

# Can We Estimate the Cost of a Recession?

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## Cover page

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## Can We Estimate the Cost of a Recession?

### *Abstract*

This paper develops a framework to estimate the economic costs of a recession for the U.S. economy. The cost is estimated in terms of losses in personal income, personal consumption, employment, labor productivity, investment and GDP growth rates. We estimate medium term cost/damages from the Great Recession. In addition, our proposed framework can be utilized to estimate losses from any recession and for any country/region. To estimate damages from the Great Recession, we consider pre-recession estimates as a benchmark and compare these estimates with those which are published after the Great Recession.

Our statistical analysis suggests that, during the 2008-2015 period, the average annual reduction in the level of real GDP is 9.9 percent, 9.8 percent in personal consumption and 10.7 percent in real disposable personal income. During the same time period, the average annual loss in business fixed investment is 20.1 percent, 7.8 percent in employment and 6.9 percent in total factor productivity. The average reduction in the labor force is 2.2 percent, 7.9 percent in labor productivity and 6.4 percent in capital services during the 2008-2015 period.

In sum, our study suggests long lasting damages from the Great Recession as level (trend) of potential series (for all variables) has shifted downward. These results are consistent with the overall economic environment since the Great Recession. That is, a painfully slow economic recovery along with slower growth in personal income, employment, wages and business fixed investment. In addition, monetary policy is still struggling to get back to “normal.”

**Keywords:** Recession Cost; Output; Personal Income & Spending; Investment; Employment;  
**JEL Classifications:** E32; E2; E24.

# Can We Estimate the Cost of a Recession?

## Introduction

Our study presents a framework to estimate economic costs of a recession for the U.S. economy. The potential damages are estimated in terms of losses in personal income, personal consumption, employment, labor productivity, investment and GDP growth rates. We estimate medium term cost/damages from the Great Recession. In addition, our proposed framework can be utilized to estimate losses from any recession and for any country/region.

Typically, economies follow business cycle properties of recession and recovery/expansion. That is, during a recession, an economy's output level falls below the potential level and a recovery/expansion phase bring output level back to the normal (pre-recession trend). In addition, standard macroeconomics textbooks consider recessions as temporary shocks and those shocks reduce the output level only in the short run as the economy get back to the normal level in the medium to long run, Mankiw (2010). However, the economic performance of the U.S. economy (and many other developed nations) since the Great Recession (2007-2009) has raised a question about the traditional notion that recessions have only short term effect. Many studies have estimated the output losses in the short to medium run and concluded that the damages from the Great Recession were significant even in the short/medium run, for more detail see Cerra-Saxena (2008), IMF (2009), Ball (2014) and Ollivaud and Turner (2014).

In addition, most studies have estimated damages from the Great Recession in terms of output, employment and productivity losses. For instance, Ball (2014) estimated the output losses compared to the pre-recession potential GDP (assuming as if there were no recession). Ollivaud and Turner (2014) estimated employment and productivity loss in addition to the output loss. Our study contributes to the current literature by including more variables in its analysis and estimating losses for nine major variables. The major reason to include more variables in the analysis is that the effect of the Great Recession may be different on different sectors/variables, i.e., a heterogeneous effect. Therefore, incorporating more variables in the analysis would allow us to capture the Great Recession effect on the economy more accurately.

Our proposed framework estimates the losses for nine major variables. Furthermore, we utilize the pre-recession potential level of the target variables, GDP for example, to estimate the cost of recession. The intuition behind this method is that the pre-recession potential GDP level is estimated using expansion phase growth rates and with the assumption of no recession in the near future (or at least for the period under study). Generally, these rates are higher than those which are calculated during recession/recovery times and thereby the gap between these two measures (estimated at two different time periods) of potential GDP is utilized as a benchmark to estimate the cost of a recession.

Our statistical analysis suggests that, during the 2008-2015 period, the average annual reduction in the level of real GDP is 9.9 percent, 9.8 percent in personal consumption and 10.7 percent in real disposable personal income. During the same time period, the average annual loss in business fixed investment is 20.1 percent, 7.8 percent in employment and 6.9 percent in total factor productivity. The average reduction in the labor force is 2.2 percent, 7.9 percent in labor productivity and 6.4 percent in capital services during the 2008-2015 period.

