

# Labor Productivity during Postwar Recessions: Basic Data, Facts, and Figures\*

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## Abstract

The behavior of labor productivity in the U.S. during the 2007-09 recession, and how it compares to previous postwar recessions, has received a lot of attention. Beyond the recent recession, the cyclical behavior of labor productivity has long been central to business cycle analysis. Research on U.S. labor productivity is complicated by the fact that a variety of measures is in use, which differ along several dimensions. The objective of this project is to construct and make available a dataset that contains most relevant series to provide a common ground for the discussion. In this note we describe the data series provided in the accompanying file and present the basic graphs summarizing the data. We compare productivity dynamics depending on (1) the data source used to measure the labor input - household survey, and the Labor Productivity and Costs program at the BLS; (2) the definition of the labor input - employment and hours; (3) the level of aggregation - total economy and non-farm business sector; and (4) the filtering procedures - levels, Hodrick-Prescott, and Bandpass filters.

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# 1 Introduction

The behavior of labor productivity in the U.S. during the 2007-09 recession, and how it compares to previous postwar recessions, has received a lot of attention. Beyond the recent recession, the cyclical behavior of labor productivity has long been central to business cycle analysis, and recent research has documented changes in this behavior that occurred in the mid 1980s.

Research on U.S. labor productivity is complicated by the fact that a variety of measures is in use, which differ along several dimensions. The objective of this project is to construct and make available a dataset that contains all relevant series to provide a common ground for the discussion. In this note we describe the data series provided in the accompanying file and present the basic graphs summarizing the data.

Some of the key data and measurement choices are as follows:

- i) The source of labor input data. There are two major and widely used sources available. First, the Current Population Survey (CPS, often also referred to as the “household survey”). Second, data constructed by the Labor Productivity and Costs (LPC) program of the Bureau of Labor Statistics (BLS), which primarily relies on the Current Employment Statistics (CES, often also referred to as the “establishment survey”), combining it with data from the CPS for parts of employment not covered by the CES. It is well known that these surveys diverge occasionally but not independently of the business cycle conditions (see, e.g., Hall (2008), Hagedorn and Manovskii (2010)).
- ii) The definition of labor input. Two measures are commonly used - employment or hours. These two series behave somewhat differently, especially depending on the source of the labor data.
- iii) The behavior of labor productivity may also depend on the sector under consideration. Some authors consider productivity of the aggregate economy while others consider the non-farm business sector only.
- iv) Finally, different filtering procedures are often employed with some authors presenting data in levels while the more typical choice is to consider the deviations of productivity

around a trend. The trend is usually defined using the Hodrick-Prescott filter (Prescott (1986)) or the bandpass filter (Baxter and King (1999)). Since the properties of the filters differ, especially, towards the beginning and the end of the series the results might be affected by the procedure used.

The accompanying data set contains all combinations of the series given the choices described. Series from the LPC program are readily available from the BLS. Most series based on the household survey were constructed from the CPS micro data.

In what follows we describe the data sources and the variable construction procedures. We also provide a basic set of graphs describing the behavior of labor productivity during post-war recessions including the 2007-09 recession. The figures are arranged in the following order.

- i) Figures 1 through 3 compare productivity measured as output per worker in the nonfarm business sector based on the CPS and LPC for three filtering procedures, levels, HP, and BP filters, respectively.
- ii) Figures 4 through 6 compare productivity measured as output per worker for the non-farm business sector and aggregate economy for three filtering procedures, levels, HP, and BP filters, respectively. Employment data is from the CPS only.
- iii) Figures 7 through 9 compare productivity measured as output per hour in the nonfarm business sector based on the CPS and LPC for three filtering procedures, levels, HP, and BP filters, respectively.
- iv) Figures 10 through 12 compare productivity measured as output per hour for the non-farm business sector and aggregate economy for three filtering procedures, levels, HP, and BP filters, respectively. Data on hours worked is from the CPS only.

We abstain from drawing conclusion here except for offering several basic observations immediate from the figures presented below.

- The behavior of productivity in the 2007-09 recession does not appear strikingly unusual or very different from, say, the 1981-83 recession. The rebound in productivity

after the 2007-09 recession was somewhat sharper than usual, although the rebound is typically sharp after a deep recession, e.g., 1983.

- Labor productivity defined with labor input from the CPS declines more during recession than productivity defined with labor input from the LPC. This pattern is particularly pronounced with output per worker.
- As expected, in all recessions output per worker declines more than output per hour.
- The filtering procedure makes relatively little difference for comparing across various samples and data sources.

We would be grateful if those who find our data useful and use it in their own research would acknowledge its source.

## 2 Data File Description

In this section we provide definitions, details of construction, and sources for the data in the accompanying file *labor\_productivity.xls*. Last updated: 9/4/2010.

In what follows CPS stands for the Current Population Survey. LPC stands for the Labor Productivity and Costs program of the Bureau of Labor Statistics that provides data for employment, hours, and output data for sectors of the US economy. LPC does not provide data on the aggregate economy.

The final quarterly employment, hours and labor productivity series are contained in the three worksheets:

- i) “CPS nfb labor productivity”
  - Output for nonfarm business sector (nfb) from BLS LPC program
  - hours and employment for nfb from CPS monthly files
- ii) “CPS all labor productivity”
  - Output for all industries is NIPA GDP
  - CPS hours and employment for all industries (all) based on published CPS series

- iii) “LPC nfb labor productivity”
  - standard series produced by LPC program

Details of Data Construction and Sources:

- i) “CPS nfb labor productivity”
  - (a) monthly series for employment (e) “CPS\_e\_aw\_nfb” and hours (h) “CPS\_h\_aw\_nfb” computed from CPS monthly files; included categories:
    - nonagriculture wage and salary, other private (that is, other than private households)
    - nonagriculture, self-employed
    - nonagriculture, unpaid familyemployment status is “at work”;  
resulting series stored in worksheet “CPS nfb monthly”;
  - (b) outliers on the low side in hours are dealt with in a similar way as in Cociuba, Prescott, and Ueberfeldt (2009): if a given monthly value is lower than 95 percent of the average of the two surrounding values, then it is replaced by this average;  
resulting hours series stored in worksheet “CPS nfb monthly trimmed”
  - (c) quarterly averages of (trimmed) monthly data stored in “CPS nfb quarterly”
  - (d) quarterly series are seasonally adjusted using Census X-12 ARIMA procedure;  
resulting series stored in worksheet “CPS nfb quarterly sadj”
  - (e) divide nfb output from LPC “LPC\_y\_nfb” by “CPS\_e\_aw\_nfb” (“CPS\_h\_aw\_nfb”) to obtain “CPS\_je\_aw\_nfb” (“CPS\_jh\_aw\_nfb”);  
LPC data was downloaded on 08/31/2010, “LPC\_y\_nfb” is BLS series id PRS85006043;  
resulting series stored in worksheet “CPS nfb labor productivity”
- ii) “CPS all labor productivity”
  - (a) monthly series for employment (e) “CPS\_e\_aw\_all” and hours (h) “CPS\_h\_aw\_all” downloaded from Simona Cociuba’s web-site on 9/3/2010 and updated using BLS

series (downloaded on 9/4/2010):

