

Supply-side Costs of the Great Recession

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The long drawn-out recovery from the 2008-09 financial crisis is now perceived as largely complete. The unemployment rate, currently at 5.6 percent, is well below the average of the last half-century and is projected to decline below the 5½ percent level that the Congressional Budget Office (CBO) has long characterized as full employment by the end of the year. Capacity utilization of the industrial sector is also close to its pre-crisis average of 80 percent. However, the improvements in these standard measures of resource utilization are largely the product of reduced supplies of labor and capital rather than increased demand. A dramatically lower rate of labor force participation is now accepted as the new normal and the capital stock is expanding at only half of the pre-crisis rate. These reductions in factor supplies have led the CBO to lower its estimated level of potential output in 2014 by seven percent since the onset of the recession, and it has cut the projected average annual growth by about ½ of a percentage point, from 3 to 2½ percent, relative to pre-crisis expectations (figure 1). Thus, the economic losses from the recession 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 financial crises have reported more pessimistic conclusions (Reinhart and Rogoff, 2009). The permanence of the output losses stemming from the recession is of great significance for future changes in living standards, but it is also important for

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evaluating the financial viability of programs, such as Social Security and Medicare, that are largely financed on a pay-as-you-go basis.

The primary objective of this paper is to examine in greater detail the impact of the recession on the U.S. economy's potential output as reflected in the aggregate supplies of labor and capital and the combined efficiency with which they are used, total factor productivity. Second, with recovery the public attention has gradually shifted away from a concern with jobs to discontent over the limited growth in incomes for those with jobs. The later portion of the paper explores the reasons for the poor growth in real wages and the link between real wage growth and productivity. I begin, however, with a quick review of the U.S. economy and the outlook.

I. Economic Outlook

The U.S. economy has ended 2014 on a relatively strong note with an annual rate of growth in the third quarter of 5 percent and a projected growth of 2.5% for the year as a whole. It is a notably upward growth path given the negative growth in the first quarter. There are several reasons to be optimistic going forward:

- The fiscal restraint induced by the budget battles of 2011-13 has passed, and fiscal policy will be more neutral in its impact on the economy over the next few years.
- Business investment has largely returned to the share of GDP exhibited in the pre-crisis years, and firms face a highly favorable financial situation of strong cash flows and extraordinarily low borrowing costs.
- Consumers appear optimistic about the future and spending is expected to continue to grow in line with incomes in 2015, buoyed by substantial gains in household net worth--the saving rate has declined back in line with the pre-crisis average.
- The external trade deficit, at 3 percent of GDP, is substantially below the pre-crisis level, and the gains in exports have been particularly impressive in view of the weakness of demand in many of the traditional markets.
- Inflation has fallen below the Fed's target of 2%, and in the aftermath of the collapse of oil prices there should be little fear of inflation in the near future.
- And most positively, gains in employment have finally begun to exceed the natural increase in the population of working age, raising the employment-to-population ratio and pushing the unemployment rate sharply lower (figure 2).

As always, however, there are some areas of concern:

- The recovery in the housing market remains disappointingly slow, and the shortfall in housing investment- equal to about 2½% of potential GDP—created a gap that proved hard to fill. The weakness of housing demand is particularly evident among first-time buyers who may be more influenced by perceptions of increased job insecurity and higher student loan debt. On the other hand, some forecasters believe that the excess supply of housing has been largely eliminated and the market is ready for a turnaround, making construction a major driver of their growth projections for 2015.
- State and local government spending has also been a modest drag on the economy, Again largely due to weakness of the housing market, which has cut into S&L government tax revenues.
- The sharp rise in the U.S. trade-weighted real exchange rate combined with weak demand in the rest of the world fuels worry that the improved export performance cannot be sustained and a worsening of the trade balance will undermine the expansion in late 2015 and 2016. An appreciating exchange rate is a problem both for the United States and China, while there have been offsetting large real depreciations for the Yen and the Euro (figure 3). Thus far, however, the effects on trade flows have been modest.
- Productivity gains have been particularly disappointing throughout the recovery and have been largely responsible for a stagnation of real wage growth (more later).
- Overall, the projections of GDP for 2015 and 2016 are centered around 3 percent growth, well above expectations for other high-income economies. The Federal Reserve is also expected to move away from its zero-rate policy and allow interest rates to rise step-wise to a more normal level. The benign outlook for inflation, however, suggests that the process will be very gradual and conditional on continued improvements in the labor market. The risks are primarily on the side of less than expected growth.

II. Impacts on Aggregate Supply

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. Its consequence for long-term growth can be measured through its effect on growth in the three primary determinants of potential output: 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 the 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 of the crisis on labor supply, capital accumulation and productivity.

Labor Supply

The aggregate labor force participation rate has fallen substantially since the onset of the financial crisis, from 66 percent in 2007 to 65.4 in 2009, and 62.9 percent in 2014. While the 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—is 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 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 noninstitutional population. As shown in the figure, about two-thirds of the 4.1 percentage point drop in the participation rate between 2000 and 2014 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 2.6 percentage points by 2022.²

²The 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.

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. The demographic component can be foreseen with a high degree of accuracy and should not be a surprise. Most of the recent debate has been the result of unforeseen shifts in the group-specific participation rates and disagreements about the extent to which they reflect the short-term—hopefully cyclical—deterioration of the labor market or more permanent changes. 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. As a partial offset, the participation rates of older men and women have been rising and that pattern accelerated after 2000.

The Bureau of Labor Statistics (BLS), the Congressional Budget Office (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.³ 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. The BLS and CBO projections are shown 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?

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)

³ For recent examples see Toossi (2013), CBO (2011, 2014), and the references that they cite.

and CBO (panel B) brought down their projections, treating the lower than expected participation rates as a permanent phenomenon.⁴ With each projection, they begin with the last known value and project the participation rate to fall further in future years, but by less than implied by a simple demographically-adjusted projection. Thus, both CBO and the BLS have lowered their 10-year projections by the amount of the recent shortfall. In their latest projections, CBO and BLS are in basic agreement through 2024 in anticipating further declines in the participation rate of about two percentage points over the next 10 years.

However, it is also important to note, as in figure 4, that the demographically-adjusted measure of the labor force will also continue to fall. Effectively, the BLS and CBO projections assume that the gap between the demographic and actual participation rates is a transitory or cyclical phenomenon that will gradually fade away, so that the projected rate matches the simple demographic extrapolation of fixed participation rates by 2022. That assumption that the gap will diminish seems to have been born out in the aftermath of the 2001 recession in which the difference between the two measures had largely disappeared by 2007; but the current magnitude is larger and it appears to be growing, rather than shrinking.