Our study concludes that damages from the Great Recession are long lasting. That is, the level form (trend) of all nine variables has shifted downward and this is true for both actual and potential forms of these variables. These results are consistent with the overall economic environment since the Great Recession. That is, a painfully slow economic recovery (using GDP as proxy) along with slower growth in the personal income, employment, wages and business fixed investment. In addition, monetary policy is still struggling to get back to “normal.”

The rest of the paper is organized as follows. Section 2 discusses the econometrics of our proposed framework. Section 3 presents empirical results and concluding remarks are summarized in section 4.

## 2. The Econometric Setup

We estimate damages from the Great Recession for the U.S. economy. Furthermore, our estimates for damages are for the medium term with potential long run implications. That is, average annual losses are estimated for the 2008-2015 period. To estimate damages from the Great Recession, we consider pre-recession estimates as a benchmark and compare these estimates with those which are published after the Great Recession. For example, we utilize potential GDP series published by Congressional Budget Office (CBO) on August 2007, labeled 2007 vintage, (our benchmark pre-recession estimates) and then compare vintage 2007 with the potential GDP published on August 2016, labelled 2016 vintage, (post-recession estimates) as well as with the actual GDP numbers.

The major reason to consider vintage 2007 (CBO published estimates on August 2007) estimates as the benchmark is that these series were not affected by the Great Recession. Because these estimates (vintage 2007) were produced before the recession and with the assumption of no recession during the next ten years. That is, typically, the CBO provides estimates for the next ten years, i.e., the 2007 vintage includes potential GDP estimates up to 2017. Therefore, the vintage 2007 series provide estimates for the next ten years (assuming no recession during the 2007-2017) which include the period of the Great Recession and help us to calculate damages from the Great recession. The vintage 2016 (estimates published by the CBO on August 2016), on the other hand, incorporate the Great Recession. For instance, the 2016 vintage include potential GDP estimates up to 2026 (ten years out) and that series also includes revisions to the previous vintages (revisions to the 2007 vintage for example) and those revisions include the Great Recession.

We utilize the actual series in the estimation process as well. That is, we include actual real GDP estimates in the analysis along with potential real GDP from vintage 2007 and vintage 2016. Furthermore, we estimate the gap between the vintage 2007 series (our benchmark) and real GDP/ vintage 2016.

In the next phase, we rebase all three series (vintage 2007, vintage 2016 and actual series) using 2005 as the base year so that all series are equal to one for 2005. Then, we calculate the average

annual loss for the 2008-2015 period. Since actual estimates are available up to 2015 (at the timing of this writing), 2015 is the end year for our analysis.

The CBO provides the potential level for GDP, labor force, labor productivity, total factor productivity and index of capital services. Except for the capital services index, we have actual estimates for all series. Therefore, we estimate damages for these series relative to vintage 2007 as well as vintage 2016. For the capital services index, we estimate the gap between vintage 2007 and vintage 2016 and then utilize that gap to estimate potential losses for capital services.

To the best of our knowledge, the CBO does not provide potential estimates for the personal income, personal consumption, employment and business fixed investment. These variables represent major sectors of the U.S. economy and therefore we include these variables in our analysis. We generate estimates for the vintage 2007 and vintage 2016 for these four series. For personal income, personal spending and business fixed investment, we utilize real GDP as a benchmark to generate estimated potential level for these series. For example, in the first step, we estimate a ratio of personal income to GDP and then multiply that ratio with GDP vintage 2007 (and with GDP vintage 2016) to obtain personal income vintage 2007 (and vintage 2016). That is, we estimate potential personal income based on 2007 vintage (pre-recession) and 2016 vintage (post-recession). Therefore, now we have potential personal income levels for pre-recession period (vintage 2007) and for the post-recession period (vintage 2016) and we can estimate damages from the Great Recession in terms of personal income loss.

We follow the same procedure for the personal spending and business fixed investment series to obtain vintage 2007 and vintage 2016 estimates for these series. For employment (nonfarm payrolls) vintages, we obtain the ratio of employment to labor force and then multiply that ratio with labor force vintage 2007 (and with vintage 2016) to obtain employment vintage 2007 (and vintage 2016). In the final step, we rebase these four variables (actual and estimates for potential vintage 2007 and vintage 2016) to 2005 and estimate potential losses for these four variables.

