OIL AND UNEMPLOYMENT IN A NEW-KEYNESIAN MODEL

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Overview

In the two recession periods in the United States in the 1970s', oil prices reached a secular peak just prior to an economic contraction. However in the last oil shock of the 2000s', it seems that this typical characteristic vanished. Despite the large increase in oil prices from the beginning of 2002 until mid-2008, the effects on inflation were less striking than the one observed in the 1970s' and the effects in growth as well as in unemployment were just visible in the aftermath of the sub-prime crisis.

The study of oil shocks and its macroeconomic effects is not a new subject. The literature has already studied the various transmission channels through which oil price increases may have an impact on economic activity: growth, inflation, and unemployment. Just to name some, works from Hamilton (1983, 1988, 2009), Rotemberg & Woodford (1996), Carruth et al. (1998), Davis & Haltiwanger (2001), and Löschel & Oberndorfer (2009), particularly state the strong correlation between oil shocks and unemployment rate increases.

Nevertheless it seems that the interest in oil shocks and unemployment has decreased since the mid-1990s, which is understandable taking into account the relative steady unemployment rate between 1995 and 2006, with the exception of 2001. However the rate of unemployment rose by 5 per cent between 2007 and 2010, which is comparable with the 4 per cent unemployment increase some quarters after the oil shocks in the 1970s'. While the influence of the sub-prime crisis of 2008 on the high unemployment rate observed in 2010 cannot be denied, we should also not dismiss the effects of oil price shocks and assume that what happened in 2008 was entirely due to a market anomaly. The objective of this paper is to address this issue by constructing the grounds of a Dynamic Stochastic General Equilibrium model (DSGE), which could be later on used as a tool for policy analysis.

With this in mind, this paper constructs a calibrated (DSGE) model with three characteristics: Unemployment dynamics, staggered multi-period wage contracting, and the introduction of oil in consumption and production. It then analyzes the impact of an oil shock.

Under the baseline calibration, the model recovers most of the well-known stylized facts after an oil price shock in the 2000s': a weak, contemporaneous and very short-lived increase in output coupled with a low increase in domestic inflation, a low price elasticity of oil demand, and in this particular model, an increase in unemployment. A sensibility analysis shows that the reduction of the bargaining power of households to negotiate wage contracts could diminish the rise in unemployment after an oil shock without affecting negatively to domestic output. It also shows that the wage flexibility strongly reduces the increase in unemployment after an oil shock, but causes a decrease in real wages, which reduces household income and affects domestic output.

Methods

The model relies on the unemployment dynamics as in Mortensen & Pissarides (1994), with staggered multi-period wage contracting as in Gertler & Trigari (2009). It also assumes a small open economy where oil is imported from a foreign country at an exogenous real price and used in consumption and production. As in Acurio Vásconez (2015), the model allows for oil imperfect substitutability. Finally the model also includes staggered good prices as in Gertler et al. (2008) and Blanchard & Galí (2010).

The model consists of three sectors: Households, Firms and Government. The oil and capital markets are markets with exogenous price. The intermediate firm market will be considered as perfectly competitive. The retailers' market is however monopolistic, where as in Calvo (1983) just a fraction of the firms are able to renegotiate their prices. In contrast to models without unemployment, labor in this paper will be traded in a process that exhibits search externalities for individual households and vacancy openness for firms.

There exists a representative household with a continuum of members of measure unity, who put their income in a pool and let the head of the family self-insures their consumption path against unemployment risk. A fraction of them works for the intermediate firms and earn a salary. The remaining part searches for a job and receives unemployment benefits. Besides, the family has a diversified ownership stake in firms, which payout profits, pays

lump-sum taxes, consumes final domestic goods and oil, invests in government bonds, for what it receives a nominal interest rate and invest in capital, which is rent to firms at a real rental rate of capital.

There exist two kinds of firms. The intermediate good producers are price-takers and use labor, oil and capital to produce their goods that are sold to the retailers. It also posts vacancies in order to attract new workers for the next period. Posting vacancies has a quadratic cost. The representative intermediate firm maximizes its profit by choosing quantities of oil, capital and vacancies. Additional to that, a fraction of the intermediate firms can bargain with the households in order to fix a new wage. This negotiation will be done in a Nash bargaining framework. The retailers in the other hand are monopolistic firms and a fraction of them is able to re-optimize its price at each period.

Finally, there is a Government sector that has exogenous spending and a Central Bank that sets the nominal short-term interest rate by a monetary policy. The model is calibrated and its reaction analyzed, face to a shock on the real price of oil.

Results

The model recovers most of the responses stylized facts after an oil shock in the 2000s': a small but persistence increase in domestic inflation, increase in hours worked, muted response of oil in production and short lived increases in investment and domestic output. One can also observes that an increase in the real price of oil provokes an increase in unemployment that stagnates one year after the shock. This effect is explained as follows: Because of the low substitutability of oil, an increase in its price obligates the firms to reduce cost somewhere else, then one observes a decrease in the hiring cost, which is translated in a contemporaneous decrease in the vacancies posted. This provokes then the increase in unemployment.
A sensibility analysis shows that the reduction of household's bargaining power in wage contract negociation reduces the increase in unemployment after an oil shock, without changing the responses of the rest of the variables, besides from those directly affected as wages, hiring cost and, vacancies. It shows also that wage flexibility could play a role in the reduction of unemployment reaction to oil shocks, but it can also cause a decrease on household's income, which will have an effect in investment and then in output.

Conclusions

This papers addresses the question of the effects of oil prices increases into unemployment and wages dynamics. It constructs a medium scale (DSGE) model that mixed two fundamental ideas: the introduction of oil in consumption and production and the recent literature on unemployment modelization. The model is able to recover most of the well know stylized facts observed after the oil shock in the 2000s'. A sensibility analyze shows that the reduction in the bargaining power of households for wage contracts negotiation reduces the impact of an oil shock in unemployment without affecting negatively domestic output. It also shows that a wage flexibility could substantially reduce the reaction of unemployment to oil shocks, but that it can also cause a negative reaction in wages, affecting negatively the income of households and by consequence investment and domestic output.

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