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 1½ percent. Surprisingly, the recession has not had a great 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.

Capital Services

In the CBO's revisions of its estimates of potential GDP between 2007 and 2014, changes to the contribution of capital account for one-third of the reduction in the level of potential GDP in 2017. However, the accumulation of capital services is largely determined through a highly endogenous process that is driven by changes in total output (GDP). 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 total factor productivity (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

⁴ See also Canon and others, 2013.

6, which shows a steady upward trend.⁵ The fall in the investment rate in recent years has slowed the growth of the capital input, but it is recovering, and with a lag, growth in the capital input will accelerate and return to trend.

Productivity

Whereas we can explain large portions of the change in labor supply as the product of variations in the age structure of the population, projections of future developments in productivity seem inherently far 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 have resulted in a range of estimates for the growth in 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.

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 decelerated from an average of 1.9 percent per year in 1950-73 to only 1 percent in 1973-95 (column 3 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

⁵ 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.

emerges from the analysis of labor productivity as used by Gordon. The measures of labor productivity imply a larger post-1995 revival of annual productivity growth (relative to TFP), increasing by 1.3 percentage points above the prior average, but with a full reversion to the post-1973 rate after 2004.⁶

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 also 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) agree 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 IT-producing industries and project 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 IT-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 stress 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 future productivity gains 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

⁶ The labor productivity measures reflect some of the strong cyclical variation in capital services.

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%) is significantly below its estimate as published in 2007 (1.4%), but it is still above the one percent average of the slow growth era 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 productivity growth by CBO remain too high.

Combined Output Effects

The CBO has revised down its estimate of the current potential output of the U.S. 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 (CBO,2014). The ICT-based boom of the late 1990s is seen as initiating a wave of excessive optimism that led to the neglect of negative demographic influences on labor force participation and a slowing of growth in productivity—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; but they seem consistent with the recent rapid decline in the overall unemployment rate and the rise in capacity utilization in the industrial sector. 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 cut back 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).

III. Sources of Real Wage Stagnation

Despite increased evidence of economic recovery, real wage gains have been niggling over the past decade and have given rise to growing claims of unfairness. I agree that all of the evidence points to uncommonly small gains in workers' real (adjusted for inflation) wages, but it is instructive to examine the reasons for the poor performance. The change in real wages has three primary determinants of: (1) gains in labor productivity, (2) the division of earned income between labor and capital (profits), and (3) the allocation of labor compensation among wages and nonwage benefits (Fleck and others, 2011).

Most importantly, the growth in the average real wage is largely determined by improvements in labor productivity, which is measured by output per worker hour. Without such gains, an increase in the average nominal wage will simply be passed forward in the form of higher prices, and higher real wages for some can only come at the expenses of lower wages for others—a zero-sum game. However, the growth in the real wage can deviate from that of productivity due to changes in labor's share of total income. Historically, labor's share has been one of the great long-run constants of economics, but its surprising decline in recent years has stimulated renewed interest in its determinants, and a popular book by the French economist, Thomas Piketty, put the issue at the center of the debate over the sources of growing income inequality (Piketty, 2014). Third, workers often focus on their take-home or money wage, ignoring the magnitude of benefits (primarily provisions for retirement and health insurance) that are paid for through their employer.

The relevance of these three determinants of real wages can be illustrated by focusing on government statistics covering workers in the private nonfarm business sector for which we have reasonable measures of productivity and wage payments. Public-sector workers are largely excluded because of problems in measuring output and productivity in a nonmarket context. Figure 8 summarizes the linkages between productivity growth and real wages over the entire post-World War era. The immediate post-war years up to the mid-1970s encompassed a span of extraordinary productivity improvement as major innovations, accumulated during the years of economic depression and war, were applied on a widespread basis. Growth slowed in the 1970s

and 80s for reasons that economists have never fully understood, but productivity surged again in the late 1990s and early 2000s under the impetus of major innovations in information and communication technologies (ICT).

Those episodes are clearly evident in the cycle of productivity growth shown in figure 8, which averaged 2.8 percent per year for a quarter of a century before slowing to 1.5 percent in 1972-94, and rose back to 2.8 percent in the boom years of 1994-2005. Unfortunately, its performance over the last ten years suggests a return to the low-growth performance of the 70s and 80s. The severity of the last recession, however, greatly complicates the interpretation of the causes and permanence of the slowdown; significant economic studies have emerged on both sides of the debate. All the same, the importance of productivity growth for gains in real wages and living standards is evident in the falloff to half its prior pace.

Absent a change in labor's share of the income generated from production, real wages should rise in lockstep with labor productivity. Labor's share within the nonfarm sector has been slowly declining since the end of the war, but for most of the period that was entirely due to an adjustment to the data to include the labor-type income of the self-employed.⁷ There is however, a larger and more evident decline in labor's share since 2000.

It is also important to compare productivity and real wages using comparable price indexes. Productivity is an output concept and an output-price deflator should be used to equate output and the real cost of labor. However, workers are more interested in what their earnings can buy, and it is equally useful to deflate nominal wages values with a measure of consumption prices. Those two price measures are not the same because the mix of products that Americans produce is not the same as what they consume.

In figure 8, real wages are shown on the basis of both output and consumption prices. The basic stability of labor's share up to 2000 is evident in the minor difference between the growth in labor productivity and real wages (output prices), but the average annual increase in real wages falls short of that of productivity by a substantial ½ percent in the 2005-14 period. In addition, workers have suffered a consistent loss in their terms-of-trade (output prices/consumption prices since the mid 1970s), further eroding their real incomes.

⁷ The income of the self-employed reflects a return on their invested capital as well as their own labor hours. The Bureau of Labor Statistics imputes a wage rate equal to that of employees in their industry. Over the post-war era, the share of the self-employed in the workforce has slowly declined.

Finally, there has been an enormous expansion of the employment-based system used to finance the provision of retirement and health care (supplements). Those costs are often not evident to the typical worker, even though the benefits are popular. However, the costs have played a surprisingly minor role in the distinction between labor compensation and wages in recent years. In fact, the growth of take-home pay in nonfarm business, shown in figure 8, has slightly outpaced that of hourly compensation since 1995. The evolution of the non-wage benefits can be seen more clearly in figure 9, which displays the cost of the major programs as a percentage of wage and salary payments. There has been no major expansion of the basic social security program since mid-1980s, and employers are phasing out their contributions to defined benefit plans in favor of defined contribution plans that are more reliant on direct employee contributions. The big expansion has been in employment-based health insurance, but even those costs have slowed in recent years. The category of other payments includes workers' compensation and unemployment insurance.

