A Note on the Categories of Unemployment in a Principles of Macroeconomics Course

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Abstract: This note articulates that the commonly-used term "structural unemployment" due to a decrease in labor demand in an industry or region essentially means "sectoral shift" — an extreme case of frictional unemployment, by definition. It suggests that structural unemployment be defined based on job rationing when the wage rate is downward rigid. This note also strives to spell out a logical sequence to bring in concepts of natural rate of unemployment and cyclical unemployment when these two terms are usually introduced together in a Principles of Macroeconomics course. Finally, it presents an exercise that instructors can utilize to clearly demonstrate to students how the cyclical unemployment rate can be measured.

1. Introduction

One of the major topics taught in a Principles of Macroeconomics course is unemployment. Virtually all textbooks devote an entire chapter to the topic. In the typical textbook description, a nation's unemployment is decomposed into three distinct categories:⁴⁹ frictional, structural and cyclical. A nation is considered to be operating at full employment when all unemployment is either frictional or structural. The natural rate of unemployment is an estimate of the unemployment rate that exists when the economy is at full employment. The difference between a nation's natural

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⁴⁹ Some authors, for example, O'Sullivan, Sheffrin and Perez (2008, p.310) included a fourth category: seasonal unemployment. Most authors, however, either incorporate it into the frictional unemployment category or ignore it since seasonal fluctuations are eliminated when seasonally adjusted unemployment data or annual unemployment data are used.

rate of unemployment and its actual unemployment rate is referred to as cyclical unemployment.

The definition of the three categories of unemployment and their impact on the natural rate of unemployment often confuses students and sometimes confuses instructors as well. The confusion partly results from possible circular definitions between the natural rate of unemployment and cyclical unemployment; that is, the natural rate of unemployment often being defined as the rate of unemployment that exists when cyclical unemployment is zero, and cyclical unemployment in turn being defined as the extra unemployment beyond the natural unemployment. Note that cyclical unemployment as a practical matter is difficult to identify empirically. Without a benchmark, it even cannot be measured. If the natural rate of unemployment is defined in terms of full employment (i.e., zero cyclical unemployment) students will ask "If we can't tell when cyclical unemployment is zero, how do we know when the economy has achieved full employment?" Also, students may be misled to believe that the natural rate of unemployment means the *lowest* unemployment rate a nation can actually achieve.

This note is intended to clarify the definitions of three types of unemployment in such a way that they will be more comprehensible to students enrolled in a Principles of Macroeconomics course. First, to avoid the circular-definition problem as above mentioned, we propose to treat the natural rate of unemployment as the *prior* and then define the cyclical unemployment accordingly as the deviation of the actual unemployment rate from the natural rate. Theoretically speaking, the natural rate of unemployment is an equilibrium concept (Hall, 1979), which is determined by "the rate at which jobs are simultaneously created and destroyed, the rate of turnover in particular jobs, and how quickly unemployed workers are matched with vacant positions" (Brauer, 2007). Pedagogically at the Principles level, however, we suggest to follow the interpretative definition that "natural rate of unemployment is the normal rate of unemployment" as given in Mankiw (2007) and Krugman and Wells (2007), and utilize the estimates of the Congressional Budget Office. With the natural rate of

unemployment being the benchmark, the cyclical unemployment rate, which is defined as the deviation of the actual unemployment rate from the natural rate, can be easily measured and hence clearly demonstrated to students in a Principles of Macroeconomics course. Since the actual unemployment rate fluctuates around, and hence may either be greater or less than, the natural rate of unemployment, the cyclical unemployment rate can be either be *positive* or *negative*. This last point is often lost on students when they are presented with a conventional textbook definition of the natural rate of unemployment based on a zero cyclical unemployment.

Second, we also address the definitions of frictional and structural unemployment, since different textbook authors define "structural unemployment" differently. For example, "when workers' skill are outmoded and do not meet the needs of employers", the resulting unemployment is conventionally labeled as "structural unemployment" (e.g., see Frank and Bernanke, 2007, p. 333), but is alternatively referred to as a "sectoral shift" – an extreme case of "frictional unemployment" (Mankiw, 2007, p.207). Though we are not proposing a "new" definition for structural unemployment here, we do intend to standardize the treatment of "structural unemployment" by Mankiw among textbooks of Principles of Macroeconomics for the following reasons.