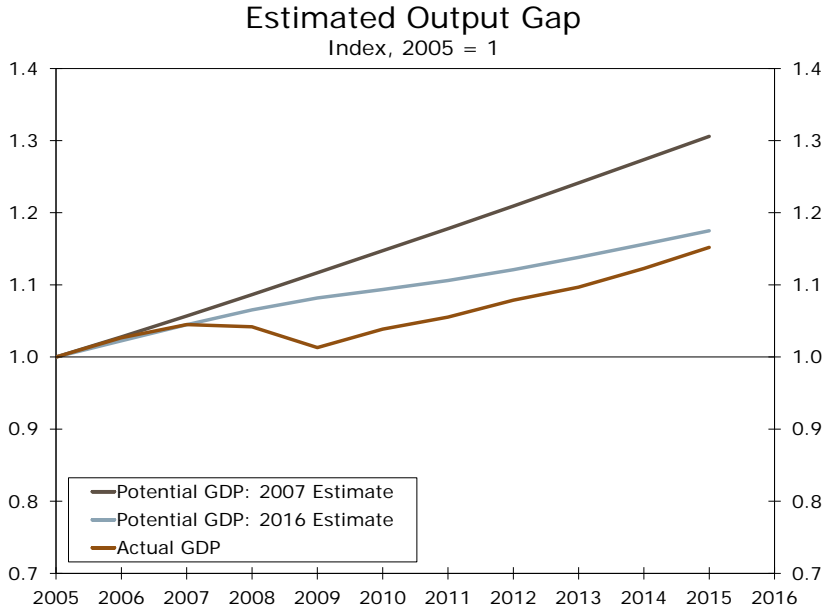
### 3. The Results

The objective of this study is to estimate the economic damages from the Great Recession. The damages are estimated for the U.S. economy and in particular for nine major sectors. In the following section, we discuss the losses for each of the nine variables.

#### 3.1 The Estimated Output Damages

GDP is a reliable indicator to judge the overall health of the economy. Figure 1 shows estimated losses from the Great Recession. There are two noticeable observations from Figure 1. First, the actual GDP series is below the vintage 2016 and significantly lower than the vintage 2007. This indicates that the U.S. economy has been unable to recover to its potential level. Second, and most important in our view, the vintage 2016 is well below the vintage 2007 (potential GDP estimated published in 2007) and that implies the Great Recession has shifted the potential level of GDP downward. In other words, the damages from the Great Recession are not temporary (or transitory) as the 2015 level of potential GDP based on vintage 2007 is significantly higher than the level estimated in 2016. This suggests that damages from the Great Recession are long lived.

