Energy Economics 32 (2010) 1523–1528

Contents lists available at ScienceDirect

Energy Economics

journal homepage: www.elsevier.com/locate/eneco

Relationship between oil prices, interest rate, and unemployment: Evidence from an emerging market

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ARTICLE INFO

Article history:
Received 2 June 2010
Received in revised form 16 September 2010
Accepted 19 September 2010
Available online 26 September 2010

JEL classification:
Q43
E24
C32

Keywords:
Unemployment rate
Real interest rate
Oil price

ABSTRACT

While the interrelation between oil price changes, economic activity and employment is an important issue that has been studied mainly for developed countries, little attention has been devoted to inquiries on fluctuations in the price of crude oil and its impact on employment for small open economies. Adopting an efficiency wage model for equilibrium employment that does not require any assumptions regarding labor supply, this paper contributes to the literature by investigating the causality between unemployment and two input prices, namely energy (crude oil) and capital (real interest rate) in an emerging market, Turkey for the period 2005:01–2009:08. Applying a relatively new technique, the Toda–Yamamoto procedure, we find that the real price of oil and interest rate improve the forecasts of unemployment in the long run. This finding supports the hypothesis that labor is a substitute factor of production for capital and energy.

1. Introduction

Unemployment is an important macroeconomic and political problem all economies confront. Due to its social and economic consequences, it is essential for policy makers to identify the factors that are affecting the unemployment rate the most. Furthermore, policy makers must also realize that the dynamics of unemployment and other factors may differ among countries at different stages of economic development. Developing countries are known to have higher unemployment rates than developed countries, with the former having higher economic growth rates than the latter. High level of unemployment has been also observed in Turkey, playing a major role in both the government's internal and international economic policies.

Considering unemployment in a supply–demand framework, it can be argued that the level of employment depends on factors such as the productivity of labor, wages, price level, and prices of other factors of production. On a macroeconomic level, unemployment rate will also follow closely the local factors such as the state of the economy, business cycles, the technology level, and population demographics, as well as global factors like energy prices. Policy makers need a clear understanding of the dynamics and microeconomic fundamentals through which factors influence the unemployment rate in the long run, in order to devise sound macroeconomic programs.

In this paper we follow an efficiency wage framework that enables us to theoretically relate real oil price, real interest rate, and unemployment. Applying the Toda–Yamamoto procedure which avoids some of the problems other techniques face, we find that real input prices positively Granger cause unemployment in Turkey. This result is inline with the theory and the results of other studies that mostly focus on developed countries.

2. Theoretical background

Previous studies document various transmission channels through which oil price shocks may have an impact on the economic activity (Davis and Haltiwanger, 2001; Brown and Yucel, 2002; Lardic and Mignon, 2008). First, there is a classical supply side effect according to which an oil price increase leads to reduction in output since the price increases signaling the reduced availability of basic input to production. As a result, growth rate and productivity decline. Slowing productivity growth decreases real wage growth and increases the unemployment rate (Brown and Yücel, 1999, 2002). Oil price shocks can increase the marginal cost of production in many industries reducing the production and thus increasing the unemployment. Since relocation of specialized labor and capital from one industry to

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doi:10.1016/j.eneco.2010.09.005

another is costly, workers do not relocate immediately but wait for conditions to get better and thus aggregate employment declines. After an oil shock, since the investment determines the potential output capacity in the long run, higher input prices caused by oil price shocks reduce the investments thus output decreases (Brown and Yücel, 2002).

Second transmission channel is the wealth transfer effect emphasizing the shift in purchasing power from oil importing nations to oil exporting nations (Fried and Schultze, 1975; Dohner, 1981). The shift in purchasing power parity leads to reduction in the consumer demand for oil importing nations and increases consumer demand in oil exporting nations. Consequently, world consumer demand for goods produced in oil importing nations is reduced and the world supply of savings is increased. Increasing supply of savings causes real interest rates to decrease. Diminishing world interest rate should stimulate investment that balances the reduction in consumption and leaves aggregate demand unchanged in the oil importing countries. As Brown and Yücel (2002) emphasized, if prices are downward sticky, the reduction in demand for goods produced in oil importing countries will further reduce the GDP growth. If the price level cannot fall, consumption spending will fall more than increases in investments leading to the fall of aggregate demand and further slowing economic growth.

Real balance effect is the third transmission channel discussed by Pierce and Enzler (1974) and Mork (1994). According to the real balance effect, increase in oil prices would lead to increase in money demand. When monetary authorities fail to increase money supply to meet growing money demand, interest rate will rise deteriorating the growth rate. Brown and Yücel (2002) discussed the impact of monetary policy giving more detail.