LNU02005054 (Unadj) Average Hours, Total At Work, All Industries,

LNU02005053 (Unadj) Number Employed, At Work;

resulting series stored in worksheet “CPS all monthly”

(b) outliers on the low side in hours are dealt with in a similar way as in Cociuba, Prescott, and Ueberfeldt (2009): if a given monthly value is lower than 95 percent of the average of the two surrounding values, then it is replaced by this average; resulting hours series stored in worksheet “CPS all monthly trimmed”

(c) quarterly averages of (trimmed) monthly data stored in “CPS all quarterly”

(d) quarterly series are seasonally adjusted using Census X-12 ARIMA procedure; resulting series stored in worksheet “CPS all quarterly sadj”

(e) output is GDP from NIPA Table 1.1.6. Real Gross Domestic Product, Chained Dollars (data published July 30, 2010, downloaded 7/30/2010);  
divide output “BEA\_y\_all” by “CPS\_e\_aw\_all” (“CPS\_h\_aw\_all”) to obtain  
“CPS\_ye\_aw\_all” (“CPS\_yh\_aw\_all”);

iii) “LPC nfb labor productivity”

BLS series downloaded on 08/31/2010:

PRS85006013 Employment Nonfarm Business

PRS85006033 Hours Nonfarm Business

PRS85006043 Output Nonfarm Business

PRS85006093 Output per Hour Nonfarm Business

PRS85006163 Output per Person Nonfarm Business

iv) “LPC all labor productivity”

(a) the underlying data employment and hours data is not published by the BLS but available on request;

(b) the data file for employment and hours used here has been constructed by Valerie Ramey [http://weber.ucsd.edu/~vramey/research/Francis-Ramey\\_updates.xls](http://weber.ucsd.edu/~vramey/research/Francis-Ramey_updates.xls) (accessed on 9/16/2010)

- (c) quarterly averages of monthly data are taken
- (d) output is GDP from NIPA Table 1.1.6. Real Gross Domestic Product, Chained Dollars (data published July 30, 2010, downloaded 7/30/2010);  
divide output “BEA\_y\_all” by “LPC\_e\_all” (“LPC\_h\_all”) to obtain “LPC\_ye\_all” (“LPC\_yh\_all”);

### 3 Description of Figures

Plots cover all NBER dated recessions from 1960 to 2010. The cyan-colored areas in the plots indicate NBER recessions.

The naming convention for the variables in plots is as follows: “Source\_Measure\_Sample” where

- i) *Source* denotes the source of the labor input and takes values in {CPS, LPC}:
  - CPS or
  - LPC
- ii) *Measure* is the labor productivity measure and takes values in {ye,yh}:
  - ye is output per worker,
  - yh is output per hour.

In case of CPS employment and hours are for workers at work only, hence “aw” modifier.

- iii) *Sample* denotes the sample used and takes values in {nfb,all}
  - nfb considers the nonfarm business sector,
  - all considers aggregate economy.

Figure 1: Output per Worker. Non-Farm Business Sector. LPC vs CPS employment data. 1960-2010. No filtering applied. Series normalized to 1 at start of the corresponding recession. Cyan shaded areas indicate recession periods.

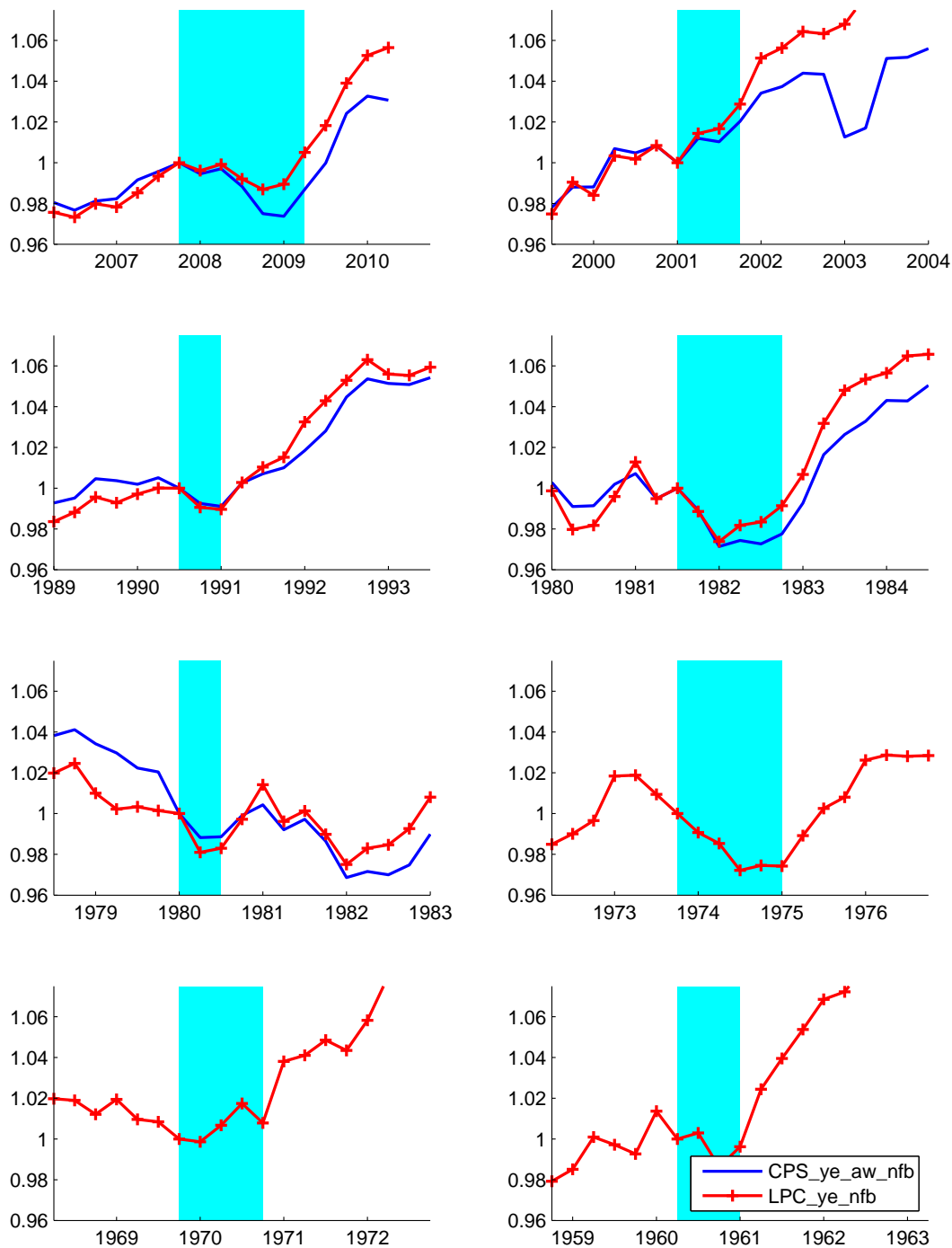




Figure 2: Output per Worker. Non-Farm Business Sector. LPC vs CPS employment data. 1960-2010. HP-Filtered (1600). Series are not normalized.

