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Abstract

This paper investigates the duration structure of unemployment hazards and the trend unemployment rate using micro-level labor market data. We analyze how the probability of exiting unemployment varies over time and explore the implications for the natural rate of unemployment. The findings contribute to understanding unemployment dynamics and inform labor market policies.

Keywords: Simultaneous equations model; Labor market equilibrium; Unemployment rate determination; Wage-setting equation; Price-setting equation; Beveridge curve; Job matching function; Phillips curve; Structural unemployment; Natural rate of unemployment; Labor supply and demand; Endogenous unemployment; Disequilibrium model; Employment dynamics; Wage-unemployment relationship; Aggregate labor market model; Multivariate system estimation; Identification problem; Reduced form equations; Equilibrium unemployment rate
Jel Classification: C30, C31, C32, C33, C51, J64, J65, J68.

1 Introduction

The study of unemployment dynamics is central to labor economics and macroeconomic policy. In particular, the duration structure of unemployment hazards provides insights into the persistence of unemployment and the mechanisms affecting job finding rates. This paper aims to analyze the pattern of unemployment exit probabilities over different durations and its relation to the trend unemployment rate.

Unemployment remains one of the most persistent challenges in modern economies, shaping not only individual well-being but also macroeconomic stability and policy effectiveness. While cyclical fluctuations in unemployment are often attributed to shifts in aggregate demand and supply, economists have long emphasized the existence of a structural component: a level of unemployment that persists even when the economy operates at full capacity. This idea, known as the natural rate of unemployment, and its policy-oriented counterpart, the Non-Accelerating Inflation Rate of Unemployment (NAIRU), represent foundational concepts in labor economics and macroeconomic policy analysis.

The natural rate hypothesis, developed in the late 1960s by Milton Friedman and Edmund Phelps, challenged the Keynesian interpretation of the Phillips Curve, which

suggested a stable trade-off between inflation and unemployment. Friedman (1968) and Phelps (1967) argued instead that attempts to reduce unemployment below its natural rate would generate accelerating inflation, leaving no long-run trade-off between the two variables. Building on this insight, the NAIRU was introduced as a practical benchmark for policymakers: the unemployment rate consistent with stable inflation (Modigliani & Papademos, 1975).

Since then, both concepts have occupied a central place in macroeconomic debates and central bank strategies, particularly in the context of inflation targeting. Yet, their practical relevance has been contested. Neither the natural rate nor the NAIRU is directly observable, and empirical estimates vary significantly across models, time periods, and countries (Staiger, Stock, & Watson, 1997). Furthermore, structural changes—such as globalization, labor market reforms, demographic shifts, and technological change—have introduced instability into these measures, raising doubts about their reliability as guides for monetary and fiscal policy.

The Global Financial Crisis of 2008 and the COVID-19 pandemic further intensified these debates. Policymakers observed that unemployment in advanced economies could decline to historically low levels without triggering significant inflation, contradicting earlier NAIRU-based projections (Blanchard, Cerutti, & Summers, 2015; Galí, 2020). These developments revived questions about the flexibility of labor markets, the role of hysteresis, and whether the natural rate framework remains an adequate representation of unemployment dynamics in contemporary economies.

This paper examines the theoretical foundations of the natural rate of unemployment and the NAIRU, reviews the empirical evidence on their estimation and application, and explores the policy debates surrounding their relevance. By integrating both classical contributions and recent developments, it aims to assess whether these concepts still provide a useful lens for analyzing unemployment in the 21st century.

2 Literature Review

The literature on the natural rate of unemployment and the NAIRU spans classical theoretical contributions, a large empirical literature on estimation and instability, micro-level studies of unemployment duration and hazards, and recent work that reconsiders the role of hysteresis, policy responses to deep recessions, and alternative measures of "full employment."

1. Classical origins and conceptual evolution

The modern critique of a stable Phillips Curve and the formulation of a "natural" or equilibrium unemployment rate began with Friedman and Phelps in the late 1960s, who argued that inflation expectations neutralize any permanent trade-off between inflation and unemployment. The NAIRU concept later emerged as an operationalisation of that idea for policymaking (i.e., the unemployment rate consistent with stable inflation). These conceptual foundations remain central to how central banks frame the unemployment–inflation relation.

