume the 1.2 percent growth rate for TFP in future years. A comparable story emerges from the analysis of the total economy measures of labor productivity used by Gordon and the SSA shown in column 1 of Table 1. They imply a larger post-1995 revival of annual productivity growth, increasing by 1.3 percentage points above the prior average, but a full reversion to the post-1973 rate after 2004.<sup>10</sup>

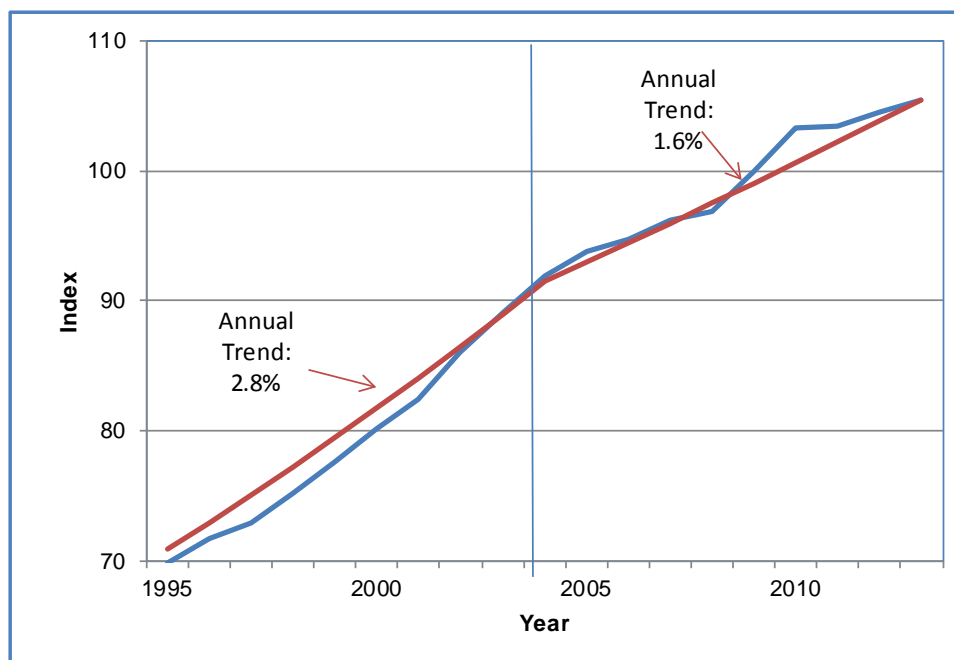
**Table 1. Measures of Annual Productivity Growth, 1950-2014**

	Actual		Potential	
	SSA	Total Economy	Total Economy	Non-farm Business
	Labor Productivity	Labor Productivity	Labor Productivity	TFP
1950-73	2.6	2.3	2.6	1.9
1973-95	1.2	1.3	1.6	1.0
1995-2004	2.5	2.2	2.8	1.7
2004-2014	1.3	1.2	1.8	1.2

Source: CBO, An Update to the Budget and Economic Outlook: 2014 to 2024, OASDI Trustees Report 2014, and author's calculations

<sup>10</sup> Gordon also extends the data for the total economy back to 1891 with an average of 2.4 percent growth in labor productivity in the eight decades prior to 1973. The magnitude and abruptness of the slowdown of the early 1970s has never been convincingly explained.

Figure 6. Labor Productivity in the Nonfarm Business Sector, 1995-2013



Source: author's calculations from Division of Major Sector Productivity, Bureau of Labor Statistics. Trends extend from 1994:4 to 2004:4 and 2004:4 to 2013:4.

John Fernald (2014) adopts a position similar to Gordon based on his analysis of a detailed industry data set of the BLS. He argues that the ICT-dominated surge in TFP ended in 2004 and slowed substantially in the pre-crisis period of 2004-07. Thus, the slowdown is not a product of the recession. He argues, as does Gordon, that the 1973-95 pace of productivity change is a reasonable expectation for the future. His analysis suggests that the slowdown is particularly marked in the ICT sector. Byrne, Oliner and Sichel (2013) are basically in agreement with Gordon and Fernald that there has been a substantial slowing of productivity growth, but they are a bit more optimistic about a partial recovery in the ICT-producing industries and growth in labor productivity within the nonfarm business sector above 2 percent.

Jorgenson Ho, and Samuels (2013) provide another perspective that is also more optimistic about the outlook for TFP growth, primarily because of continued strong gains in the ICT-using industries. However, their overall projection of GDP growth is reduced by offsetting expectations of a substantial falloff in the rate of improvement in labor quality (an adjustment not included in the CBO methodology). Similarly, Baily, Manyika, and Gupta (2013) cite the

development of a number of new technologies and emphasize the uncertainty involved in any projection of TFP.