Figure 1

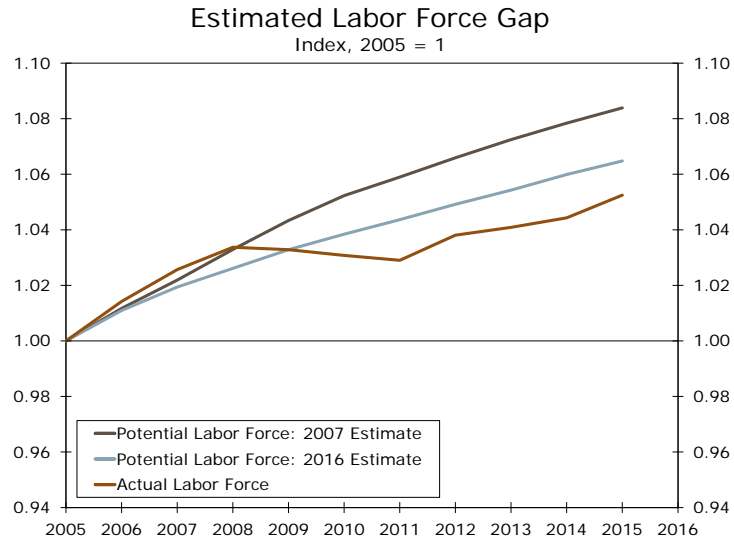


#### 3.2 The Estimated Labor Force and Labor Productivity Damages

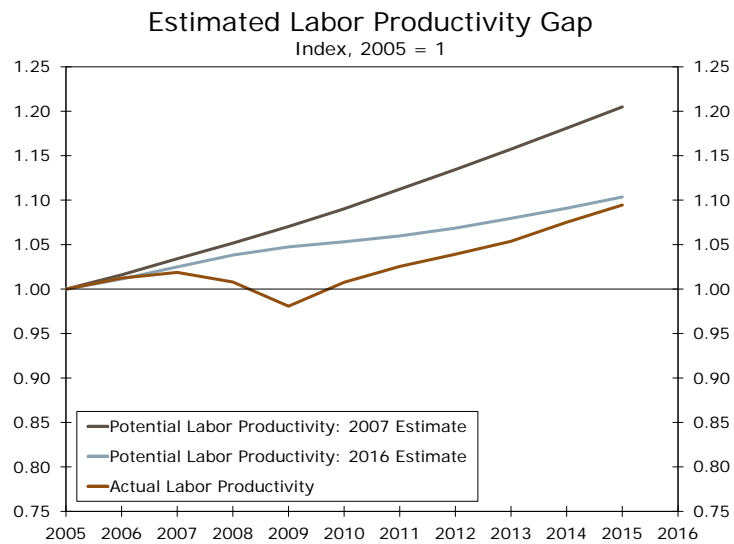
The labor market estimates are consistent with the GDP picture as the labor force is well below the vintage 2016 and vintage 2007 (Figure 2) which may explain the recent drop in the labor

force participation rate. The damages to the labor market seem long-lived as well because the vintage 2016 labor force line is well below the vintage 2007 line. Figure 3 depicts labor productivity and it also show longer term damages from the Great recession.

**Figure 2**



**Figure 3**

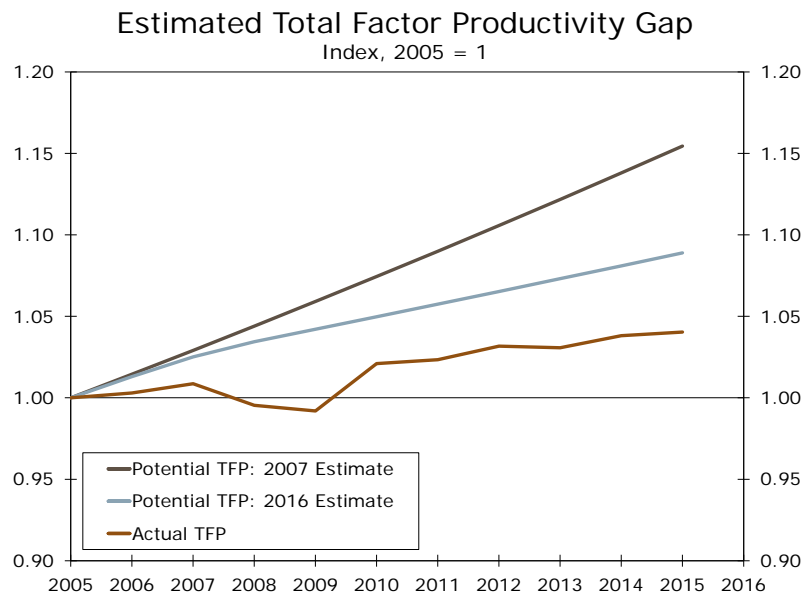




### 3.3 The Estimated Total Factor Productivity Damages

Total factor productivity suffered from the Great Recession as well, Figure 4. The Great Recession has shifted the potential total factor productivity level downward significantly, evidence of long lasting damages. The actual productivity line is unable to cross the vintage 2016 line (which is already lower than the vintage 2007 line).