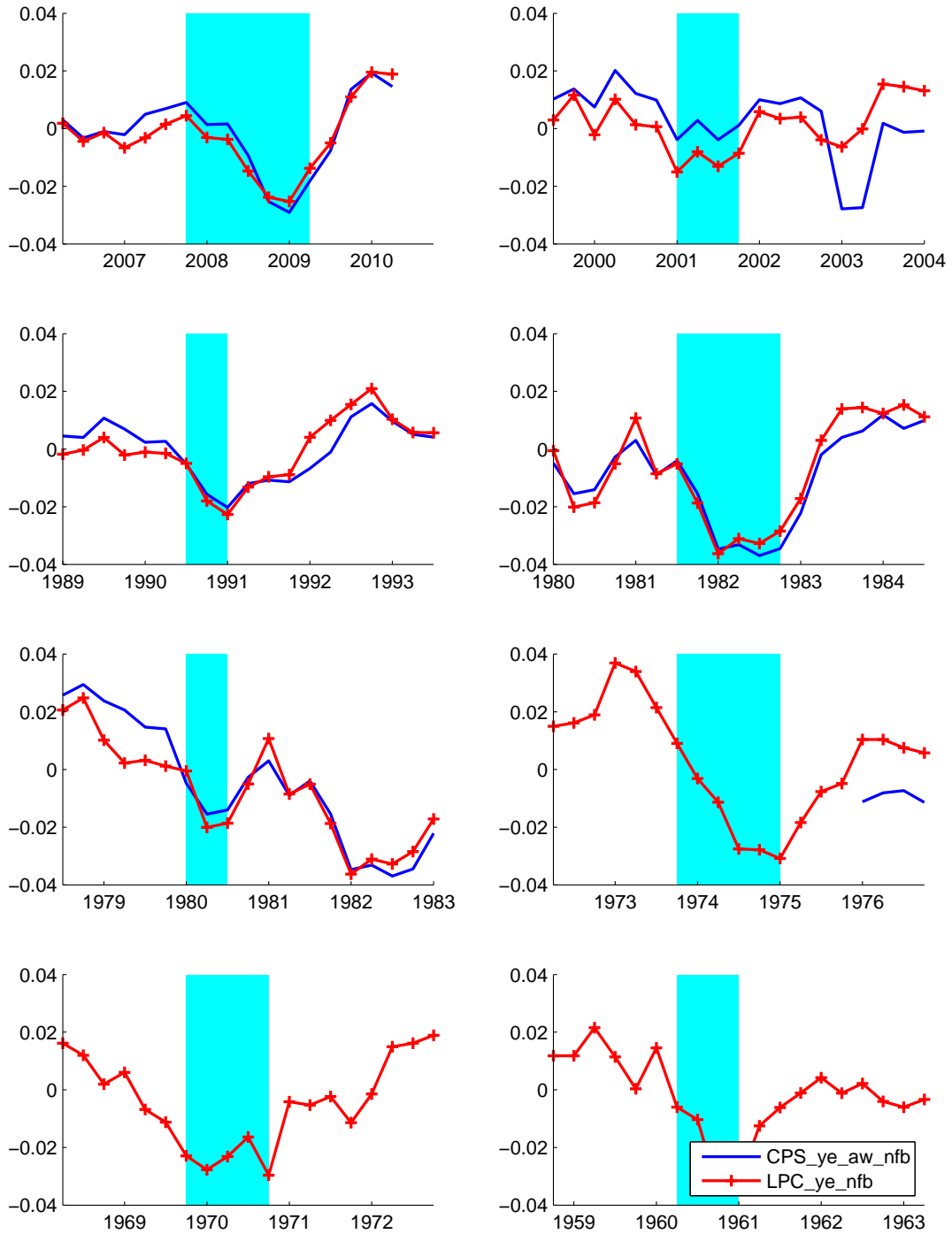


Figure 3: Output per Worker. Non-Farm Business Sector. LPC vs CPS employment data. 1960-2010. Bandpass-Filtered (6,32). Series are not normalized.

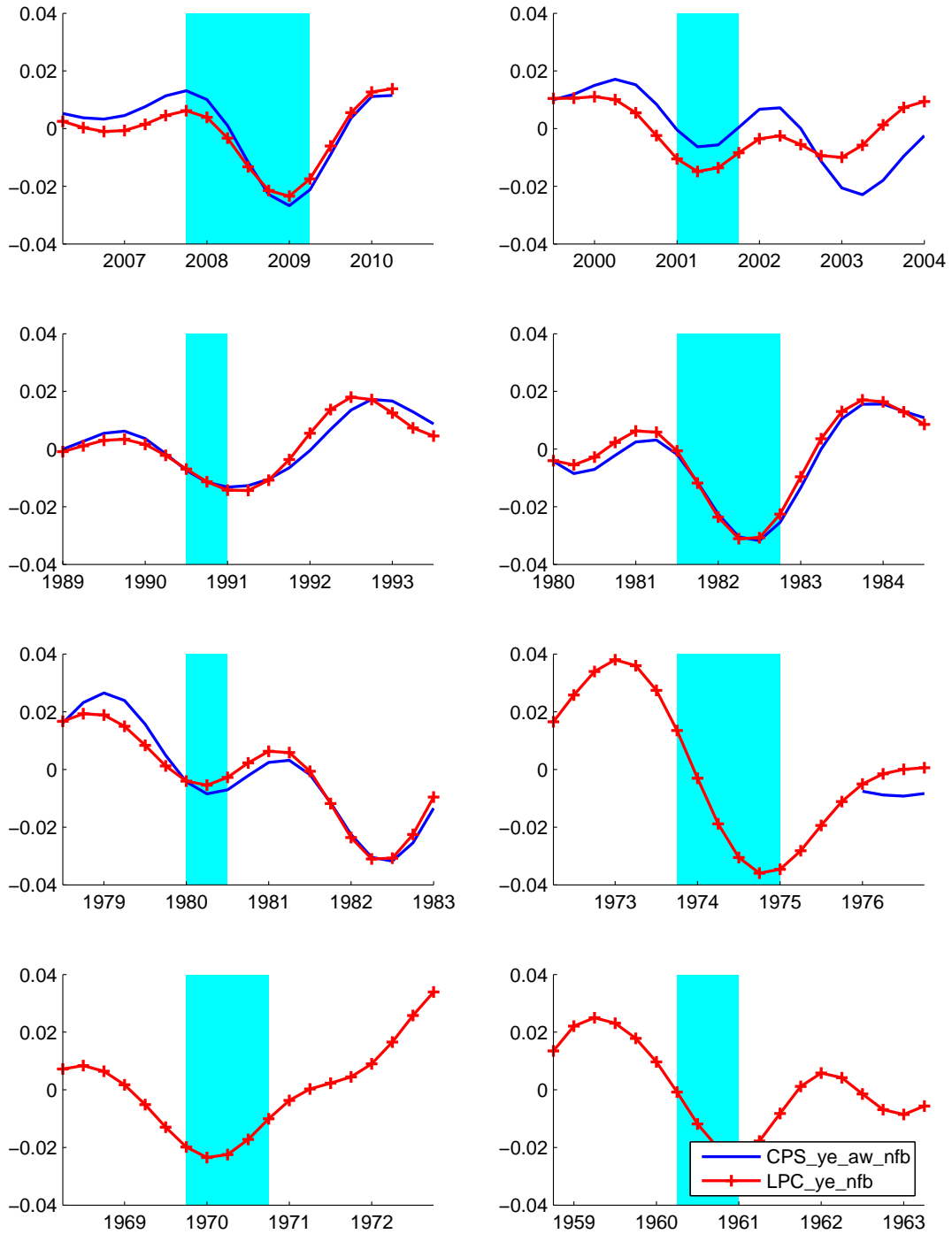


Figure 4: Output per Worker. Aggregate Economy vs. Non-Farm Business Sector. CPS employment data. 1960-2010. No filtering applied. Series normalized to 1 at start of the corresponding recession.