We believe that the definitions employed in Principles of Macroeconomics textbooks should be simple and theoretically consistent with basic economic concepts and analysis. Frictional unemployment, as defined in almost all textbooks, exists due to *job searches* that are caused by the process of matching employers and job seekers. Since imperfect information exists in labor markets, it usually takes a period of time for job seekers to find suitable jobs that match their particular tastes and skills, even when no job shortage exits. Structural unemployment, on the other hand, occurs due to *job rationing* or *shortage* when the wage rate becomes stuck above the equilibrium wage (i.e., wage rigidity). Following such a definition, one should conclude that a "sectoral shift" may cause frictional, rather than structural, unemployment. This is because even if there is temporary mismatch between workers' skills and job requirements due to

structural changes in the nation's economy, in the absence of wage rigidity, wages will quickly adjust to eliminate the temporary job shortage.

Is a "Sectoral Shift" Frictional or Structural Unemployment?

Different textbooks define frictional and structural unemployment differently. In Parkin (2008) and Frank and Bernanke (2007), for example, the definitions of frictional and structural unemployment are as follows:⁵⁰

The unemployment that arises from normal labor turnover – from people entering and leaving the labor force and from the ongoing creation and destruction of jobs – is frictional unemployment. The unemployment that arises when changes in technology or international competition change the skills needed to perform jobs or change the locations of jobs is structural unemployment. (Parkin, 2008, p.139)

Frictional unemployment is the short-term unemployment that is associated with the matching of workers and jobs. Structural unemployment is the long-term and chronic unemployment that occurs when workers' skills are outmoded and do not meet the needs of employers. (Frank and Bernanke, 2007, p. 333)

There are two problems in the above definitions, in particular, on structural unemployment. First, the difference between structural and frictional unemployment is not entirely clear; since both are associated with the matching or mismatching between workers and jobs that arises during *job searches*. The only difference implied in the above definitions is that the "structural unemployment" may involve job searches in a broader range and possibly over longer-time period than frictional unemployment does (i.e., a difference in degree but not in nature). Second, the structural unemployment refers to the *job shortage* caused by structural changes in the economy (e.g., technological change or international competition). But the explanation for the persistence of such job shortage is inconsistent with the standard equilibrium and

61

Many other textbooks also adopt this conventional treatment in defining structural unemployment, for example, Baumol and Blinder (1999, p.509), and O'Sullivan *et al* (2008, p.311), among others.

comparative static analysis in the supply-and-demand model as applied in a labor market.

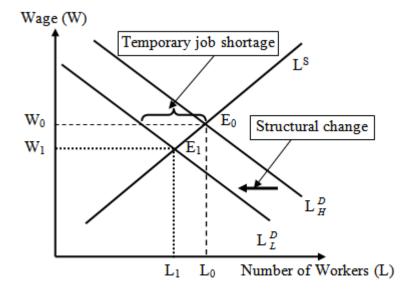


Figure 1. The conventional "structural unemployment"

In a standard demand-and-supply model, when structural changes in the economy occur such that the demand for workers in a particular labor market decreases, there will be a shortage of jobs in the affected market only for as long as it takes wages to adjust downward, as shown in Figure 1. At the initial equilibrium wage, W₀, the number of workers demanded is less than the number of workers seeking employment. The job shortage will be temporary in this process, however, since the wage rate will adjust to a new equilibrium at W₁, unless the wage rate is rigid downward. When wages are fully flexible, the wage will quickly adjust from W₀ to W₁ and the labor market will move from its initial equilibrium, E₀, to E₁, where there are no unemployed workers due to the structural change in the economy. When wages are sticky, on the other hand, the adjustment process is sluggish and accompanied by temporary job shortage. The resulting job shortage, however, is due to sticky wages but not due to the change in industry structure that triggers it. In either case, the final impact of the structural change on this labor market is that (L₀ - L₁) workers will shift away from this sector and search for jobs in other sectors, rather than waiting for jobs in the current industry. Hence, the so-called "structural unemployment" in this context is

not sustained, but actually an extreme case of frictional unemployment; it entails labor turnover where unemployed workers in a specific industry or region must *search for new jobs* that match their skills and preferences to the needs of employers somewhere else. Once the adjustment is complete, there is *lower employment* (L_1 relative to L_0) in that industry, but no job shortage and hence no (structural) unemployment any more.⁵¹

