On Why Current Definitions of Economic Recessions Are Unsatisfactory and How to Improve It

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Abstract: In this article it is shown that current definitions of economic recessions are unsatisfactory. NBER definition of an economic recession takes into account many macroeconomic indicators such real gross domestic product growth, real personal income, employment, etc., but the definition is only qualitative, and also the use of too many indicators does not enable identifying a recession unequivocally in cases when some indicators point out to a recession while others do not. Another often used 'technical definition' of a recession takes into account only quarter-to-quarter changes in real GDP (a decrease in two consecutive quarters) without considering changes in population, so in some cases economy can be in a recession while real GDP per capita is actually increasing, and vice versa. Hence, the aim of the article is to propose new quantitative definition of an economic recession based both on economic and population growth or decline respectively. The use of the proposed definition is illustrated on examples of recent economic development in selected countries of the European Union and the World.

1. Introduction

In the recent years the European Union countries as well as many other countries worldwide experienced the biggest economic downturn since the World War II. The so called global financial crisis started in the U.S.A. in the summer 2007 by a liquidity shortfall in the U.S. banking system. The trigger of the crisis was a collapse of a U.S. housing bubble that led to fall of large financial institutions or its bailout by national governments, and to large share drops around the world.

In European Union the crisis started in the second quarter of 2008 with the decline of 0.4 % of real GDP quarterly from the preceding period. After a short recovery in 2010 a lot of EU countries fell into another recession during 2011 and 2012. Economic recession became one of the most cited words in today's World. But it is surprising that such an important macroeconomic term is not well defined yet. At present, there are many definitions of an economic recession, but they are all unsatisfactory as will be shown in the following Sections. The aim of this article is to revise the current definitions of economic recessions and to propose more appropriate definition of this economic phenomenon, which is clear, simple, precise and more natural then existing definitions.

Primer on business cycles and economic recessions can be found in the classic papers Schumpeter (1939) and Fels(1952), or more recently, e.g. in Rebelo (2005), Barufaldi (2008) or Newson (2009), where the last two papers focus on the recent U.S. and EU recessions respectively.

The paper is organized as follows: in Section 2 current definitions of an economic recession are discussed, in Section 3 a new definition of an economic recession is introduced and in Section 4 economic development of selected EU countries is analyzed by both new and old definition of a recession. Section 5 focuses on an influence of ageing of populations on the economic growth and Conclusions close the article.

2. The present state of a definition of an economic recession

There are many definitions of an economic recession in literature such as that of the National Bureau of Economic Research (NBER 2012):

> (Recession is) ...a significant decline in the economic activity spread across the country, lasting more than a few months, normally visible in real gross domestic product (GDP) growth, real personal income, employment (non-farm payrolls), industrial production, and wholesale-retail sales.

The main weakness of this definition is that it is only qualitative. One may ask, what is 'significant decline'? Is it 1%, 3% or 5%? The definition does not provide any quantity to lean on at all. Also, it is not clear from the definition whether declines in all mentioned parameters (real GDP, real personal income, etc.) must occur, so the event is called a recession, or only some of them. For example after the fall of the Soviet Union in 1991 post-Soviet republics experienced a drastic fall in real GDP (cca 50 %!), but it was not accompanied by the higher unemployment, which remained at 2-3% due to the structure of the Soviet economics fully controlled by the state, see Boutenko and Razglogov (1997). So for practical use this definition is useless.

In practice another simple 'technical' definition of a recession is used:

> A recession is a period of time when a nation's GDP declines for at least two consecutive quarters
> in a quarter-to-quarter comparison.

This definition is much better, because it is quantitative, and it consists of only one parameter (real GDP), so it can be easily evaluated. But as much as this technical definition of a recession is appealing, it is flawed.

To explain why it is flawed consider the following simple example: country A experiences 2% growth (in real GDP) during two consecutive quarters, while country B experiences decline by 1% in real GDP in the same period. From the technical definition of recession it follows that country B is in recession. Now suppose that in country A during the same period population growth was 3%. It means that GDP per capita actually *decreased*. In country B demographic decline occurs by 2% in the same period. It means that GDP per capita actually *increased*. GDP per capita is more important than national GDP, because it expresses the wealth of one (average) inhabitant. And surely such an average inhabitant would not agree that his country is flourishing, when his/her wealth is decreasing...