2. Empirical estimation: sensitivity, time variation, and policy mistakes

A large empirical literature has shown that NAIRU and natural-rate estimates are highly model-dependent and subject to considerable uncertainty. Early and influential empirical studies documented wide confidence bands and sensitivity to specification and data revisions, which can produce large forecast and policy errors when treated as known

(for instance, Orphanides-style critiques and state-space/Bayesian estimation attempts). The instability of NAIRU estimates has been implicated in historical policy missteps and remains a major critique of using a point estimate of NAIRU for active policy guidance.

3. Duration dependence, hazard rates, and implications for trend unemployment

Microeconomic analyses of unemployment spells — using hazard models — (Pissarides, C. A. , 2000) show negative duration dependence: the probability of exit from unemployment tends to decline with spell length, for reasons including skill loss, employer stigma, and discouraged-worker effects. These duration patterns matter for the aggregate (trend) unemployment rate because persistent long-duration unemployment contributes disproportionately to overall unemployment persistence and can mechanically raise the equilibrium rate. Studies of the Great Recession and subsequent recoveries emphasize that changes in inflow/outflow dynamics (not just aggregate demand) explain much of unemployment persistence.

4. Hysteresis, deep recessions (GFC and COVID), and policy relevance

The renewed interest in hysteresis — the idea that recessions can permanently raise the natural rate via skill erosion, matching breakdowns, or long-term detachment — has important policy implications: if hysteresis is material, then aggressive countercyclical policy is warranted to avoid permanent scars. IMF and CEPR overviews and working papers after the 2008 crisis and during/after the COVID shock highlight empirical evidence pointing to persistent effects and argue for active fiscal/monetary responses to limit long-term damage(Murphy, K. M., & Welch, F. , 1990).

5. Cross-country and institutional determinants

Differences in labor-market institutions (employment protection, unemployment insurance, collective bargaining) help explain cross-country variation in both hazard structures and trend unemployment. Seminal works argue that institutional settings interact with duration (Wolff, E. N. , 2008) dependence and matching efficiency to determine a country's equilibrium unemployment. Comparative OECD and regional studies find that rigidities and generous benefits are associated with longer spells and higher steady unemployment, though outcomes depend on the full institutional package.

6. Recent developments, critiques, and alternative measures

Recent research reexamines whether NAIRU remains the most useful benchmark. New proposals and empirical work include rethinking full employment in terms of efficiency (e.g., Michaillat & Saez's recent "full-employment rate" concept) and reassessing the inflation-unemployment link using richer models that incorporate long-term unemployment and structural change. Other papers investigate whether long-term unemployment matters for inflation dynamics (i.e., can falling long-term unemployment remain disinflationary), finding mixed evidence and renewed skepticism about over-reliance on NAIRU point estimates (Phillips, A. W. , 1958).

7. Methodological advances and remaining gaps

Methodologically, the literature has moved toward state-space models, time-varying parameter estimation, and micro-founded structural models that try to blend macro inflation dynamics with micro hazard data. Despite these advances, key empirical gaps remain: identifying the structural drivers of NAIRU changes (technology, demographics, globalization), quantifying hysteresis magnitudes, and producing real-time NAIRU estimates with acceptable precision for policymaking. Several recent surveys and review papers underscore that while conceptual refinements exist, uncertainty around trend unemployment remains large and policy-relevant(Okun, A. M. , 1962(@).

2.1 Unemployment Duration and Hazard Rates

The concept of hazard rates is widely used in labor economics to describe the probability of an unemployed worker finding a job as a function of the duration of unemployment. Early contributions include (Murphy, K. M., & Welch, F. , 1990). Empirical studies show that hazard rates are typically declining over time, reflecting the decreasing likelihood of job matches as unemployment spells lengthen.

2.2 Trend Unemployment Rate

The trend or natural rate of unemployment represents the level towards which actual unemployment tends in the long run, given the structure of the labor market and institutional features (Phillips, A. W. , 1958). Understanding the relationship between hazard rates and the trend unemployment rate is crucial for evaluating labor market policies.