When wage rigidity exists, however, then a job shortage results and it will persist as long as the rigidity exists. The concept of a *sustained* job shortage has been noted by Mankiw (2007) as well as Krugman and Wells (2006), who both defined structural unemployment based on some built-in mechanism that persistently sets the wage rate above the equilibrium wage. In particular, Mankiw clearly classified the unemployment due to changes in the structure of the economy as sectoral shifts - a special case of frictional unemployment:

Frictional unemployment is unemployment that results because it takes time for workers to search for the jobs that best suit their tastes and skills. Structural unemployment is unemployment that results because the number of jobs available is insufficient to provide a job for everyone who wants one. Changes in the composition of demand among industries or regions are called *sectoral shifts*. (Mankiw, 2007, pp. 206-207, italic original)

Frictional unemployment is unemployment due to the time workers spend in job search. Structural unemployment is unemployment that results when there are more people seeking jobs in a labor market than there are jobs available at the current wage rate. (Krugman and Wells, 2006, pp. 370-371)

In the above treatment, the frictional unemployment and the structural unemployment are featured quite clearly. Frictional unemployment occurs due to *job search* because it always takes time for workers to find jobs that match their skills and tastes, even when there is no job shortage. In contrast, structural unemployment occurs due to *job rationing* or *job shortage* when the number of jobs available remains fewer than number of workers seeking jobs in some labor markets.

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⁵¹ We thank Professor Gregory Mankiw for a discussion on this point.

Why there is a sustained job shortage? The "mismatch" argument based on economic changes is not satisfying, because the above-equilibrium wage rate will not stay there in the absence of downward wage rigidity. Mankiw (2007) and Krugman and Wells (2006) have identified three cases where the wage rate remains above its equilibrium: 1) minimum wage; 2) union wage; and 3) efficiency wage. It is worth noting that their treatment in this regard is beginning to have a strong impact on prevailing textbooks; even some authors who use the mismatch argument for structural unemployment are adopting the notion of a built-in above-equilibrium wage rate (e.g., Parkin, 2008, pp.166-168). The treatment in Mankiw (2007) and in Krugman and Wells (2006) is logically consistent with the standard equilibrium analysis in the supply-and-demand framework, and we hope such a treatment will become the standard in textbooks.

Natural rate of unemployment and cyclical unemployment

The natural rate of unemployment and cyclical unemployment are usually introduced together in textbooks. Some authors define the former in terms of the latter, while others define them in a reverse order. For example, Parkin (2008) and Frank and Bernanke (2007) define the natural rate of unemployment based on cyclical unemployment as follows:

The fluctuating unemployment over the business cycle is cyclical unemployment. The unemployment rate at full employment is called the natural unemployment rate. Full employment occurs when there is no cyclical unemployment, or when all unemployment is frictional and structural. (Parkin, 2008, p. 140)

Cyclical unemployment is the *extra* unemployment that occurs during periods of recession. Natural rate of unemployment is the unemployment rate that prevails when cyclical unemployment is zero. (Frank and Bernanke, 2007, p. 333, italic added)

On the other hand, Mankiw (2007) and Krugman and Wells (2006) define cyclical unemployment in terms of the natural rate of unemployment:

The normal rate of unemployment around which the unemployment rate fluctuates is called the natural rate of unemployment, and the deviation of unemployment from its natural rate is called cyclical unemployment (Mankiw, 2007, p. 206).

The natural rate of unemployment is the normal unemployment rate, and cyclical unemployment is the deviation in the actual rate of unemployment from the natural rate (Krugman and Wells, 2006, p. 373).