There are other measures of real wage changes that imply even smaller gains in real wages. Most prominently the employment cost index (ECI) is widely used as a measure of nominal wage changes. It excludes the effects of changes in the composition of jobs, which makes it ideal for measuring inflation pressures, but is not fully comparable with the productivity measures that include changes in the composition of output and employment. The ECI also does not include stock options and other forms of compensation to workers at the top of the wage distribution. Household-based surveys also provide estimates of wage changes, but they exclude the costs of most supplements. Both the ECI and the household survey indicate even lower rates of real wage growth, but they are less comprehensive in their coverage than the national accounts. While no full reconciliation is available, the most important differences are believed to be concentrated in the reporting of wage data for workers at the very top of the earnings distribution.

Still, the data of figure 8 clearly document a major slowdown in real wage growth. It is largely the product of poor productivity performance over the past decade, but that may not be surprising in view of the enormous economic losses that were precipitated by the financial crises. Nor is it unprecedented if the ICT revolution is viewed as a transitory phenomenon. The new phenomenon is the decline in labor's share of income for which we have no satisfactory explanation. It may reflect the huge rents that accrued to commodity producers during the boom

of the last decade, and as that comes to an end, labor's share may rise back toward the historical norm. However, some analysts point to the development of a highly competitive global market for labor combined with a more general reduction in product-market competition through reliance of mergers, IT patents, and regulations that suggest a reduced labor share may be a longer-lasting phenomenon.

IV. Summary

The recent recession has been unusually severe and long-lasting. It has heightened the concern that, unlike past recessions, it could have a permanent and long-lasting impact on future growth in the economy. 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 the cyclical influence. As a result, there is little room for a cyclical recovery and the participation rate is likely to continue to go down in future years. Second, the rate of TFP improvement has also slowed, but again the slowdown appears to have predated the crisis. Most studies anticipate that modest TFP growth will persist in future years, but they are agnostic about the role of the crisis. Certainly, the recession triggered a broad reassessment of the growth outlook and most projections have adopted a more pessimistic perspective; but it has proved hard to establish a causal link between the recession and lower expectations of future growth.

The recent employment growth has also brought about a shift of focus away from the emphasis on job creation to growing complaints about the stagnation of real wage growth. However, we find that the two issues are closely linked in that the limited increase in productivity that made it possible to achieve larger than expected job gains despite relatively modest growth in the overall economy is the primary factor accounting for low rates of real wage gains. The problem has been also been exacerbated by a fall in labor's share of the total income from production.