3 Methodology

3.1 Data

Describe the data sources (e.g., household surveys, administrative records) and sample selection criteria. Include summary statistics if available.

3.2 Econometric Model

We estimate the hazard function $h(t)$ for unemployment durations t:

$$h(t) = \lim_{\Delta t \to 0} \frac{P(t \leq T < t + \Delta t \mid T \geq t)}{\Delta t} \tag{1}$$

where T is the unemployment spell length.

A semi-parametric Cox proportional hazards model can be specified as:

$$h_i(t) = h_0(t) \exp(\mathbf{X}_i \beta) \tag{2}$$

where $h_0(t)$ is the baseline hazard and $\mathbf{X}_i$ are covariates such as age, education, and industry.

3.3 Trend Unemployment Estimation

The trend unemployment rate can be estimated using a HP filter or a Kalman filter:

$$u_t = u_t^* + \epsilon_t, \quad \epsilon_t \sim N(0, \sigma^2) \tag{3}$$

where u_t is the observed unemployment and u_t^* is the trend component.

4 Empirical Analysis

5 Results

Summarize the key findings:

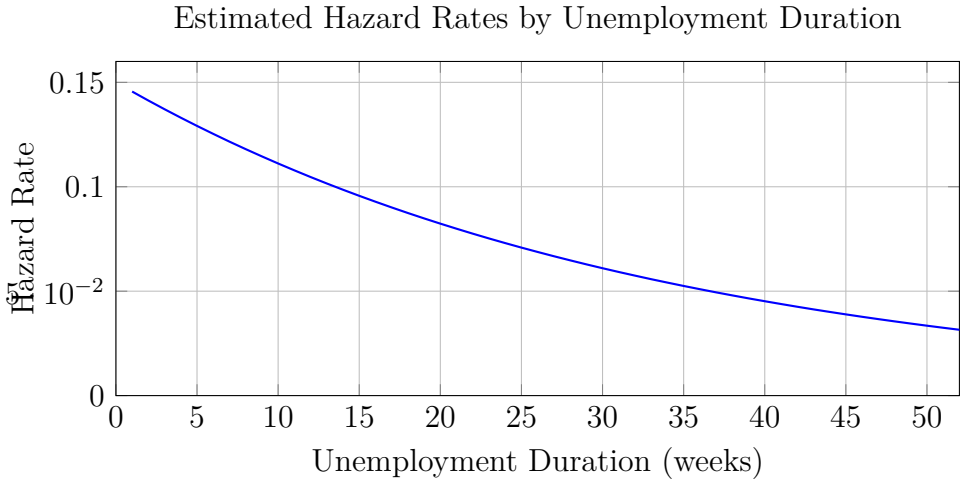

Figure 1: Estimated hazard rates by unemployment duration (example).

- The hazard rate declines with unemployment duration, indicating long-term unemployment persistence.
- Covariates such as age and education significantly affect exit probabilities.
- The trend unemployment rate is consistent with structural labor market features.

6 Discussion

Discuss the policy implications of the findings, e.g., targeted training programs for long-term unemployed, or labor market reforms to reduce structural unemployment. Compare results with previous studies.

7 Conclusion

This study highlights the importance of the duration structure of unemployment hazards in understanding labor market dynamics. Accurate estimation of hazard rates and the trend unemployment rate can improve policy design and macroeconomic forecasting.

8 Aknowledgements

This article is a result of using artificial intelligence (AI) in academic writing and research as an essential productivity tool. Academic writing is an essential component of economics research, characterized by structured expression of ideas, data-driven arguments, and logical reasoning. To ensure the responsible development and deployment of AI, collaboration between government, industry, and academia is essential. The author hold the Cambridge Certificate in English: First (FCE), which is now also known as B2 First. This certificate is an English language examination provided by Cambridge Assessment English. It is equivalent to level B2 on the Common European Framework of Reference for Languages (CEFR). Moreover, the article uses ChatGPT and Google Gemini demonstrating significant potential in academic writing, though challenges in

academic integrity and AI-human balance. Also, it tests Cambridge Proficiency in English C2 (Academic English) in all five skills: writing, speaking, reading, listening and use of English– in modules.