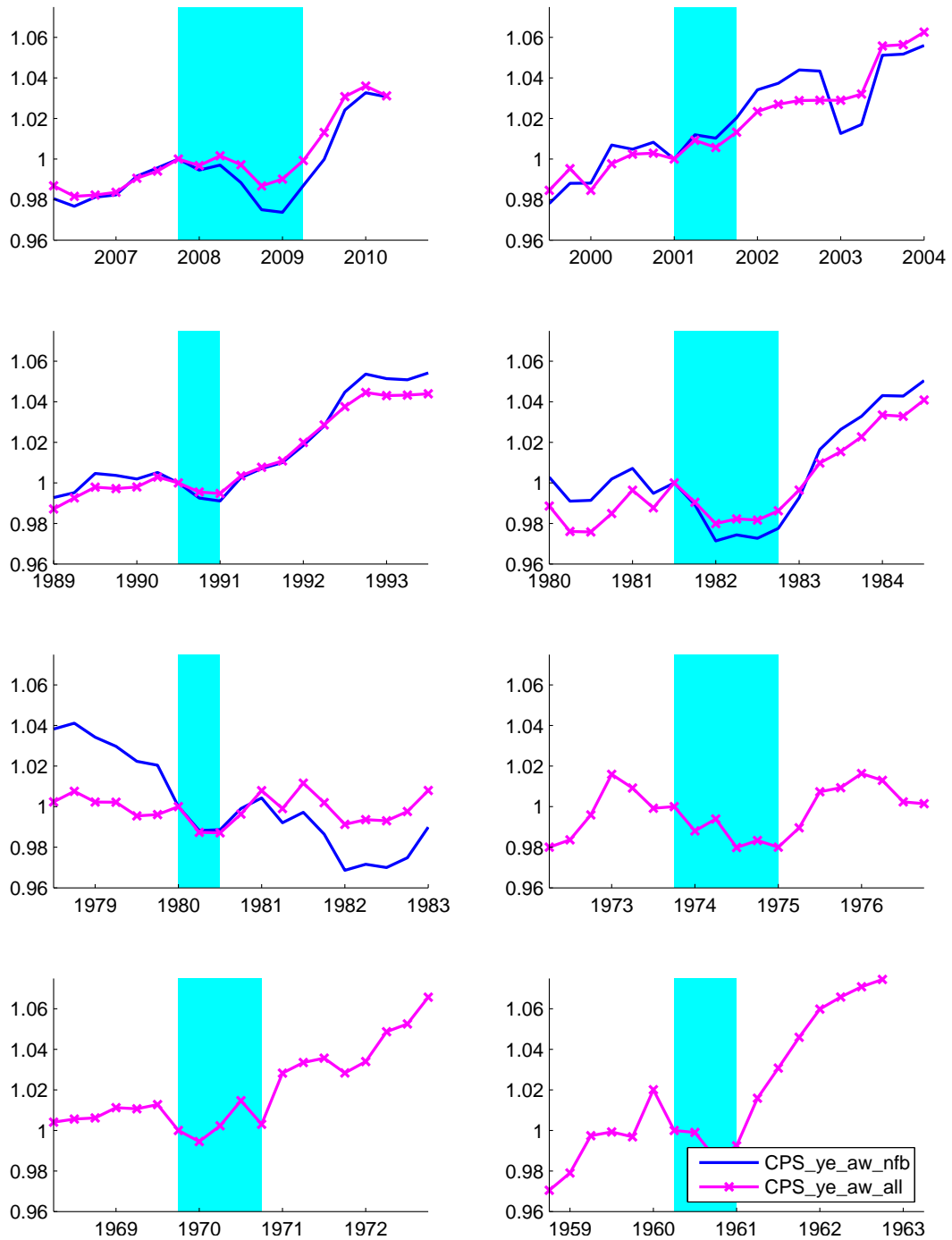


Figure 5: Output per Worker. Aggregate Economy vs. Non-Farm Business Sector. CPS employment data. 1960-2010. HP-Filtered (1600). Series are not normalized.