**Figure 4**

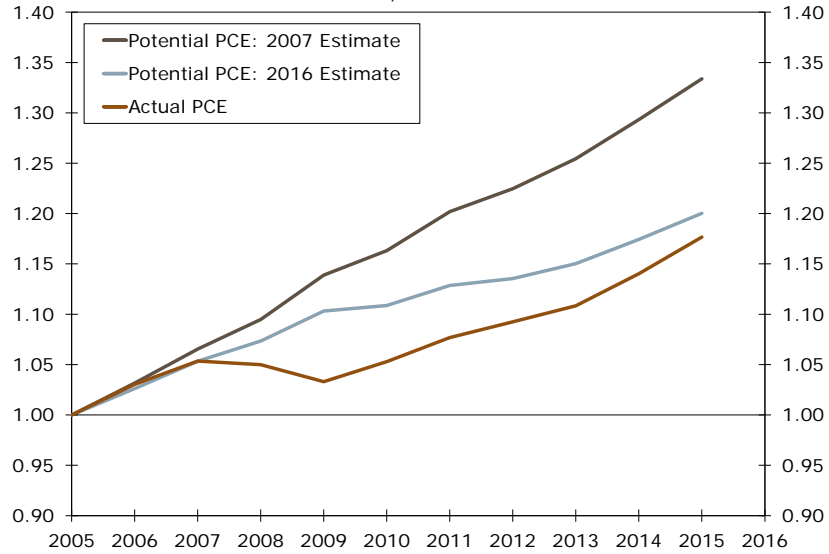


### 3.4 The Estimated Personal Income and Spending Damages

Private consumption is the largest component of GDP and therefore we include personal income (real disposable personal income) and personal spending (real personal consumption) in the analysis. As mentioned earlier, we estimated the vintage 2007 (potential personal consumption based on 2007, pre-recession estimates for example) and vintage 2016 to estimate potential losses from the Great Recession for personal income and spending. In Figure 5, the real personal spending line is closing the gap with vintage 2016 which indicates consumption is moving closer to its potential level. However, both the actual personal spending and vintage 2016 lines are well below the vintage 2007 line, which emphasizes the notion of long lasting damages from the Great Recession. The real disposable income behavior is also consistent with personal spending's behavior and confirms the long term damages from the Great Recession, Figure 6.

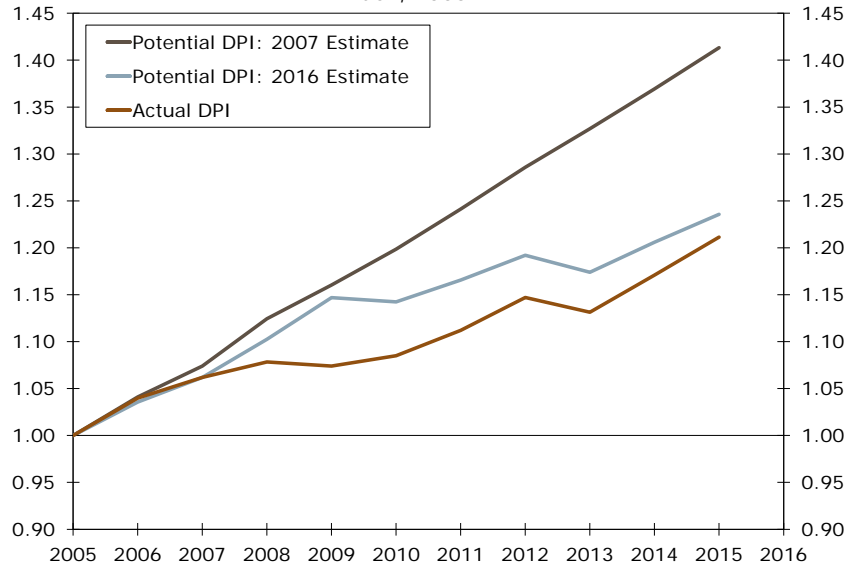
**Figure 5**

**Estimated Personal Consumption Gap**  
Index, 2005 = 1



**Figure 6**

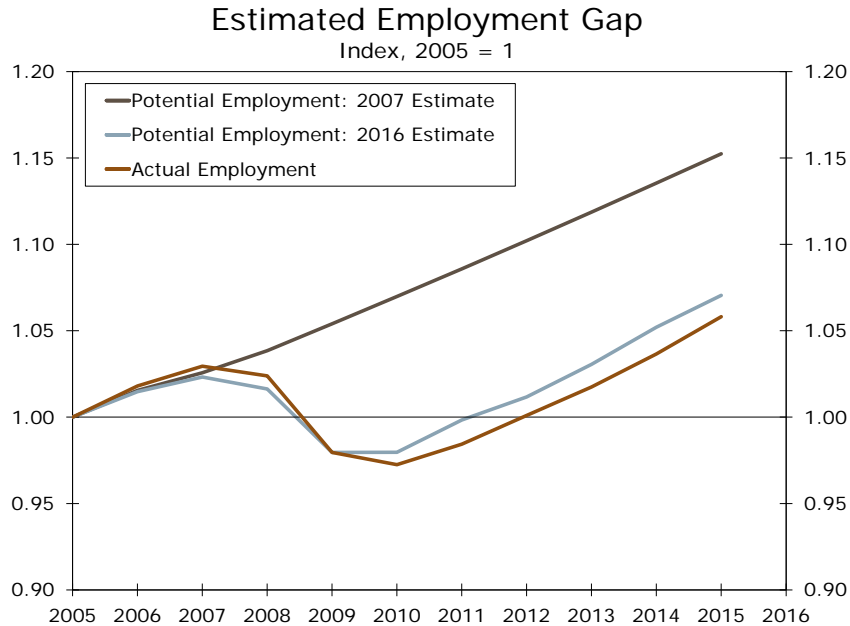
**Estimated Disp. Personal Income Gap**  
Index, 2005 = 1



### 3.5 The Estimated Employment Damages

The Great Recession produced the largest employment loss in the post-World War II era. In addition, the labor market recovery from the Great Recession was painfully slow. Figure 7 suggests that the Great Recession left a long lasting effect on employment growth as both vintage 2016 and actual employment lines have shifted downward significantly.