Hence, economic growth (or decline) cannot be separated from a population growth. It seems trivial that countries with high population growth also experience economic growth, because labor force increases (there are literally 'more hands' to do a work), and vice versa.

In literature other definitions of recessions appear, such as definition based on the unemployment growth for a given period of time. Also, the term 'depression' is used for especially deep recessions such as the Great Depression (1929-1933) in the USA, but this term is also questionable because there is no measure of deepness or strength of recessions, but see the recent paper by Mazurek and Mielcová (2013).

3. A new definition of an economic recession

In the previous Section it was showed that a definition of an economic recession must take into account a population change over a given period of time.

***Definition* 1a** (an economic recession): Economic recession is a period of time when a nation's GDP per capita declines for at least two consecutive quarters in a quarter-to-quarter comparison.

If quarterly nation's GDP per capita is not available, it can be easily computed from nation's GDP and population change.

***Definition* 1b** (an economic recession): Let α be a quarter-to-quarter change (given as a decimal number) of real national GDP (ΔGDP), and let β be a quarter-to-quarter population change in the same period. Then quarter-to-quarter change (given as a decimal number) in real GDP per capita is given as:

$$\Delta GDP_{pc} = \frac{\alpha - \beta}{1 + \beta} \tag{1}$$

Economic recession occurs when ΔGDP_{pc} given by (1) is negative for at least two consecutive quarters.

***Remark* 1**: From (1) it follows that an economic recession occurs when $\alpha < \beta$ for at least two consecutive quarters.

***Remark* 2**: Population change is usually expressed in year-to year format, but quarterly changes in population might be estimated as 1/4 of a yearly change.

***Remark* 3**: When the parameter β (a quarter-to-quarter national population change) in relation (1) is close to 0, then we obtain:

$$\lim_{\beta \to 0} \Delta GDP_{pc} = \lim_{\beta \to 0} \frac{\alpha - \beta}{1 + \beta} = \alpha = \Delta GDP \tag{2}$$

Therefore, in such a case there is no difference between ΔGDP_{pc} and ΔGDP, which is logical, as population does not change.

Remark 4: Because the parameter β is usually much smaller than 1, relation (1) can be reduced to the following simple form:

$$\Delta GDP_{pc} = \alpha - \beta \qquad (3)$$

Example 1. For $\alpha = 1.2$ % and $\beta = 0.6$ % we obtain from (1) and (3):

$$\Delta GDP_{pc} = \frac{\alpha - \beta}{1 + \beta} = \frac{0.0012 - 0.006}{100.6} = 0.00596$$

$$\Delta GDP_{pc} = \alpha - \beta = 0.0012 - 0.006 = 0.006$$

Economic recession can be defined by a modification of NBER definition as well. Suppose that the NBER definition has logical form of 'IF then RECESSION', so it can be reformulated in the following way:

Definition **2a**. IF a significant decline in the economic activity spread across the country lasting more than a few months, normally visible in real gross domestic product (GDP) growth AND/OR real personal income AND/OR employment (non-farm payrolls) AND/OR industrial production AND/OR and wholesale-retail sales THEN a recession occurs.

A recession occurs when the logical value of the statement is 'true'. The use of a logical conjunction/disjunction in the antecedent is up to convention. Also, all statements in the antecedent of Definition 2a can be made quantitative:

Definition **2b**. IF the economic activity of the country lasts more than a few months AND declines by α percent, real gross domestic product declines by β percent AND/OR real personal income declines by γ percent AND/OR employment (non-farm payrolls) declines by δ percent AND/OR industrial production declines by ε percent AND/OR and wholesale-retail sales declines by η percent THEN recession occurs.

In Definition 2b threshold coefficients can be established by a consensus among economists or by an empirical research on recessions of the present and the past.