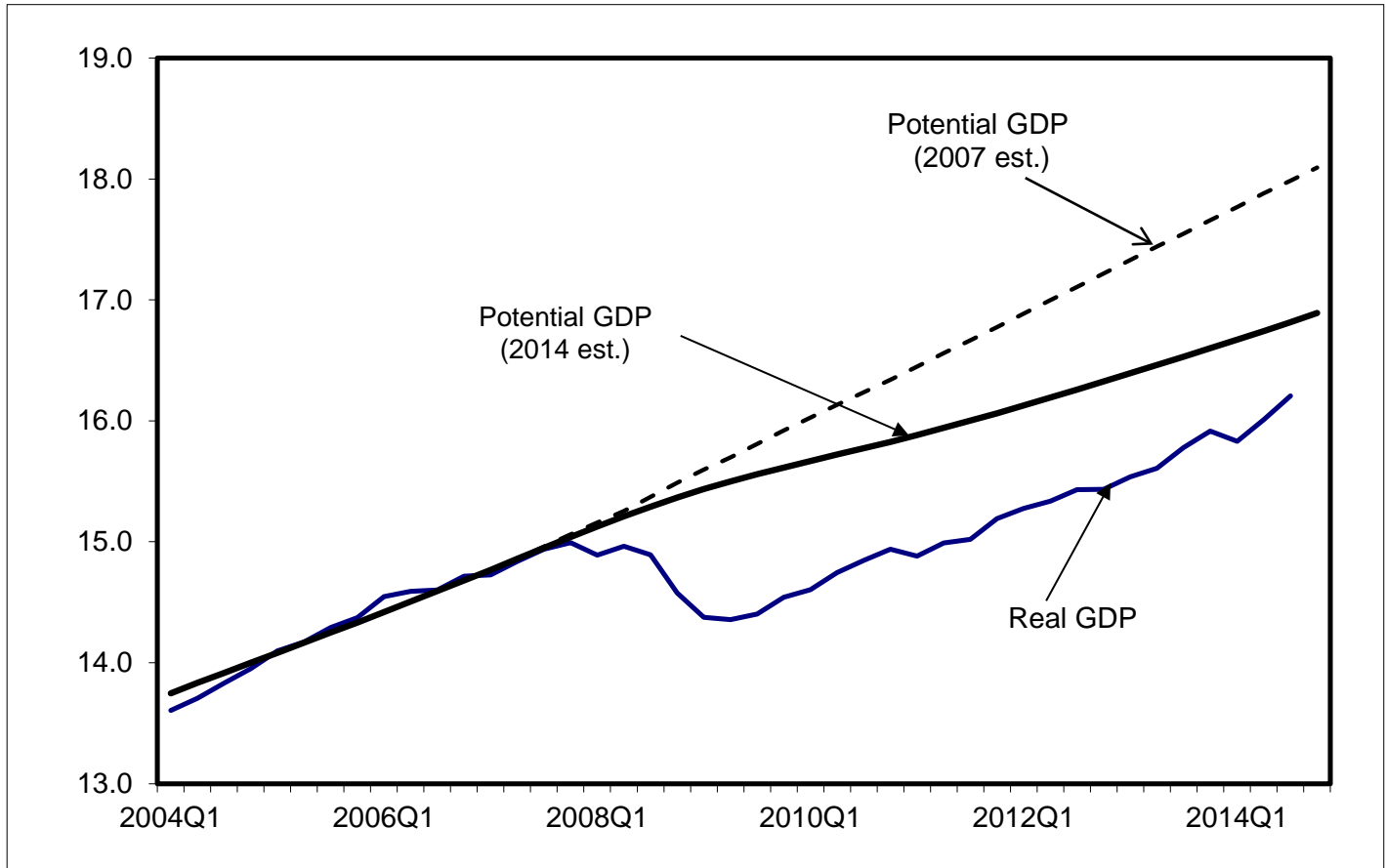
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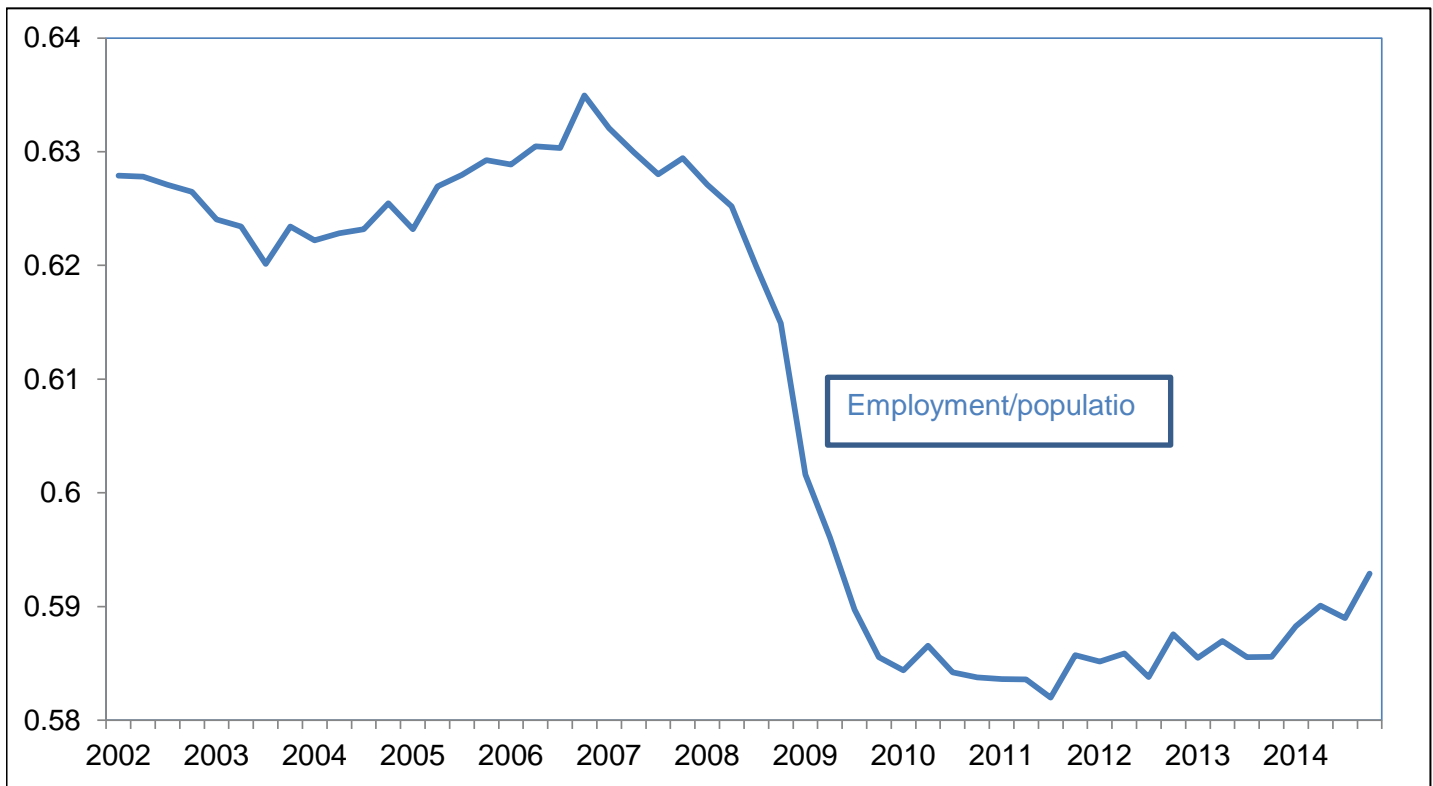
Figure 1. Actual and Potential GDP, 2004-2014

trillions of 2009 dollars



Source: Congressional Budget Office and author's calculations.