What is the difference between the above two approaches to defining the natural rate of unemployment and cyclical unemployment? The difference lies in which concept between the two terms is treated as the "primitive" or the *prior*; in the former it is cyclical unemployment, while in the latter it is the natural rate of unemployment.

Perhaps in all disciplines, some concepts are primitive; they are introduced without a formal definition and can be easily understood and accepted. For example, "point" and "line" in Euclid geometry are such primitive concepts, from which other concepts like "angle" are defined. When natural rate of unemployment and cyclical unemployment are introduced together, the term "natural rate of unemployment" should be treated as the primitive relative to "cyclical unemployment". Pedagogically, we believe that the treatment in Mankiw (2007) and Krugman and Wells (2006) is more understandable for students than that in Parkin (2008) and Frank and Bernanke (2007) for the following two reasons.

First, it is logically much easier to present both concepts by introducing the natural rate first and then defining cyclical unemployment in terms of the natural rate. By first introducing the natural rate of unemployment we don't need to define it in terms of cyclical unemployment at all. If we begin with the natural unemployment rate for each year over a particular period and then obtain actual unemployment rate for the same years, it is straightforward to measure cyclical unemployment as the deviation of actual unemployment from the natural rate. Using this approach, the concepts of cyclical unemployment and the natural rate of unemployment can be effortlessly conveyed to students in a Principles of Macroeconomics class. This can be visually

demonstrated to the students with historic unemployment rates and the natural unemployment rates drawn on a common graph. The vertical distance between the historic unemployment rate and the natural unemployment rate at a particular point in time is the cyclical unemployment rate at that point.

If instead, cyclical unemployment is introduced first and the natural rate is defined in terms of it, then it is the equivalent of starting with a chart of historic unemployment rates without the natural rate curve drawn in it. From such a chart with a fluctuating unemployment rate, we cannot measure the cyclical unemployment since there is no benchmark. Hence, we cannot determine when it is zero. If we cannot determine when the cyclical unemployment equals zero, how can we define the natural rate of unemployment based on zero cyclical unemployment? That is, without the natural rate introduced first as the benchmark (i.e., the primitive concept), it is logically troublesome to measure and define cyclical unemployment. It also involves a circular-definition problem. Therefore, the approach adopted in Mankiw (2007) as well as in Krugman and Wells (2006) is a logically easier way to explain both the natural rate and cyclical rate of unemployment.

Second, defining the natural rate of unemployment based on *zero* cyclical unemployment can mislead students to conclude that the natural rate of unemployment is the *minimum* achievable level of unemployment. This is especially true if the cyclical unemployment is defined as "the extra unemployment during recession and natural rate is defined as the unemployment rate that exists when the cyclical unemployment is zero" (Frank and Bernanke, 2007, p.333). In contrast, if we start by defining the natural rate and then measure cyclical unemployment as the deviation from the natural rate, it clearly implies that cyclical unemployment can be either *positive* or *negative*.

A logical derivation of the cyclical rate of unemployment

In this section we demonstrate a logical approach to deriving the cyclical rate of unemployment in a Principles of Macroeconomics class. In the exercise we describe,

the economy's natural rate of unemployment is obtained from the Congressional Budget Office. The cyclical unemployment rate is then measured as the deviation of the nation's actual unemployment rate from the natural rate. The average annual unemployment rate for each year during the 1949 to 2010 period is presented in Table 1, along with the natural unemployment rate and cyclical unemployment rate. The actual unemployment rate data were obtained from the Bureau of Labor Statistics. Once the actual rate and natural rate for a given year is known, it is straightforward to compute the cyclical unemployment rate. The frictional plus structural unemployment rate for a given year is, by definition, equal to the natural rate of unemployment, since the "natural rate of unemployment is the unemployment rate that prevails when cyclical unemployment is zero" (Frank and Bernanke, 2007, p.333).