Inflation effect is another transmission channel which establishes a relationship between domestic inflation and oil prices. When the observed inflation is caused by oil price-increased cost shocks, a contractionary monetary policy can deteriorate the long-term output by increased interest rate and decreased investment (Tang et al., 2009).

The fifth transmission channel works via effects of oil shocks on the labor market by changing relative production costs in some industries. As Loungani (1986) discussed, if the oil price increases are long-lasting, it can change the production structure and have an important impact on unemployment. Oil price shock can increase the marginal cost of production in many sectors that are oil intensive and can motivate firms to adopt new production methods that are less-oil intensive. This change in turn generates capital and labor reallocation across sectors that can affect unemployment in the long run. Since the workers have industry-specific-skill and job search is time consuming, labor absorption process tends to take time increasing the amount of unemployment. In other words, higher dispersion of sectoral shocks cause higher unemployment rate by increasing the amount of labor reallocation.

The classical model of macroeconomics states that the amount of actual employment will be the equilibrium amount that equates the quantity of labor to the quantity of labor supplied given the assumption of perfectly flexible wages and prices. The real wages will adjust to equate the number of available jobs with the number of qualified job applicants. In other words at equilibrium there is no involuntary unemployment (Borjas, 1996). But the impact of business cycles on employment is greater than the classical theory claimed. Hamilton (1988) investigates a general equilibrium model of unemployment and the business cycle. He points out that a rational expectations equilibrium with flexible prices can exhibit unemployment. The business cycle mechanism explored by Hamilton (1988) brings forth the possibility that an energy price increase would depress consumer purchases of energy using goods. The decline in product demand in return causes cyclical and structural unemployment.

Another dimension through which energy prices may influence unemployment is through the relative prices of factors of production. According to Carruth et al. (1998), the efficiency wage models provide an attractive framework to investigate the relationship between energy prices and employment for at least 3 reasons. First, the criticism regarding the different relative sizes of changes in wages and employment in classical models is avoided. Second, it allows voluntary unemployment. The third reason is the most important one that is also motivating this paper. That is, the link between unemployment and other factor prices, including oil, has a theoretical explanation in the efficiency wage framework. Carruth et al. (1998) point out that without any assumptions regarding the elasticity of labor supply, the change in the equilibrium in labor market can be attributed to demand changes triggered by changes in input prices.

Probably, except only for Carruth et al. (1998), efficiency wage models either ignore energy or treat it as a secondary input in the production process. Beaudreau (2005) however, argues that energy must be considered as a primary factor of production, as no work is possible without energy from an engineering point of view.[2] We follow the efficiency wage model proposed by Carruth et al. (1998). Their model starts with the following wage equation from Shapiro and Stiglitz (1984) (see Carruth et al. (1998) for the derivation of Eqs. (1) and (2):

$$\log w = \log b + f + \frac{f \times s}{[1-p(u)](1-s)}. \tag{1}$$

Where, w is the wage rate, b represents any unemployment benefits, f is effort, s is the probability of shirking successfully, u is the unemployment rate, and p(u) is the probability by which an unemployed person finds a job. Assuming constant returns to scale production function which is homogeneous of degree one and perfect competition in the final good market, Carruth et al. (1998) show that there exists a relationship between real input prices.

$$\mu = C(w, r, ep). \tag{2}$$

Here, the interest rate r reflects the capital rental rate and ep is the energy price. Carruth et al. (1998) derive the equilibrium unemployment rate from Eqs. (1) and (2):

$$U^* = U^*(r, ep, b(\mu), f, s). \tag{3}$$

As a result of comparative static analysis Carruth et al. (1998) show that the equilibrium unemployment rate depends on the real interest rate and the real energy price; whereas, it is neutral to total supply and technology. A rise in oil price erodes profits and the economy must adjust to equilibrium where there are no economic profits or losses. Assuming that workers do not shirk, this adjustment takes place through an increase in equilibrium unemployment because wages and unemployment are inversely related. A similar adjustment also takes place when interest rates rise. Carruth et al. (1998) see unemployment as a "discipline device". As real input prices rise, wages decline leading to higher unemployment rates.

Following the Carruth et al. (1998) model we investigate the relationship between the unemployment rate, real energy prices, and the real interest rate in Turkey.

3. Empirical evidence

There are several studies addressing the relationship between oil price changes and employment directly for developed countries. Using a dispersion index from 1947 to 1982 for 28 industries, Loungani (1986) examines the effect of world oil market disruptions on the reallocation process in the U.S. labor market. His analysis shows that oil price increases in the 1950s and 1970s seem to account for unusual amount of labor reallocated across industries thereby increasing the unemployment

[2] Stern (2000) is probably the first to consider energy in a multivariate production function along with labor and capital.