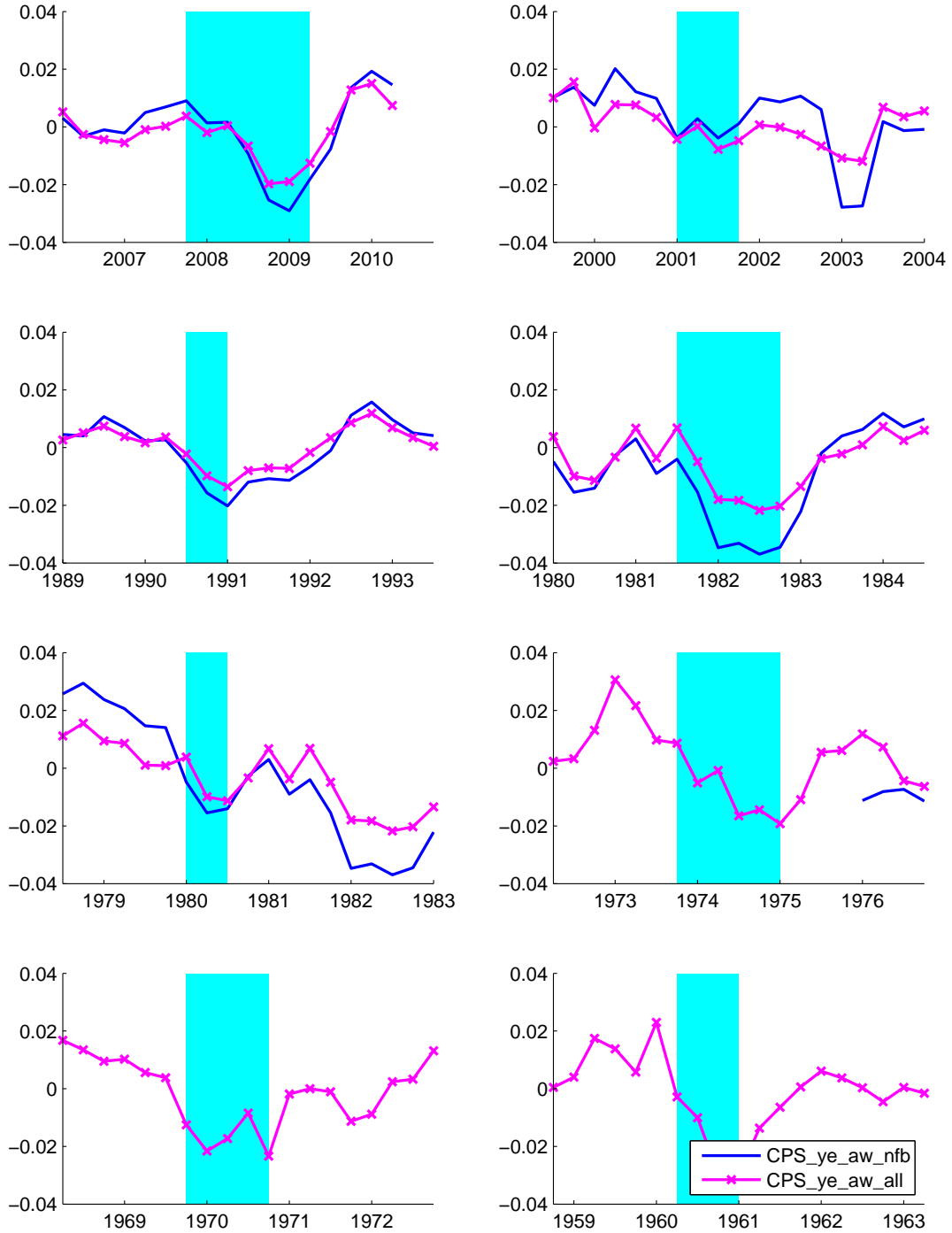


Figure 6: Output per Worker. Aggregate Economy vs. Non-Farm Business Sector. CPS employment data. 1960-2010. Bandpass-Filtered (6,32). Series are not normalized.

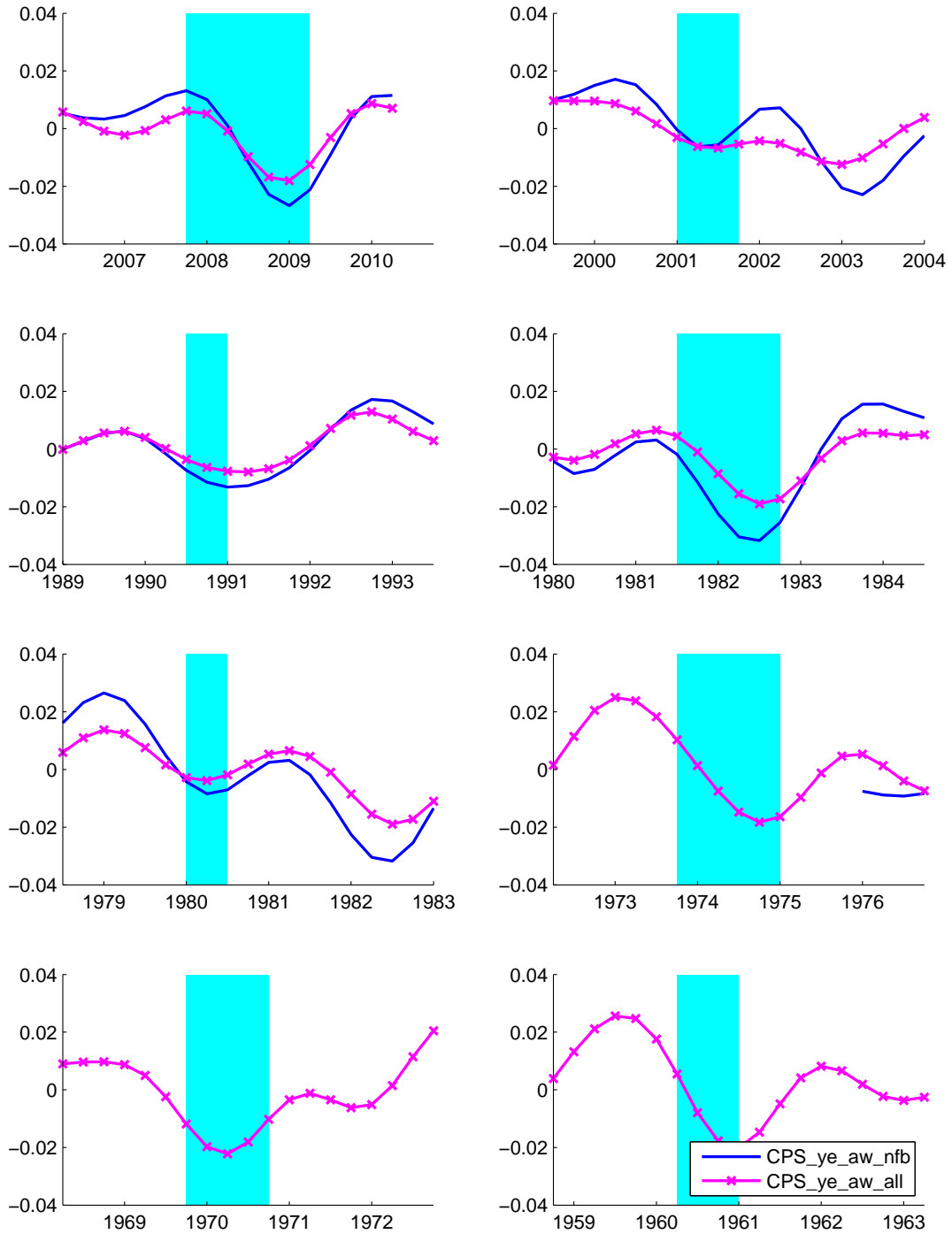


Figure 7: Output per Hour. Non-Farm Business Sector. LPC vs CPS hours data. 1960-2010. No filtering applied. Series normalized to 1 at start of the corresponding recession.