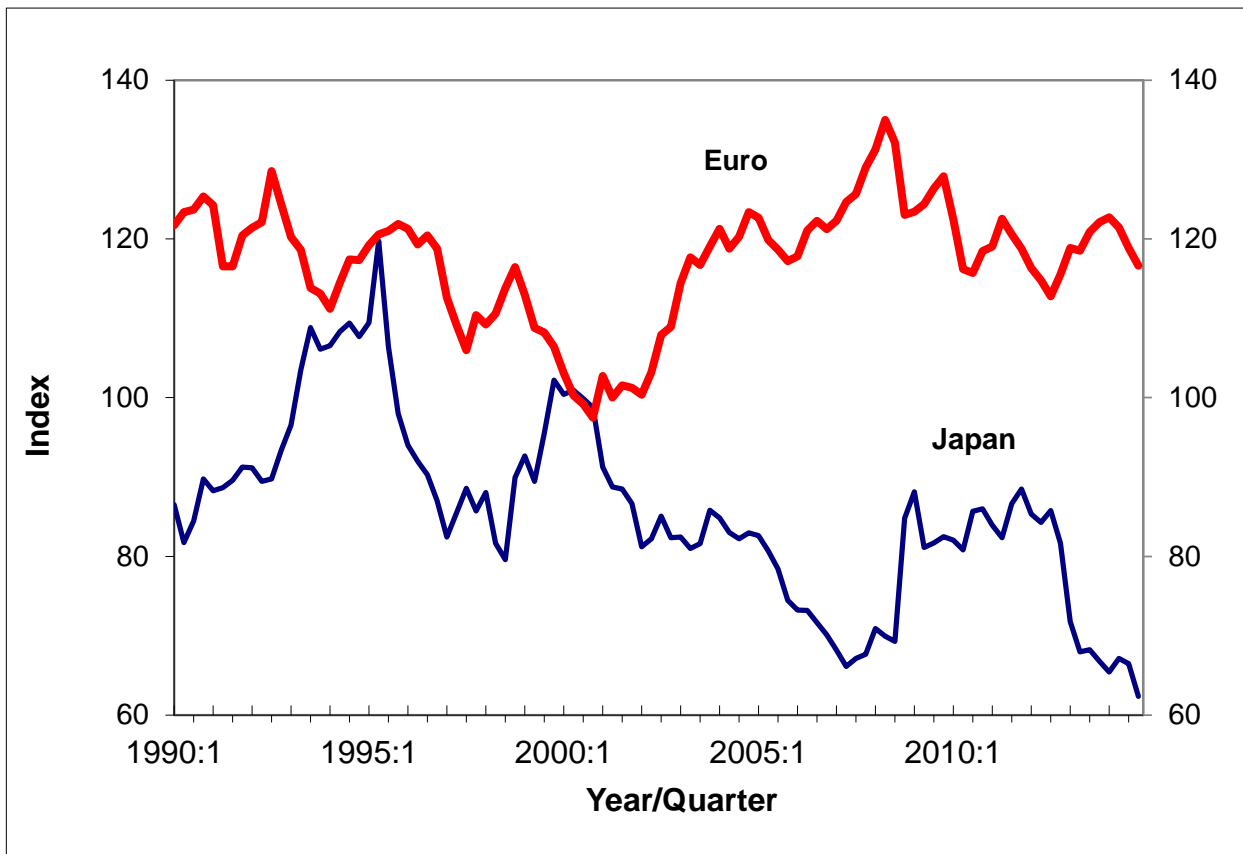
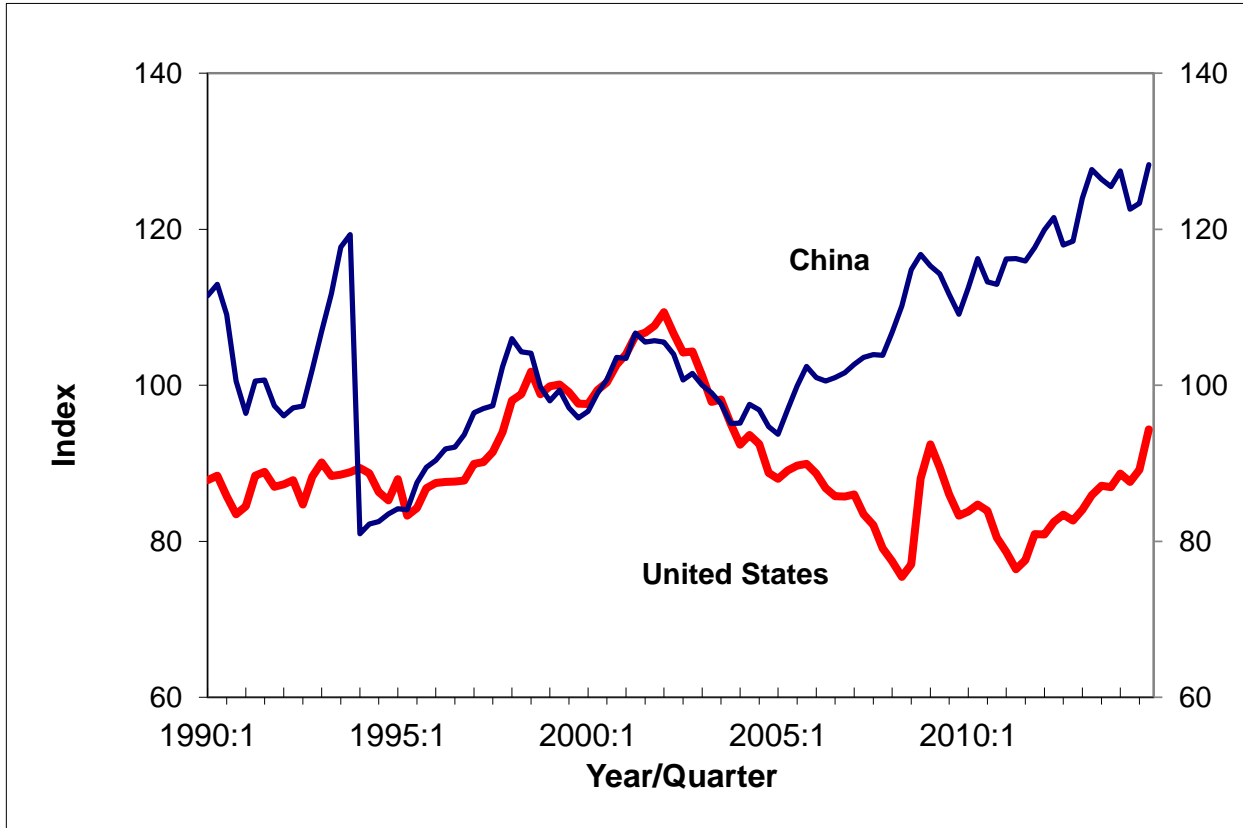
Figure 2. Employment to Population Ratio, 2002-2014



Source : Bureau of Labor Statistics.

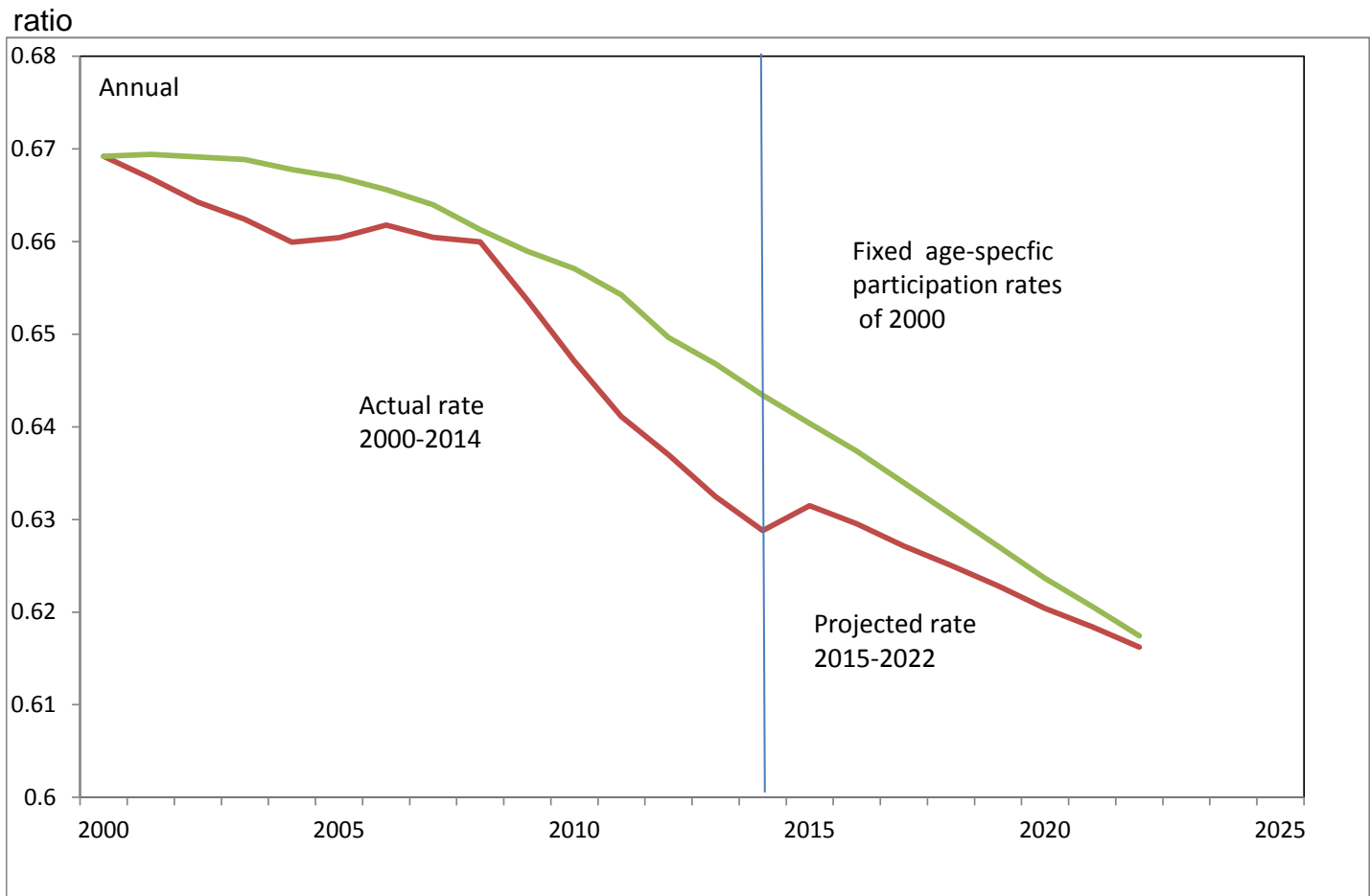
Figure 3. Trade-weighted Real Exchange Rates, 1990-2014.