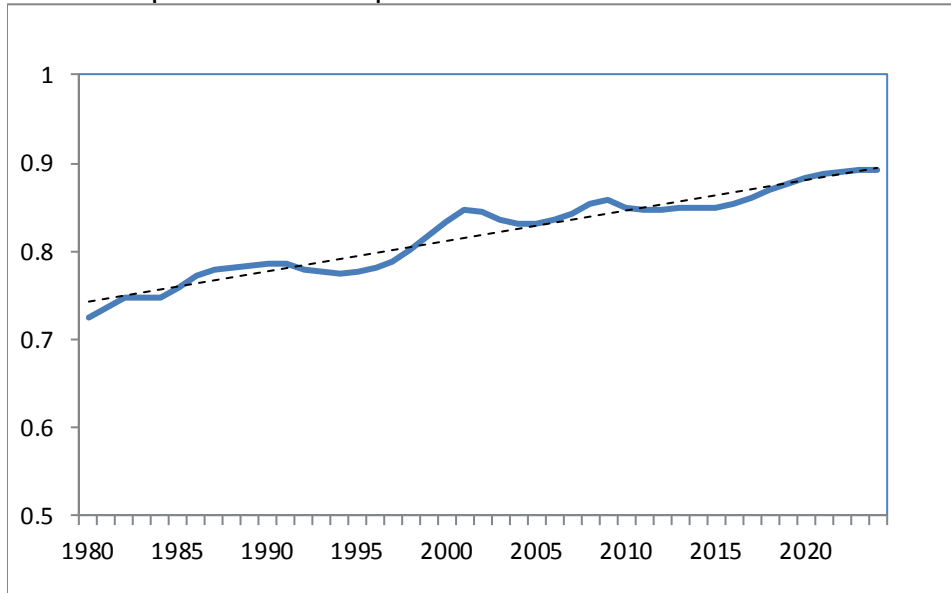
All of these studies emphasize the importance of the IT-producing sectors for determining the future trend of productivity. Yet, it is difficult to measure the impact of high-technology companies, such as Apple, on productivity in the United States. Even if we assume that Apple's design innovations are the result of R&D work done in the United States, the products are increasingly being produced abroad by foreign contract manufacturers. Apple will transfer its intellectual property as an export to a foreign subsidiary at something close to cost to avoid U.S. taxes and incorporate it in the wholesale value of an iPhone or equivalent product. When Apple brings the iPhone or equivalent back to the United States, its high retail price should be matched by a similar high import valuation to avoid taxes, implying a low margin on the retail sale. Thus, it is likely that Apple is recorded in the U.S. domestic economic statistics as a relatively low-productivity company.

CBO's 2014 estimate of future TFP growth (1.2 percent) is significantly below the estimate as published in 2007 (1.4 percent), but it is still above the 1 percent average of the slow growth era of 1973-95. Similarly, the SSA projections out to 2090 assume annual improvements in labor productivity of 1.7 percent throughout the next 75 years – well above the 1.2 percent average of 1973-95. In light of Gordon's suggestion that the ICT-driven revival was a transitory phenomenon and that we are reverting to the post-1973 era of smaller gains in productivity, there is a concern that the projections of future growth by CBO and SSA remain too high.

*Capital Services.* In the CBO's revisions of its estimates of Potential GDP since 2007, changes to the contribution of capital account for one-third of the reduction in the level of potential GDP by 2017. However, capital services are largely determined through a highly endogenous process that is driven by the more independent trends in potential labor supply and TFP. Capital investment plunges during recessions in response to reduced demand and heightened uncertainty, but it will ultimately recover and grow over the long term in proportion to increases in the workforce and TFP, reflecting a very stable trend in capital intensity, the ratio of capital services to potential output. The stability of the ratio is most evident in Figure 7,

which shows a steady upward trend in the ratio.<sup>11</sup> The fall in the investment rate in recent years has slowed the growth of the capital input, but with a lag, the investment rate should recover and growth in the capital input will accelerate and return to trend.

**Figure 7. Capital Intensity, 1980-2024**  
ratio of capital services to potential GDP of nonfarm business



Source: Supplemental data for CBO's Budget and Economic Update, 2014-2024.

*Combined Output Effects.* The CBO has revised down its estimate of the current potential output of the United States by 7 percent compared to the level that it anticipated in 2007, before the financial crisis. It is striking, however, that only a small portion of the revision, about one-fourth, is attributed to the direct effects of the recession and weak recovery. Instead, the changes are attributed to a reassessment of prior trends. The ICT-based boom of the late 1990s is seen as initiating a wave of excessive optimism that led to neglect of negative demographic influences on labor force participation and a slowing of growth in productivity –

<sup>11</sup> Recent revisions to the national accounts resulted in a considerable broadening of the definition of capital to include R&D and other forms of intellectual property, but without much impact on the trend in capital intensity. CBO does not make a cyclical adjustment to its measure of capital services. While the actual use of capital services may vary greatly over the business cycle, there is no available measure of its utilization. Therefore, the computed volume of capital services already corresponds to its potential flow

problems that are now perceived as being evident prior to the recession. Reduced levels of potential labor and capital inputs each account for a third of the reduction, and about a fourth can be traced to a lower than expected level of total factor productivity. These revisions on the supply side of the economy have sharply altered perceptions of the amount of slack in the economy, cutting the shortfall of GDP relative to potential by more than 50 percent. As discussed above, the CBO’s attribution of the revisions to a reassessment of prior trends is echoed in the research of others on changes in labor force participation and TFP.