*Figure 7*



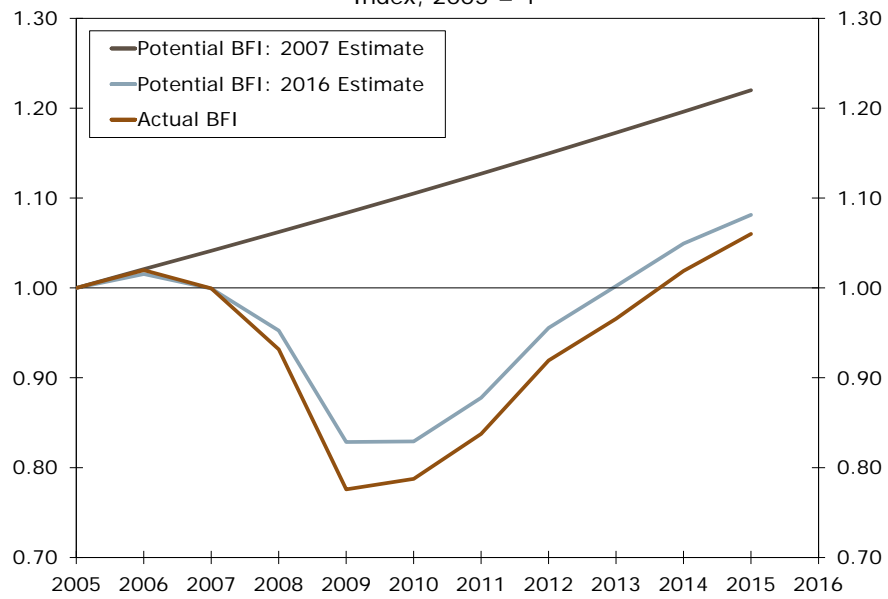
### 3.6 The Estimated Business Fixed Investment and Capital Services Damages

The business fixed investment is another area which shows significant damages from the Great Recession, Figure 8. Both vintage 2016 and actual business fixed investment lines are well below the vintage 2007 line but the gap has narrowed over the past few years. The capital services index (vintage 2016) is also well below the vintage 2007 line, Figure 9. Note, we do not have actual series for the capital services index and CBO produces the potential level of the index only.