Index, 2000=100



Source: JP Morgan.

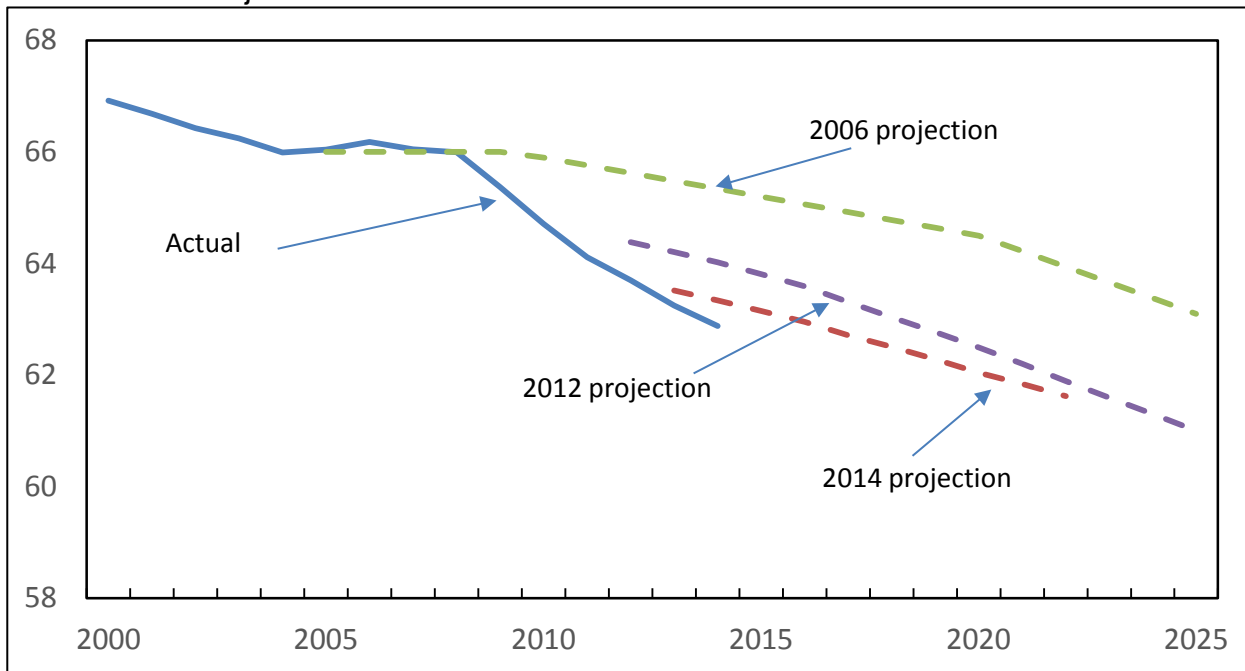
Figure 4. Actual and Demographically-Adjusted Labor Force Participation, 2000-2022.



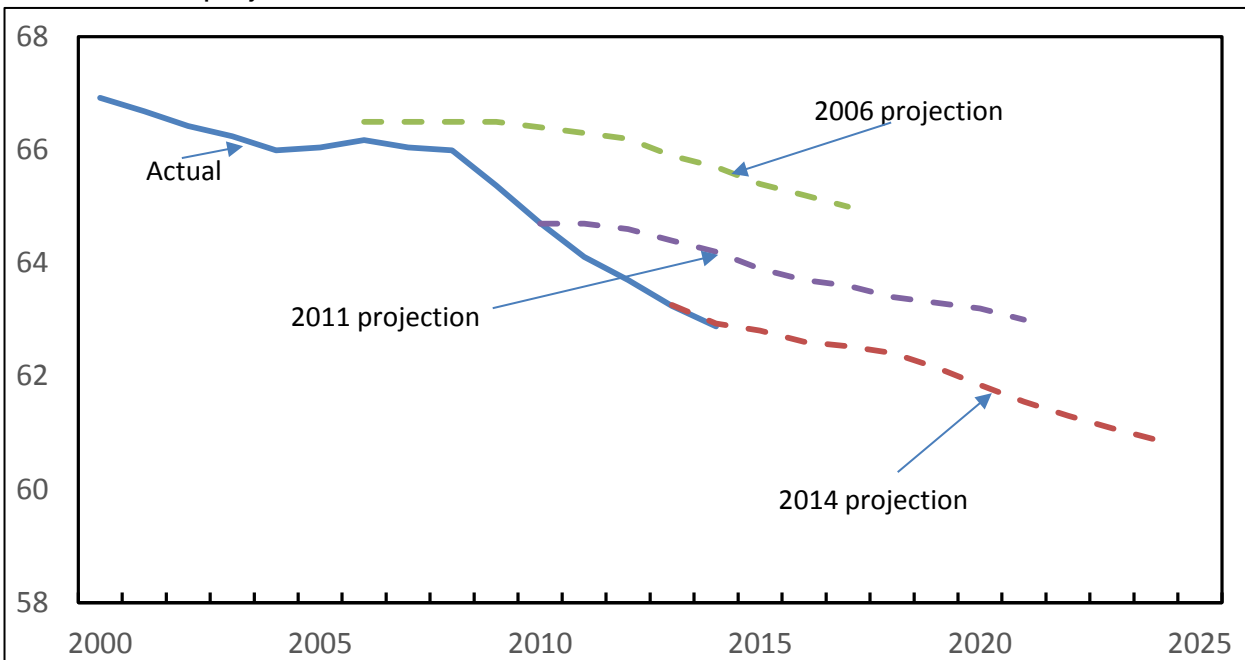
Source: the actual labor force data are from BLS, and the projections are from Toossi (2013). The demographic adjusted rate is computed by the author from BLS data on the labor force and population in 5-year age groups using fixed participation rates of 2000.