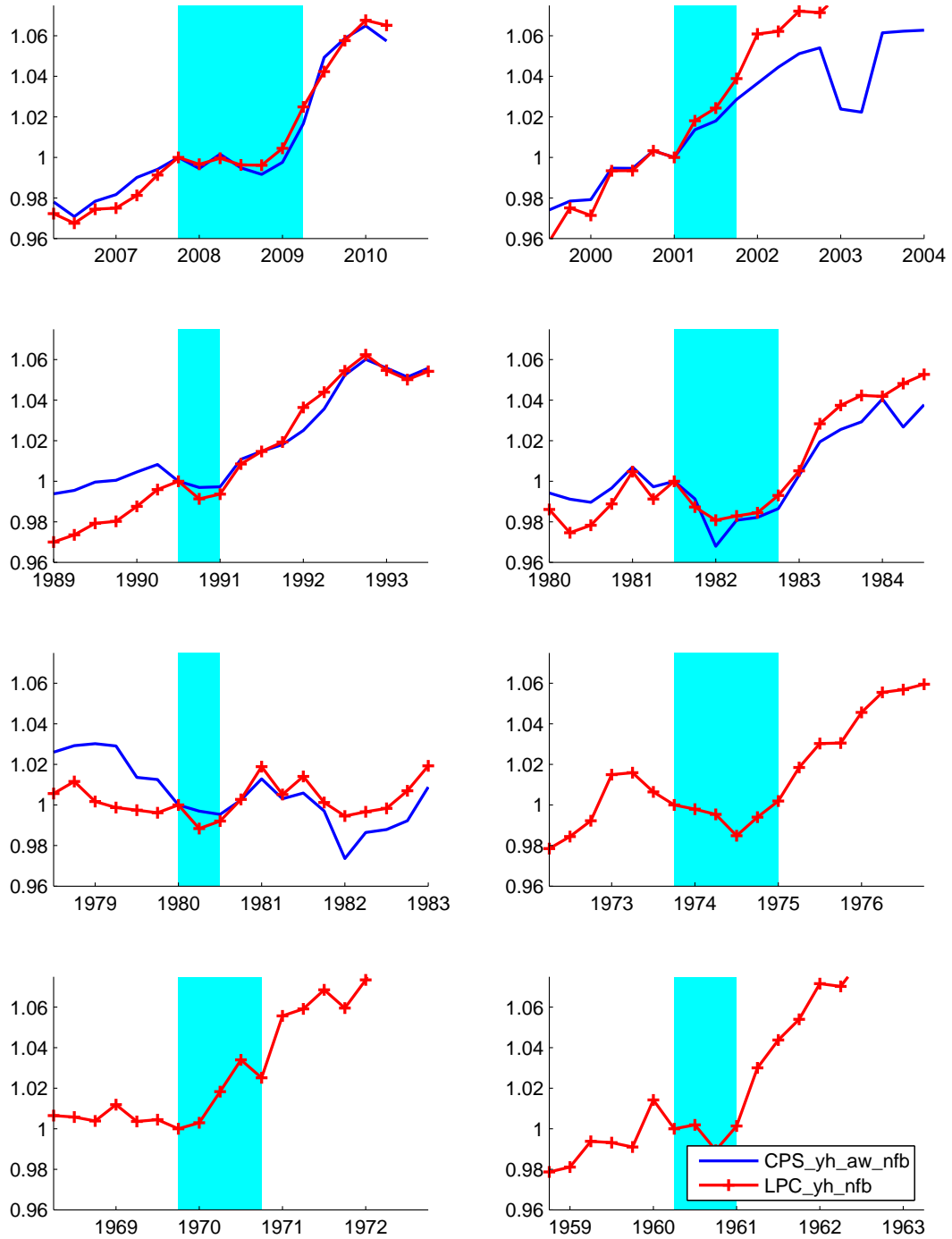


Figure 8: Output per Hour. Non-Farm Business Sector. LPC vs CPS hours data. 1960-2010. HP-Filtered (1600). Series are not normalized.

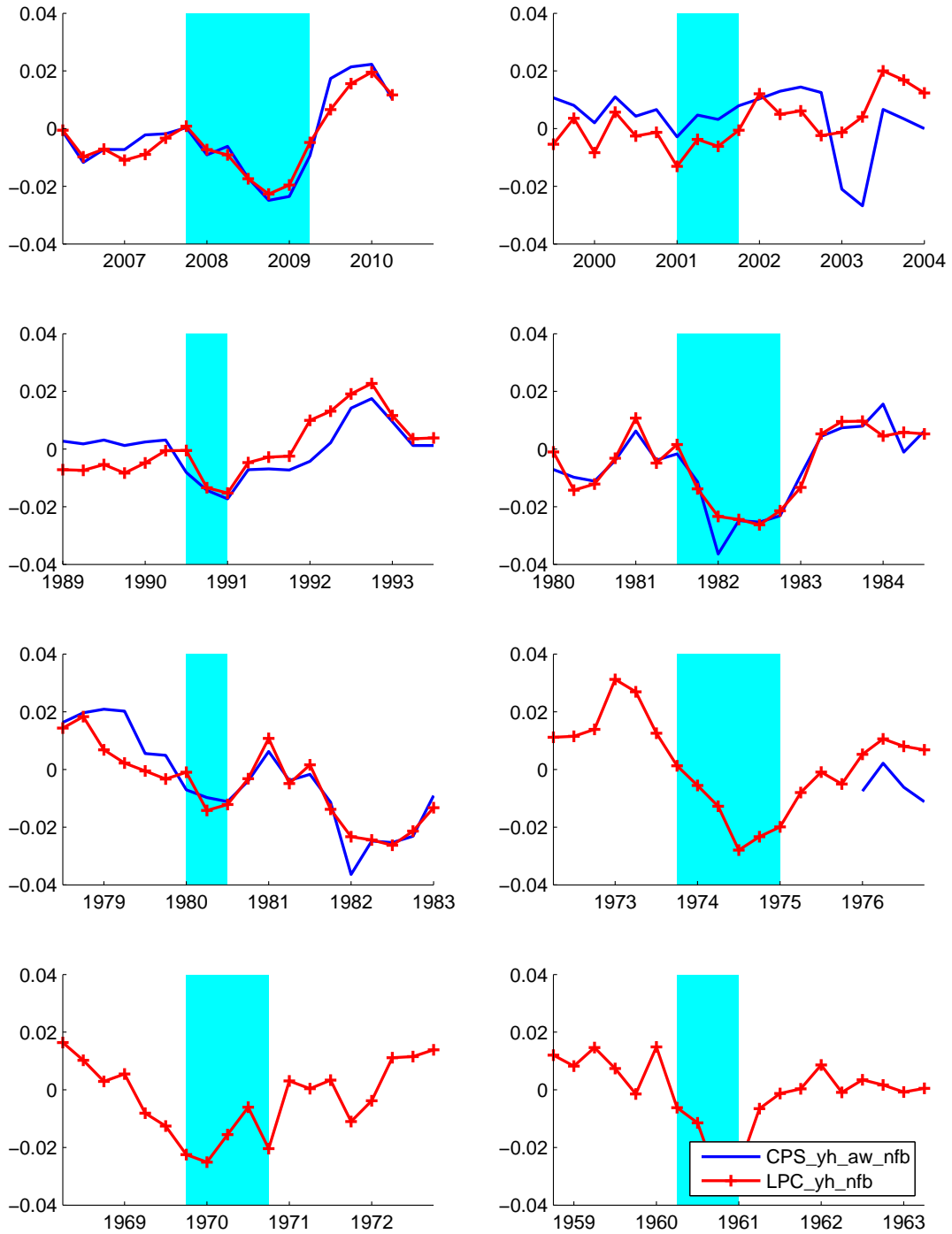


Figure 9: Output per Hour. Non-Farm Business Sector. LPC vs CPS hours data. 1960-2010. Bandpass-Filtered (6,32). Series are not normalized.