4. Examination of an economic development in selected EU and non-EU countries

In this economic development of selected EU countries with regard to proposed definition of a recession (Definition 1) during the last two years will be examined. Real GDP quarter-to-quarter growth rates were taken from Eurostat (2012), see Table 1, while annual population growth data were obtained from IndexMundi (2012), see Table 2. For an examination four major EU economies were selected: Germany, France, Italy and UK, and two small transition economies from the former Eastern bloc: Lithuania and Romania.

Recessions according to the technical definition of recession are presented in Table 1 in bold figures: only Italy and UK experienced recessions during examined period.

When real GDP per capita quarter-to-quarter growth rates instead of real GDP quarter-to-quarter growth rates are used, the data change slightly (up or down by one or two tenth of a percent), see Table 3. From new figures a new recession by Definition 1 emerges in France, and the recession in UK is now slightly deeper. For a comparison of the real quarter-to-quarter GDP growth and per capita real quarter-to-quarter GDP growth of France from 20010 to 2012 see Figure 1. On contrary, in Lithuania and Romania GDP per capita growth rates are higher (and positive), because both former communist countries experienced population decline in the selected period. The rest of the data remains unchanged.

The example illustrates that when a population change is small than the evaluation of recessions with regard to Definition 1 can be significantly different only in cases when quarter-to-quarter GDP growth rates are small, typically 0-0.3%. However, when a population growth is high (more than 0.5% annually), as it is a case in some African and South Asia countries, Persian Gulf countries (Qatar 4.9%), Canada (0.78% annually, all figures in this and the next paragraph are from IndexMundi (2012)) or Brazil (1.1% annually), then the evaluation of a recession by Definition 1 can be significantly different. For example India's GDP grows around 7% each year, but the population growth is cca 1.3%, so India's annual GDP per capita growth is 'only' around 5.7%. In Niger real GDP growth during 2011 was 2.3% annually, but population growth during the same period was 3.63%, hence GDP per capita in Niger actually *decreased* during this period of 'economic growth'.

The same argument applies to countries with large population declines, e.g. for Russia, Moldova or Bulgaria, where population declined by 0.48%, 1.0% and 0.80% respectively in 2011. In these countries during a mild recession real GDP per capita might in fact increase.

Table 1: Real GDP quarter-to-quarter growth rates.

country	2010Q1	2010Q2	2010Q3	2010Q4	2011Q1	2011Q2	2011Q3	2011Q4	2012Q1	2012Q2
Germany	0.7	2.2	0.7	0.6	1.2	0.5	0.4	-0.1	0.5	0.3
France	0.3	0.7	0.4	0.4	0.9	0.1	0.2	0	0	-0.1
Italy	0.9	0.6	0.5	0.2	0.1	0.3	**-0.1**	**-0.7**	**-0.8**	**-0.7**
UK	0.6	0.7	0.6	-0.4	0.5	0.1	0.5	**-0.4**	**-0.3**	**-0.4**
Romania	-0.7	0.4	-0.8	0.9	1.2	0	1.I	-0.1	0.1	0.5
Lithuania	0.6	0.9	0.8	2	1.6	1.7	1.2	1	0.3	0.6

Source: Eurostat (2012).

Table 2: Annual population growth of selected countries.

| country	2010	2011	2012
Germany	-0.06	-0.21	0.2
France	0.53	0.5	0.5
UK	0.56	0.56	0.55
Italy	-0.08	0.42	0.38
Lithuania	-0.28	-0.28	-0.28
Romania	-0.25	-0.25	-0.26

Source: IndexMundi (2012).

Table 3: Real GDP per capita quarter-to-quarter growth rates.

country	2010Q1	2010Q2	2010Q3	2010Q4	2011Q1	2011Q2	2011Q3	2011Q4	2012Q1	2012Q2
Germany	0.72	2.22	0.72	0.62	1.25	0.55	0.45	-0.05	0.45	0.25
France	0.17	0.57	0.27	0.27	0.78	-0.03	0.08	**-0.13**	**-0.13**	**-0.23**
Italy	0.92	0.62	0.52	0.22	0.00	0.20	**-0.21**	**-0.81**	**-0.90**	**-0.80**
UK	0.46	0.56	0.46	-0.54	0.36	-0.04	0.36	**-0.54**	**-0.44**	**-0.54**
Romania	-0.64	0.46	-0.74	0.96	1.26	0.06	1.16	-0.04	0.17	0.57
Lithuania	0.67	0.97	0.87	2.07	1.67	1.77	1.27	1.07	0.37	0.67

Source: own calculations.