**Figure 8**

**Estimated Business Fixed Investment Gap**

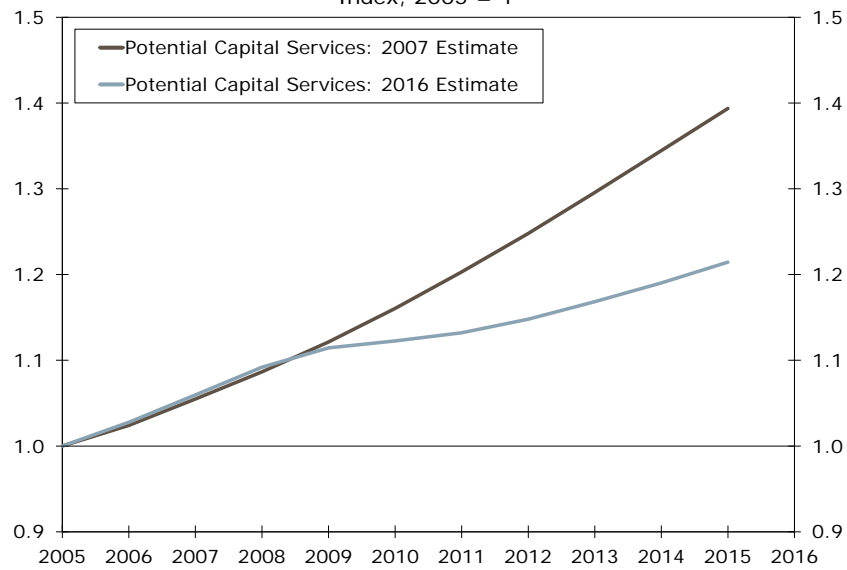
Index, 2005 = 1



**Figure 9**

**Estimated Capital Services Gap**

Index, 2005 = 1



### ***3.7 The Average Potential Losses from the Great Recession***

We also estimated the average annual loss for each of the nine variables for the 2008-2015 period. We calculate two set of losses. First, we compared the actual series with the vintage 2007 and that indicates losses due to the Great Recession. This scenario assumes no recession (as if there were no recession in 2007-2009). For example, the estimated average annual loss in terms of GDP compared to vintage 2007 is 9.9 percent (difference between actual GDP and potential GDP based on 2007 estimates). That is, the Great Recession, on average, reduced the level of GDP by 9.9 percent each year during the 2008-2015 period.

The second method compared the actual series with the vintage 2016. The average annual GDP loss compared to vintage 2016 is 3.8 percent. The Great Recession has shifted the level of potential series downward for each of the nine variables and thereby there are smaller losses using vintage 2016 as benchmark. Results for all variables are reported in Table 1. Using the vintage 2007 as a benchmark, the largest annual average loss is estimated for the business fixed investment (20.1 percent) and smallest damage is for the labor force (2.2 percent). Our analysis suggests that, during the 2008-2015 period, the average annual loss is 9.8 percent for personal consumption and 10.7 percent for disposable real personal income. During the same time period, the average annual loss in employment is 7.8 percent and 6.9 percent for total factor productivity. The average cost for labor productivity is 7.9 percent and 6.4 percent for capital services during the 2008-2015 period.

### ***3.8 What Is Next? Future Implications of the Potential Loss***

Our analysis suggests that damages from the Great Recession are long lasting as the level (trend) of potential series (for all variables) has shifted downward. These results are consistent with the overall economic environment since the Great Recession. That is, a painfully slow recovery in the overall economy (GDP), along with slower growth in the personal income, employment, wages and business fixed investment is observed. In addition, monetary policy is still struggling to get back to “normal.”

For future research, we would suggest to conduct a cause and affect (feedback loop) analysis to estimate damages from the Great Recession. That is, a drop in output may lead to a drop in investment and employment. The investment and employment losses would put downward

pressure on personal income and spending. Personal consumption is around 70 percent of the U.S. GDP and therefore a reduction in the consumption would reduce GDP and this cycle may continue. Therefore, an initial drop in GDP may trigger a chain-reaction and the total damages may be a lot more than just the drop in the GDP. This scenario may be true for the U.S. economy at least since the 1990s as the last three recoveries are slower and job-less compared to the pre-1990s era's recoveries. That supports our thesis to conduct a cause-and-effect analysis to estimate damages from the Great Recession, at least for the major variables/sectors. In other words, we should include the possibility of causality (at least among major sectors of an economy) when we estimate damages from the Great Recession.

*Table 1*

Variable	Estimated Long-term Damage from The Great Recession*	
	Vintage_2016	Vintage_2007
Real GDP	-3.8%	-9.9%
Personal Consumption	-3.5%	-9.8%
Disposable Personal Income	-3.5%	-10.7%
Business Fixed Investment	-9.4%	-20.1%
Labor Force	-0.8%	-2.2%
Employment	-1.2%	-7.8%
Ratio_PGDP_PLF	-3.0%	-7.9%
Capital Services**	N/A	-6.4%
Total Factor Productivity	-3.8%	-6.9%

\*Average loss per year for the 2008-2015 period

\*\* Losses are compared to the 2007 Vintage

#### **4. Concluding Remarks**

Our study estimates damages (economic costs) from the Great Recession for the U.S. economy. The cost is estimated in terms of losses in personal income, personal consumption, employment, labor productivity, investment and GDP growth rates. We estimate medium-term cost/damages from the Great Recession. In addition, our proposed framework can be utilized to estimate losses from any recession and for any country/region. To estimate damages from the Great Recession, we consider pre-recession estimates as a benchmark and compare these estimates with those which were published after the Great Recession.

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In sum, our study suggests long lasting damages from the Great Recession as the level (trend) of potential series (for all variables) has shifted downward. These results are consistent with the overall economic environment since the Great Recession. That is, a painfully slow economic recovery along with a slower growth in the personal income, employment, wages and business fixed investment. In addition, monetary policy is still struggling to get back to “normal.”

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