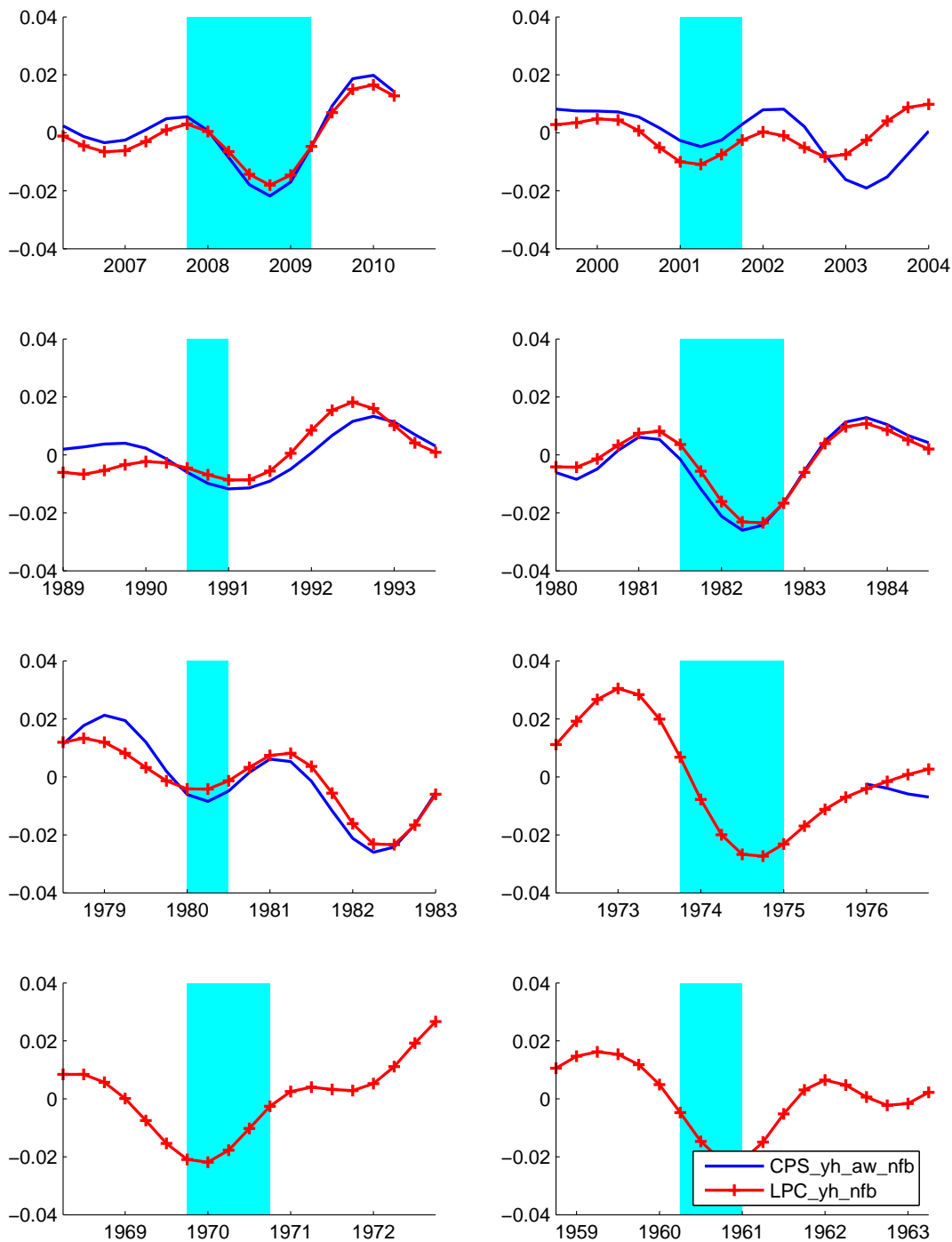




Figure 10: Output per Hour. Aggregate Economy vs. Non-Farm Business Sector. CPS hours data. 1960-2010. No filtering applied. Series normalized to 1 at start of the corresponding recession.

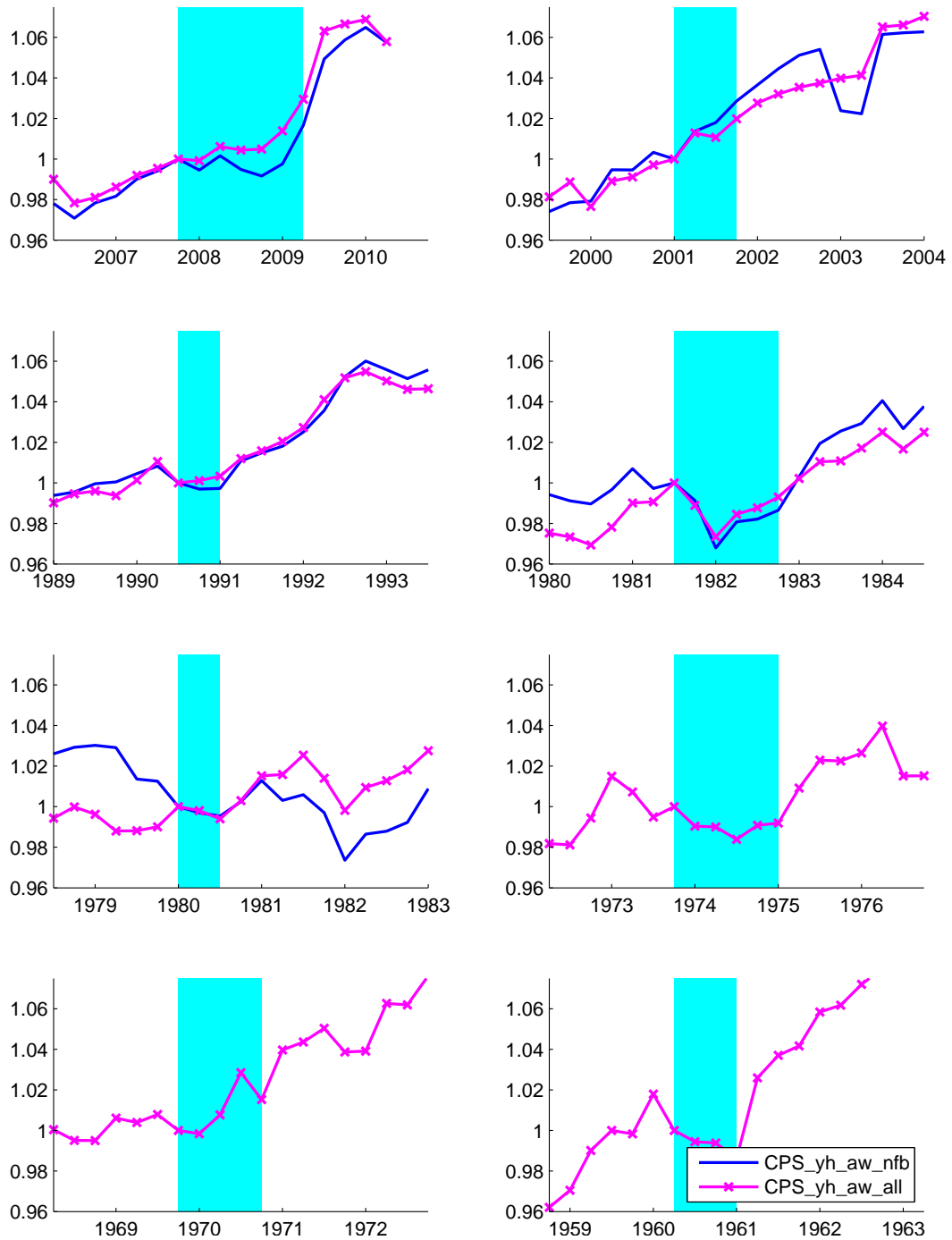


Figure 11: Output per Hour. Aggregate Economy vs. Non-Farm Business Sector. CPS hours data. 1960-2010. HP-Filtered (1600). Series are not normalized.