Figure 1: Blue (red) line: (per capita) GDP growth of France from 2010Q1 to 2012 Q2.
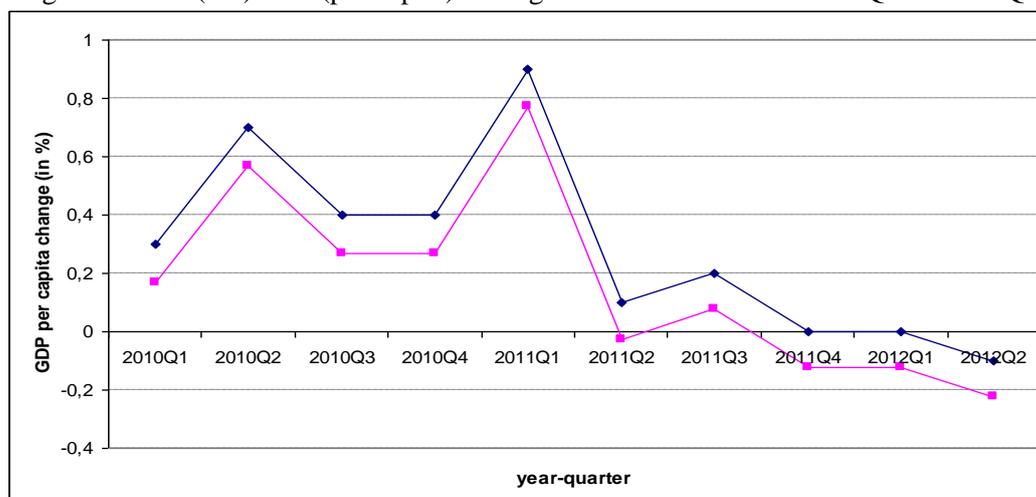
Source: Eurostat (2012) and own calculations.

5. Economic growth and ageing of populations

Another aspect, which might be considered to be included into a definition of a recession, is ageing of populations, visible in the West, Japan and some other developed countries during recent decades. When a population is getting older (but is not increasing or decreasing as a whole), the number of economically active people decreases, so an economic output of a country decreases as well, though this process might be outweighed by higher efficiency enabled by technological progress and modification from industrial (agricultural) economy to an economy based on knowledge and services. In terms of Cobb-Douglass production function $Y = AK^\alpha L^\beta$ lower labour input can be canceled by the higher total productivity factor A.

Nevertheless, younger populations will tend to grow faster than older ones in general. Bloom et al. (2011) expect modest declines in the pace of economic growth in OECD countries due to ageing, but argues that developing countries such as China might compensate the shortage of labour force by rural or urban unemployed workers.

Alternatively, economic growth (decline) can be related to a size of economically active population instead of population itself, as only economically active people contribute to an economic growth. In Birdsall (2011) it is shown that rapidly developing countries of the Southeast Asia profited from favourable age structure with relatively low rate of economically inactive (too old or too young) population in the recent decades.

6. Conclusions

In this article a new definition of economic recession was proposed, and its use was demonstrated on real GDP and population data of selected EU countries. It was shown that according to the new definition of an economic recession France was in a recession recently, while according to the old technical definition it was not. The differences between both definitions can be neglected when a population change is small, but when a population changes rapidly, then the difference might be significant.

Another still unresolved problem concerning economic recessions is the evaluation of their strength or severity, as current recessions are often compared with recessions of the past, especially with the U.S. Great Depression 1929-1933; see e.g. Gascon (2008) or Eichengreen and O´Rourke (2010).

The paper by Mazurek and Mielcová (2013), which introduces recession magnitudes on the scale from 1 to cca 10 based on GDP decline during a recession, and divides recessions into four categories (minor, major, severe and ultra), might be considered the first step in this direction.

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