The CBO’s reduction in the level of potential GDP also carries into the future because it has lowered its expectations of growth in potential output over a 10-year horizon (see Table 2). For the years of overlap between its 2007 projections and those of 2014, the growth of potential GDP in the nonfarm business sector is cutback from 2.9 percent per year to 2.3 percent, with the decreases spread across labor hours, capital services, and TFP. CBO projects a recovery in the last half of its projection period due to a modestly higher growth in the factor inputs, but it maintains a reduced expectation for future growth in TFP. This projection of slower future productivity growth is generally supported by other analysts as summarized in Byrne, Oliner, and Sichel (2014).

**Table 2. CBO Revisions to Potential GDP Growth**  
Annual Percent Change

Contribution From:	2007 projections		2014 projections	
	2007-2017	2013-2017	2014-2017	2018-2024
Potential Hours	0.6	0.4	0.3	0.5
Capital Services	1.1	1.1	0.8	1.0
Potential TFP	<u>1.4</u>	<u>1.4</u>	<u>1.2</u>	<u>1.2</u>
<b>Total</b>	<b>3.1</b>	<b>2.9</b>	<b>2.3</b>	<b>2.6</b>

Source: CBO, An Update to the Budget and Economic Outlook: 2014 to 2024.

However, there is less consensus on the longer-term implications. In earlier years, the CBO did not publish details of its long-term projections with regard to the underlying contributions of growth in labor supply or productivity. However, it raised its expected growth rate between 2025 and 2050 in the immediate aftermath of the crisis and has kept it largely unchanged in recent years. It does provide a more detailed explanation for its 2014 projections that imply an extrapolation of its 10-year projections for potential GDP into the future: growth of the labor



force at an average annual value of 0.5 percent and increases in labor productivity of 1.8 percent per year. Thus, CBO projects no rebound in the level of potential output, and a constant future growth rate.

The projections of the SSA trustees incorporate even fewer changes in the aftermath of the crisis. Actual GDP growth is assumed to recover most of the recession losses by 2020 with a net loss relative to the pre-recession expectations of about 3.5 percent, and the assumed rates of growth of GDP in subsequent decades are unchanged. Most of the recovery is concentrated in the projections of growth in the labor supply where the recent reductions in the labor force participation rate exceeded SSA expectations. Thus, the Trustees' projections are the clearest expression of the view that the effects of the financial crisis are largely transitory. However, despite the fact that the Trustees' projections have not changed significantly since the onset of the financial crisis, their long-term projections of GDP remain below those of the CBO.

## **Summary**

The current recession has been unusually severe and long-lasting. It has heightened the concern that, unlike past recessions, the current downturn could have a permanent and long-lasting impact on future growth in the economy. The impact on future growth rates has great significance for evaluating the sustainability of overall budget trends and the financial condition of the OASDI and Medicare trust funds. This paper has examined three sources of research information that bear on the issue.

First, the existing research literature provides a contrast between research on past recessions in the United States and the international experience. The studies of U.S. recessions suggest that their effects on output growth are transitory with very little evidence of enduring effects on future growth. In contrast, many of the international studies conclude that the effects of severe financial crises have been large, with persistent effects extending beyond a decade and perhaps longer.

A more detailed examination of the international evidence focused on severe financial crises in three Nordic countries and Japan in the 1990s that seem comparable to the current situation. The magnitude of initial output loss and increases in unemployment in the Nordic countries were very similar to the recent U.S. experience. However, all three countries responded in an aggressive fashion to deal with the financial disruptions and the recovery to

trend rates of output growth was relatively complete within 5-10 years. As small economies, they could rely on strong promotion of exports to lead them out of the recession. In Finland and Sweden, however, there was a continuing long-term cost in rates of unemployment that never returned to pre-crisis levels. Japan experienced a very incomplete recovery that has lasted for more than two decades and is most evident in a slowing of the underlying trend growth in productivity. The weak recovery is often attributed to the failure to respond in the same aggressive fashion as in the Nordic countries to the financial dislocation; but many of the studies point to other underlying problems that would have led to a slowing of growth in the absence of the crisis.

The examination of recent trends in the components of U.S. economic growth suggests a significant slowing of future growth relative to pre-crisis expectations, but many of the studies argue that the slowdown is only marginally related to the recession. Most of the attention has focused on a decline in the labor force participation rate, but the largest portion of that change is the result of previously-known changes in the demographic structure of the population. A relatively small portion of the decline is attributed to the cyclical influence. Thus, there is little room for a cyclical recovery and the participation rate is likely to continue to decline in future years. Second, the rate of TFP improvement has also slowed, but most studies view the slowdown as having predated the crisis. They often perceive the more modest rate of improvement as persisting in future years, but they resist attributing it to the crisis.

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