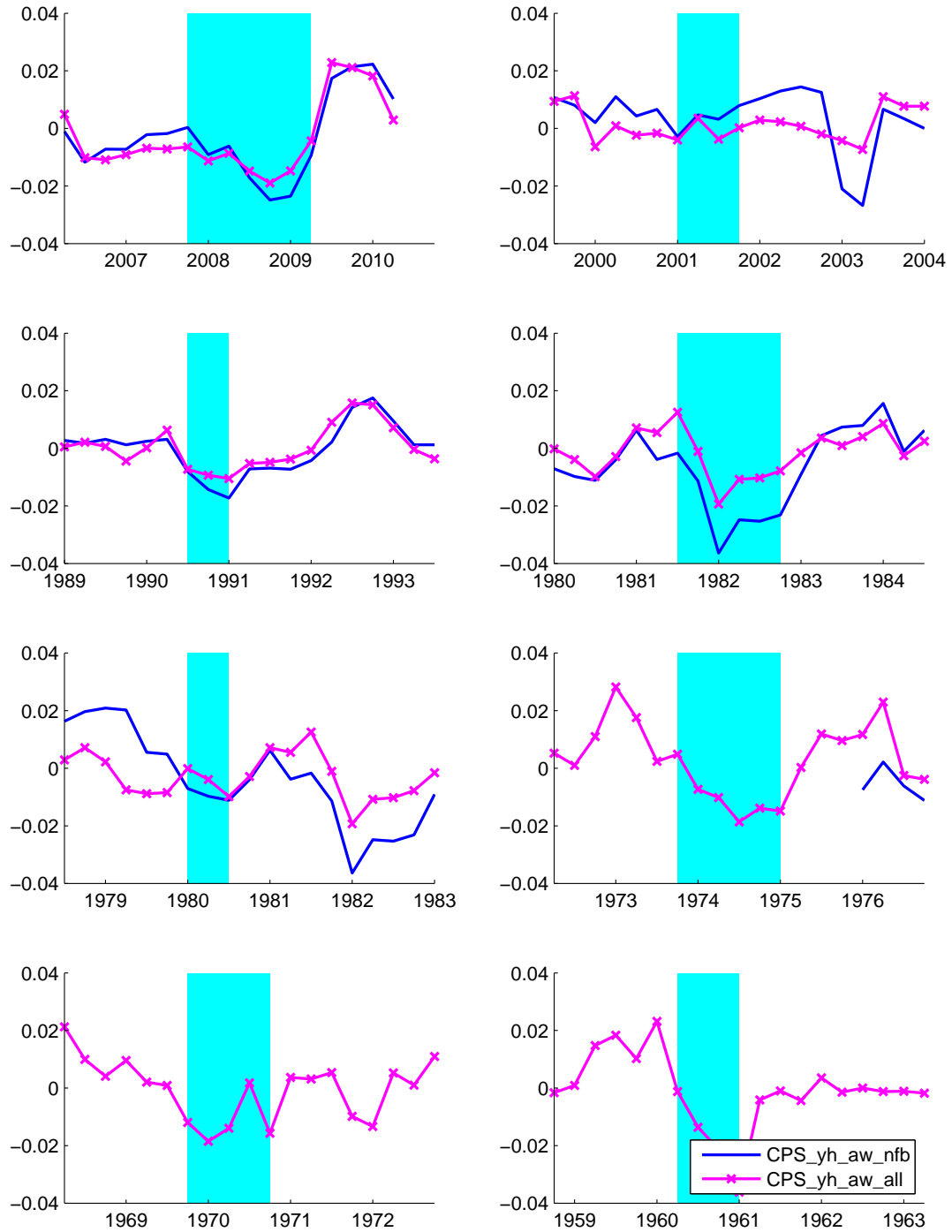
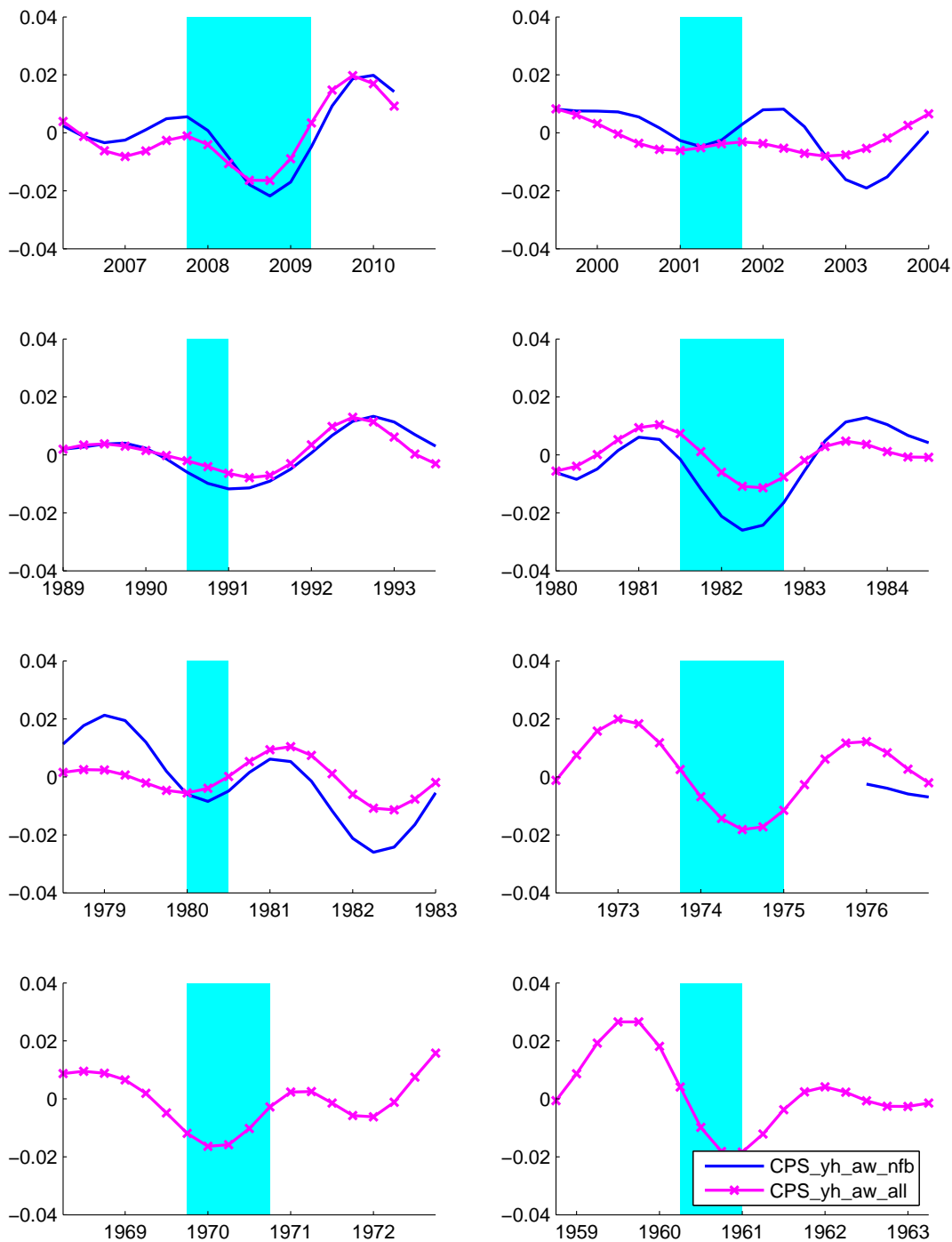


Figure 12: Output per Hour. Aggregate Economy vs. Non-Farm Business Sector. CPS hours data. 1960-2010. Bandpass-Filtered (6,32). Series are not normalized.



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