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The cyclicality of the user cost of labor

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ABSTRACT

The user cost of labor is the expected difference between the present discounted value of wages paid to a worker hired in the current period and that paid to a worker hired in the next period. Analogous to the price of any long-term asset, the user cost, not wage, is the relevant price for a firm that is considering adding a worker. I construct its counterpart in the data and estimate that it is substantially more procyclical than average wages or wages of newly hired workers. I demonstrate an application of the finding using the textbook search and matching model.

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1. Introduction

Macroeconomists have long been interested in the cost of labor that firms face over the business cycle (i.e., price of labor). The literature usually considers average wage to be the measure of the price of labor.[1] However, firm–worker relationships are often long term, and thus wage is simply an installment payment on an implicit contract between a worker and a firm. Hence, wage may not be a good measure of the price of labor. This paper introduces the concept of the user cost of labor as the relevant wage measure to study the price of labor, acknowledging labor to be a long-term asset with adjustment costs involved, and provides empirical estimates of the sensitivity of the user cost to aggregate unemployment (cyclicality).

The paper then uses the estimates of the cyclicality of the user cost of labor to study a central puzzle in modern macroeconomics – the cyclical behavior of unemployment. In the search and matching model (Mortensen and Pissarides, 1994), allocative wage rigidity corresponds to rigidity in the present value of wages a worker earns over the course of a new job. I show that the extent of rigidity of the user cost of labor is appropriate for assessing the role of wage rigidity as an explanation for the unemployment volatility puzzle of Shimer (2005).[2] I then provide an assessment of whether the estimates support wage rigidity as an explanation for unemployment volatility.

The user cost of labor equals the increment to the expected present value of costs of adding a worker now versus waiting until the subsequent period, i.e., the user cost of labor in period t is the difference between the expected present value of wages paid to a worker hired in t and the expected present value of wages paid to a worker hired in $t+1$.[3] If the labor market is a spot market, then the difference equals the wage. However, if a worker is contracted for more than one period,

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[1] See, for example, a survey in Mankiw et al. (1985).

[2] See also Hall (2005) and Costain and Reiter (2008).

[3] There can be other costs associated with adding a worker besides wage payments (for example, hiring or training cost). I return to this issue in Section 3.

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then the difference need not be equal to the wage, as economic conditions at the time of hiring may have an impact on the future wages. The user cost thus takes into account both the wage at the time of hiring and the effect of the economic conditions at the time of hiring on future wages. Analogous to the price of any long-term asset, the user cost, and not wage, is the relevant price of labor for a firm that is considering adding a worker.

Since the user cost is not directly observed in the data, I construct its empirical counterpart by calculating the present value of wages a worker earns over the course of a new job. In the construction, I discount future payments taking into account the separation rates and the real interest rates. I then project the constructed user cost on unemployment. Using NLSY79 data, I find that a one percentage point increase in unemployment corresponds to a more than 4.5% drop in the user cost, which is larger than the drop in wages of newly hired workers (3%) or average wages (1.5%).

The intuition behind the large cyclicality of the user cost of labor as compared to the cyclicality of wages is as follows. Consider a firm hiring a worker when unemployment is high. Since unemployment is high, the hiring wage is low. Once a worker is hired, his wage in the employment relationship does not respond as much to the contemporaneous labor market conditions as the hiring wage does (because wages of newly hired workers are found to be more procyclical than the wages of workers in ongoing relationships[4]). Hence, the stream of wages to be paid to a worker hired when unemployment is high is expected to be lower than the stream of wages to be paid to a worker hired when unemployment is low. Consequently, the user cost of labor is lower than the already low hiring wage because the user cost also captures comparatively low future wages in the relationship that starts when unemployment is high. The opposite is true when a worker is hired at the peak of the business cycle, i.e., when unemployment is low and expected to rise. Then, the user cost of labor is higher than the hiring wage. Hence, the procyclical hiring wages and the relatively noncyclical wages within the employment relationship contribute to the user cost of labor being more procyclical than average wage or even than the hiring wage.

The paper's main empirical finding that the user cost of labor is substantially more procyclical than the average wages or even wages of newly hired workers has an important implication for the existing models. Models often require some rigidity of the user cost of labor to amplify the impact of a productivity shock. The weak cyclicality of wages in the data is often used as evidence of such rigidity. The results of the paper show, however, that the labor's user cost is much more procyclical than wages. Consequently, the propagation mechanism based on the rigidity of labor's user cost might lack support in the data.

I use the empirical result on the cyclicality of the user cost of labor in the applications related to the unemployment volatility puzzle. First, I study whether wage rigidity can account for the unemployment volatility puzzle in the search and matching model. The wage rigidity solution works through making the user cost of labor rigid. Using the estimate of the cyclicality of the user cost of labor, I find that the user cost of labor is too procyclical to generate empirical volatility in the profitability of vacancy creation. Furthermore, the model's free entry condition cannot simultaneously generate the empirical volatilities of the user cost of labor and the vacancy–unemployment ratio. Thus, wage rigidity cannot account for the unemployment volatility puzzle. The conclusion does not depend on the particular wage formation assumed in the search and matching model because any wage formation should be able to match the empirical volatility of the user cost of labor.

Second, I examine the solution to the puzzle proposed by Hagedorn and Manovskii (2008), which involves a high flow value of unemployment, b. Hagedorn and Manovskii argue that a high value of b, $b > 0.95E(z)$, combined with a low bargaining power of workers, can deliver the empirical volatility of the vacancy–unemployment ratio. Intuitively, when b is high, the worker's wage is close to productivity and its response to productivity is limited by the low bargaining power. Consequently, small changes in productivity translate into large changes in firms' profits, and, thus, into large volatility of the vacancy–unemployment ratio. However, such a high value of b implies a small benefit for workers from employment and is substantially higher than the typical value assumed in the literature.[5] To examine their proposed solution, I consider a search and matching model with Nash bargaining period by period. Hagedorn and Manovskii measure the volatility of the price of labor in the model by the volatility of average wage in the data. When instead, the volatility of the price of labor is measured by the volatility of the user cost, the model cannot simultaneously generate the volatility of the vacancy–unemployment ratio and the volatility of the price of labor. This is because the user cost, which is the empirical counterpart of the price labor in the model, is much more procyclical than the average wages. Consequently, when the extent of wage rigidity that is appropriate for assessing the role of wage rigidity as an explanation for the unemployment volatility puzzle is taken into account, the proposed solution which involves a high flow value of unemployment does not work.

Finally, I demonstrate that observations on the cyclical behavior of the average wages or the wages of new hires are not particularly useful for assessing the importance of allocative wage rigidity by considering alternative forms of wage contracting. I specify and solve four search and matching models with wage formations that allow for different degrees of wage rigidity within an employment relationship. In particular, I consider implicit insurance contracts with different degrees of commitment as in Rudanko (2009). The simulation results from the models illustrate that, in the presence of contracts, a weak cyclicality of individual wages can conceal a substantial cyclicality of the user cost. When the cyclicality of the user cost is calibrated to be the same across the models with different wage formations, the models generate very similar volatility of the vacancy–unemployment ratio; however, the cyclicality of individual wages and the wages of newly hired workers differs across the models and is determined by each model's wage formation. When the models are calibrated

[4] See Bils (1985), Solon et al. (1994), and, among recent empirical works, Martins et al. (2012) and a survey in Pissarides (2009).

[5] For example, Shimer (2005) sets $b=0.40$, and Hall (2005) and Pissarides (2009) set $b=0.70$ (given $E(z)=1$).

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