Table 1 about here

Figure 2 shows the movement of the economy's actual unemployment rate along with its natural rate during the 1949 to 2010 period. It is readily apparent that while the movement of the natural rate over time is fairly smooth and predictable, the movement of the actual unemployment rate is highly volatile and much less predictable. It is also apparent that in some years the actual unemployment rate is higher than the natural rate while in other years it is lower than the natural rate. In those years when the actual rate exceeds the natural rate, the cyclical unemployment rate is positive. Conversely, in those years when the natural rate exceeds the actual rate, the cyclical unemployment rate is negative. Figure 3 shows the movement of the economy's cyclical unemployment rate over time.

Figures 2 and 3 about here

Using this approach, where we begin with the natural rate of unemployment as the given, it is relatively easy to proceed to cyclical unemployment. By comparing the natural rate of unemployment to the actual rate over the 62 year time period examined here, students can clearly see how the two rates differ and can see the magnitude of the difference.

The remaining unemployment, structural plus frictional, is the actual unemployment rate minus the cyclical rate and is, by definition, the natural rate. Since the cyclical rate is sometimes negative, the structural plus frictional rate for a given year may exceed the actual rate. By first obtaining the natural rate and then moving forward to compute the cyclical rate, student comprehension of the various types of unemployment is likely to be stronger than if the alternative approach that begins with frictional and structural unemployment is utilized.

The technique can also be used to exam how the cyclical unemployment rate is affected by the business cycle. In Table 1, the years that contained at least two months of an economic contraction, as defined by the National Bureau of Economic Research, are bolded. The NBER has defined eleven contractions during the period examined in this study. The start and end dates of the contractions are listed in the note at the bottom of Table 1. Since the NBER defines the start and end dates of contractions by month, and since this study utilizes annual rather than monthly data, most years in which a contraction occurred had some months that were classified as being part of the contraction and some months that were classified as being part of the expansion. Generally, years in which an economic contraction occurred have a positive cyclical unemployment rate (i.e., an actual unemployment rate that exceeds the natural rate). This is especially true in the second and subsequent years of a contraction that spans more than one year.

Summary and concluding remarks

This note has revisited the classifications of unemployment: frictional, structural and cyclical. It emphasizes that frictional unemployment is due to job search, while structural unemployment is due to (sustained) job shortage when wage rate is persistently set above the equilibrium. Under these definitions, one should conclude

that a change in industry structure may cause sectoral shift, an extreme case of frictional unemployment, but not structural unemployment.

It also has compared and contrasted two common approaches to explaining the different types of unemployment in a Principles of Macroeconomics course. One approach begins with cyclical unemployment and then defines natural rate of unemployment based on zero cyclical unemployment. The other approach begins with the natural rate of unemployment, and then defines cyclical unemployment as the deviation of the actual unemployment rate from the natural rate. It is our contention that the latter approach is more easily understood by students, because it begins with two known values, the natural unemployment rate and actual unemployment rate. The former approach, on the other hand, is much more confusing to students because it begins with a concept, cyclical unemployment, that is itself difficult to measure in the absence of known values.

By using historical unemployment data for the United States along with Congressional Budget Office estimates of the natural rate, the concepts of cyclical unemployment and frictional plus structural unemployment can be conveyed to students without confusion. We suggest that authors of Principles of Macroeconomics textbooks utilize the approach that begins with the natural rate of unemployment and that they then compute the cyclical rate of unemployment as the deviation of the actual unemployment rate from the natural rate.

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Volume 7, Number 1, Spring 2011

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Table 1: Actual, Natural, and Cyclical Unemployment Rates