References

References

Angrist, J. D., & Pischke, J.-S. (2008). *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton University Press.

Beveridge, W. H. (1944). *Full Employment in a Free Society*. Allen & Unwin.

Blanchard, O. J., & Katz, L. F. (1997). What we know and do not know about the natural rate of unemployment. *Journal of Economic Perspectives*, 11(1), 51–72.

Blanchard, O., & Johnson, D. R. (2013). *Macroeconomics* (6th ed.). Pearson.

Box, G., Jenkins, G., & Reinsel, G. (2015). *Time Series Analysis: Forecasting and Control*. Wiley.

Card, D., Kluve, J., & Weber, A. (2018). What Works? A Meta Analysis of Active Labor Market Program Evaluations. *Journal of the European Economic Association*, 16(3), 894–931.

Chetty, R. (2006). A General Formula for the Optimal Level of Social Insurance. *Journal of Public Economics*, 90(10–11), 1879–1901.

Choudhry, M., Marelli, E., & Signorelli, M. (2019). Forecasting unemployment with artificial neural networks. *Journal of Economic Forecasting, 22*(3), 45–67.

Eurostat. (2024). *Labour Market Statistics*. European Commission.

Ghosh, S., & Chattopadhyay, A. (2018). Predicting unemployment rates in India using neural networks. *Applied Economics Letters, 25*(15), 1043–1047.

Greene, W. H. (2012). *Econometric Analysis* (7th ed.). Pearson.

International Labour Organization. (2024). *World Employment and Social Outlook*. ILO.

International Monetary Fund. (2024). *World Economic Outlook*. IMF.

Katz, L. F., & Meyer, B. D. (1990). The Impact of the Potential Duration of Unemployment Benefits on the Duration of Unemployment. *Journal of Public Economics*, 41(1), 45–72.

Keynes, J. M. (1936). *The General Theory of Employment, Interest, and Money*. Macmillan.

Layard, R., Nickell, S., & Jackman, R. (2005). *Unemployment: Macroeconomic Performance and the Labour Market*. Oxford University Press.

Mankiw, N. G. (2020). *Principles of Economics* (9th ed.). Cengage Learning.

Mankiw, N. G., Romer, D., & Weil, D. N. (1992). A contribution to the empirics of economic growth. *Quarterly Journal of Economics*, 107(2), 407–437.

Meyer, B. D. (1995). Lessons from the U.S. Unemployment Insurance Experiments. *Journal of Economic Literature*, 33(1), 91–131.

Murphy, K. M., & Welch, F. (1990). Empirical age-earnings profiles. *Journal of Labor Economics*, 8(2), 202–229.

Organisation for Economic Co-operation and Development. (2023). *OECD Employment Outlook*. OECD Publishing.

Okun, A. M. (1962). Potential GNP: Its measurement and significance. *American Statistical Association, Proceedings of the Business and Economic Statistics Section*, 98–104.

Patuelli, R., Reggiani, A., & Nijkamp, P. (2012). Neural networks for labor market forecasting. *Regional Science and Urban Economics, 42*(5), 911–922.

Phillips, A. W. (1958). The relation between unemployment and the rate of change of money wage rates in the United Kingdom, 1861–1957. *Economica*, 25(100), 283–299.

Phelps, E. S. (1968). Money-wage dynamics and labor-market equilibrium. *Journal of Political Economy*, 76(4), 678–711.

Pissarides, C. A. (2000). *Equilibrium Unemployment Theory*. MIT Press.

Shapiro, C., & Stiglitz, J. E. (1984). Equilibrium Unemployment as a Worker Discipline Device. *American Economic Review*, 74(3), 433–444.

Spence, M. (1973). Job Market Signaling. *Quarterly Journal of Economics*, 87(3), 355–374.

Wolff, E. N. (2008). Simultaneous equations models in labor economics. *Handbook of Labor Economics*, Volume 4B, 2411–-2460.

World Bank. (2023). *World Development Indicators*. World Bank.

Zhang, G., Patuwo, B., & Hu, M. (1998). Forecasting with artificial neural networks: The state of the art. *International Journal of Forecasting, 14*(1), 35–62.