Figure 5. Labor Force Participation Rates, Alternative Projections

Panel A: BLS Projections



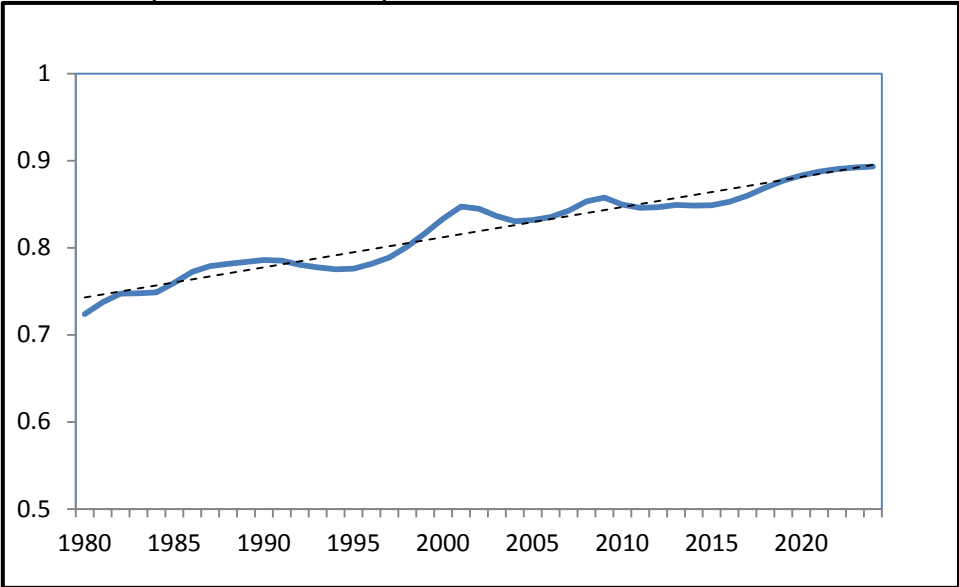
Panel B: CBO projections



Sources: Toosi (2007,2013), and CBO (2004,2011,2014)

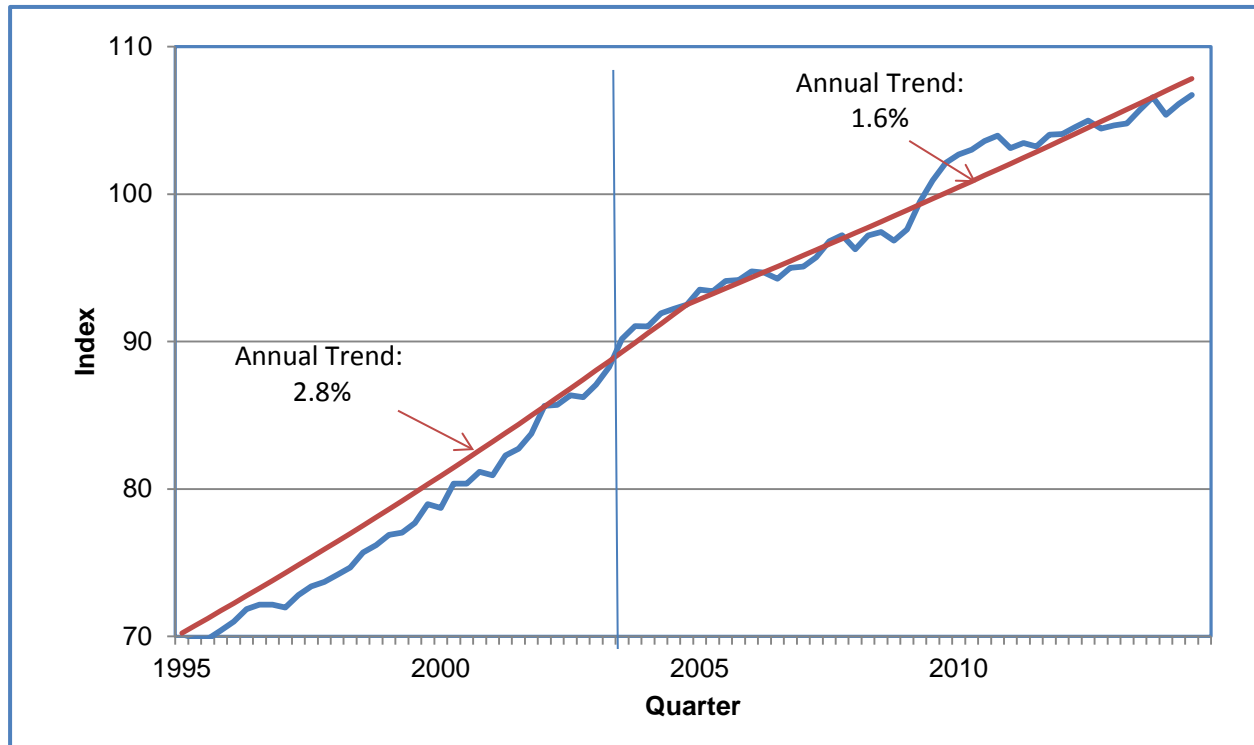
Figure 6. Capital Intensity, 1980-2024

ratio of capital services to potential GDP of nonfarm business



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

Figure 7. Labor Productivity in the Nonfarm Business Sector, 1995:1-2014:3



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.