Year	Actual UR	Natural UR	Cyclical UR
1949	5.934	5.258	0.676
1950	5.285	5.268	0.017
1951	3.314	5.315	-2.001
1952	3.030	5.373	-2.343
1953	2.910	5.370	-2.460
1954	5.550	5.370	0.180
1955	4.386	5.380	-0.994
1956	4.132	5.408	-1.276
1957	4.272	5.400	-1.128
1958	6.804	5.400	1.404
1959	5.470	5.428	0.042
1960	5.532	5.495	0.037
1961	6.690	5.510	1.180
1962	5.539	5.505	0.034
1963	5.666	5.545	0.121
1964	5.180	5.595	-0.415
1965	4.521	5.675	-1.154
1966	3.794	5.763	-1.969
1967	3.846	5.780	-1.934
1968	3.578	5.793	-2.215
1969	3.508	5.843	-2.335
1970	4.945	5.895	-0.950
1971	5.944	5.943	0.001
1972	5.609	6.035	-0.426
1973	4.881	6.128	-1.247
1974	5.607	6.168	-0.561
1975	8.455	6.173	2.282
1976	7.702	6.200	1.502
1977	7.061	6.235	0.826
1978	6.066	6.268	-0.202
1979	5.847	6.253	-0.406
1980	7.141	6.215	0.926
1981	7.613	6.168	1.445
1982	9.689	6.115	3.574
1983	9.607	6.075	3.532
1984	7.520	6.043 6.020	1.477
1985 1986	7.199 6.990	5.993	1.179 0.997
1987	6.194	5.970	0.997
1988	5.508	5.933	-0.425
1989	5.270	5.903	-0.423
1989 1990	5.600	5.865	-0.033 - 0.265
1991	6.829	5.780	1.049
1991	7.504	5.660	1.844
1993	6.920	5.528	1.392
1994	6.101	5.395	0.706
1995	5.596	5.265	0.700
1000	5.550	5.205	0.551

Volume 7, Number 1, Spring 2011

1996	5.402	5.155	0.247
1997	4.944	5.050	-0.106
1998	4.511	4.960	-0.449
1999	4.219	4.890	-0.671
2000	3.992	4.835	-0.843
2001	4.732	4.805	-0.073
2002	5.783	4.800	0.983
2003	5.989	4.800	1.189
2004	5.528	4.800	0.728
2005	5.084	4.800	0.284
2006	4.623	4.800	-0.177
2007	4.622	4.800	-0.178
2008	5.784	4.800	0.984
2009	9.254	4.800	4.454
2010	9.634	4.800	4.834

<u>Source</u>: The Actual UR is the average annual unemployment rate as reported in U.S. Department of Labor, Bureau of Labor Statistics, "Employment status of the civilian noninstitutional population, 1940 to date", (http://www.bls.gov/cps/cpsaat1.pdf) – accessed November 30, 2011. Our analysis uses 1949 as the initial year rather than 1940 because the Natural Unemployment Rate data that we obtained from the Congressional Budget Office begins in 1949.

<u>Source</u>: The Natural UR is obtained from the Congressional Budget Office, CBO's Estimates of Potential GDP and the Natural Rate of Unemployment (http://www.cbo.gov/ftpdocs/97xx/doc9706/Background_Table2-2.xls) — accessed November 30, 2011. Using the "Quarterly Data" tab, the average annual natural unemployment rate for each year is computed as the average rate for the year's four quarters.

Note: Bolded years are years that contained at least two months of a Business Cycle Contraction as defined by the National Bureau of Economic Research (http://www.nber.org/cycles/cyclesmain.html) – accessed on November 30, 2011. There have been eleven contractions during the 1949 to 2010 period: November 1948 – October 1949; July 1953 – May 1954; August 1957 – April 1958; April 1960 – February 1961; December 1969 – November 1970; November 1973 – March 1975; January 1980 – July 1980; July 1981 – November 1982; July 1990 – March 1991; and March 2001 – November 2001; and December 2007 – June 2009.

Figure 2. Actual and Natural Unemployment Rates

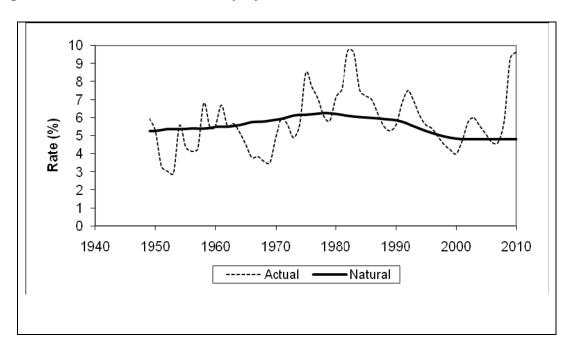


Figure 3. Cyclical Unemployment Rate