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

annual percentage change

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

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

Table 2. CBO Revisions to Potential GDP Growth

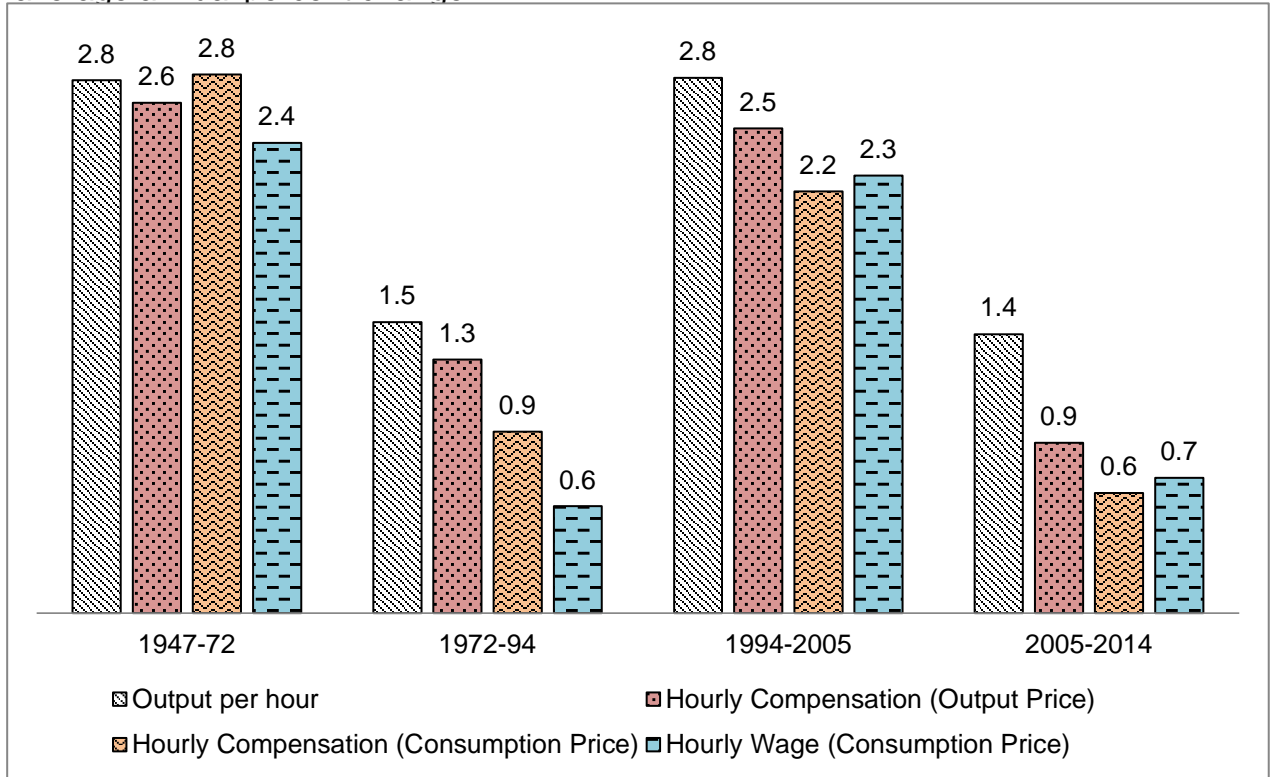
Annual Percent Change

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>
<u>Total</u>	3.1	2.9	2.3	2.6

Source: CBO, An Update to the Budget and Economic Outlook: 2014 to 20

Figure 8. Changes in Productivity and Real Wages, 1947-2014

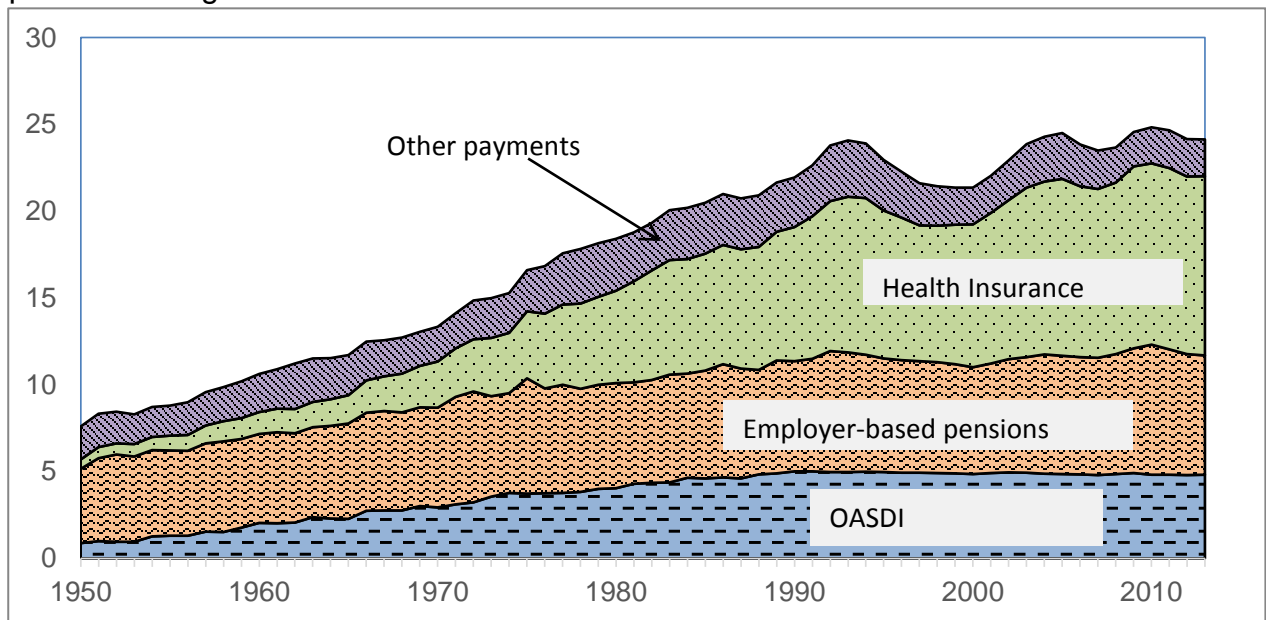
average annual percent change



Source: Bureau of Labor Statistics and author calculations

Figure 9. Wages Supplements, 1950-2012

percent of wages and salaries



Source: author's computations and table 7.8 of the national income and product accounts. Coverage is at the level of the total economy.