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Uncertainty-driven labor market fluctuations

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This paper explores uncertainty shocks as a driving force in a search and matching model of the labor market. Uncertainty takes the form of a noisy component in a firm's initial signal about job productivity. Greater uncertainty dampens job creation by increasing the risk of making the costly mistake of investing in jobs that will turn out to be unprofitable. Thus, uncertainty shocks can cause labor market downturns: lower vacancy rates, lower job-finding rates, and higher unemployment. Numerical simulations examine the level of volatility and the cross-correlations and autocorrelations of key U.S. labor market indicators that result from fluctuations driven by changes in uncertainty.

1. Introduction

Firms making decisions about whether to create new jobs face significant uncertainty regarding the various factors that affect their future profitability: productivity, product demand, input costs, entry by new competitors, changing laws and regulations, etc. In the face of this uncertainty, firms will sometimes create jobs that ex post prove to be unprofitable, and at other times they will forgo opportunities that do not seem promising, but that would have proven profitable if they had been pursued. In periods of heightened uncertainty, these challenges will be magnified, thus making the job creation process more costly. As a result, firms may respond to an increase in uncertainty by reducing job creation, which in turn would reduce worker job-finding rates and increase the unemployment rate. That is, changes in the level of uncertainty can potentially serve as a driving force behind labor market fluctuations. This paper examines, in the context of a relatively standard labor market matching model, whether such changes in the degree of uncertainty can generate fluctuations in key labor market indicators—job creation, job-finding rates, unemployment, etc.—that can, qualitatively and quantitatively, account for the labor market fluctuations observed in the U.S.

In the model, potential firms pay an initial discovery cost to have an opportunity to create a new job. After paying the cost, they receive a draw of a noisy signal about the potential job's productivity. Based on that signal, the firm must decide whether to pay another cost: the start-up cost necessary to get the job off the ground.[1] These start-up costs represent investments that are (completely, or partially) irreversible, such as the cost of remodeling a restaurant or office space, the cost of acquiring equipment, or the administrative costs associated with creating a new position. If the firm makes the investment, only to discover that in fact the job is not productive enough to be profitable, then the job is destroyed and the

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[1] Lee and Mukoyama (2008) present a model with a similar two-step job creation process involving a discovery cost and a start-up cost.

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start-up cost is lost.[2] On the other hand, if the firm determines that the job will be profitable, it posts a vacancy in order to find a worker.

Aside from this noisy job creation process, the economic environment is very similar to the Pissarides (1985) matching model. Workers and firms are brought together via a constant-returns-to-scale matching function, wages are determined via Nash bargaining, and worker–firm pairs face some probability that their match will be exogenously destroyed. In analyzing the model below, the only shock takes the form of changes in the level of uncertainty, so as to focus attention on the role of uncertainty as a driving force. I model this by specifying a discrete-state Markov process for the standard deviation of the noisy element of the job quality signal. Later, in a quantitative section, I also incorporate productivity shocks.

In general, the impact that heightened uncertainty has on job creation depends on the nature of the uncertainty. In a standard Diamond—Mortensen—Pissarides search environment, if uncertainty is modeled as greater dispersion in job (or match) productivity, then an increase in this type of uncertainty would actually generate a boom—an increase in vacancy creation and in the job-finding rate, and a decline in unemployment. This would occur for the same reason that financial options are more valuable when uncertainty is greater: greater dispersion is desirable when good outcomes can be retained while bad outcomes can be easily discarded. An uncertainty-induced boost to job creation of this sort appears, for example, in Mortensen and Pissarides (1994), where the effects of an increase in the dispersion of match-specific productivity are considered.

In other economic environments, greater dispersion in productivity can indeed lead to a decline in employment. This is the case in models (e.g. Bloom, 2009) in which the "real-option effect" plays an important role. The "real option effect" (see, for example, Dixit and Pindyck, 1994) holds that when investments are irreversible, and outcomes are uncertain, the decision to pull the trigger on the investment is tantamount to forfeiting an option. When uncertainty is greater, that option is more valuable and firms are more inclined to take a "wait and see" approach, hoping that uncertainty will be resolved and bad outcomes can be avoided. To express the contrast differently, in a standard search and matching environment an option is being acquired when a match is created, whereas the irreversible nature of decisions in the case of "real-option effects" means that an option is being relinquished.

Here, uncertainty shocks are not modeled as changes in the dispersion of productivity, but rather as fluctuations in the dispersion of the noisy element of a firm's initial signal about job quality. These variations in the noisiness of signals represent the ways in which technological innovations, shifts in consumer tastes, or changes in the regulatory environment make it more difficult at some times than at others for firms to discern the profitability of different activities. Importantly, an increase in the noisiness of the job creation process in the model presented here does not generate the option value associated with greater dispersion, since the true underlying productivity of jobs is not affected. Moreover, the noisiness is potentially costly due to the sunk nature of the discovery costs and start-up costs.

To understand better the role of these costs, note that the start-up investment makes false positives—jobs that are created, but are then revealed to be unprofitable—costly, and thus induces firms to be more selective in deciding which job opportunities to pursue. That is, the higher the start-up cost, the more confident firms must be (based on their initial signals) in the quality of their job opportunities before they will be willing to pay the cost to create the job. At the same time, firms cannot be so selective that they only create the job opportunities for which the initial signal indicates that a profitable match is nearly certain. To do so would result in many false negatives—forgone job opportunities that would have been revealed to be high quality. If job opportunities were free and limitless, then these squandered opportunities would not be problematic. However, the discovery cost means that job opportunities are not free, and thus firms must take care not be too selective.[3]

Greater uncertainty exacerbates these difficulties, and raises the expected cost of creating a good job. Indeed, below I show analytically that in the model's equilibrium, states with greater uncertainty (greater noise in the job quality signal) are states in which the vacancy/unemployment ratio is smaller. This reduced vacancy/unemployment ratio means that worker job-finding rates are smaller, which *ceteris paribus* puts upward pressure on the unemployment rate. In other words, heightened uncertainty (again, in the sense of greater noise rather than greater dispersion of outcomes) results in a labor market downturn.

I carry out numerical simulations of the model to assess whether it can generate fluctuations in labor market measures (vacancies, unemployment, and job-finding rate) that qualitatively and quantitatively capture the key features of the data. The results show that the model can generate autocorrelations and cross-correlations that are in line with their empirical counterparts. Importantly, and in contrast with other types of shocks such as separation rate shocks, the model also can generate a realistic Beveridge curve. In addition to the model's ability to account for correlations, another key question, given the important finding in Shimer (2005) regarding the inability of productivity shocks to generate quantitatively significant levels of volatility in a standard matching model, is whether uncertainty shocks are capable of producing realistic levels of volatility.

Three parameters have a clear impact on the model's volatility: the magnitude of the discovery cost, the magnitude of the start-up cost, and the standard deviation of the level of noise. As direct evidence on those parameters is somewhat elusive, I report results for a range of values. I find that if discovery costs are equal to two weeks of production, start-up costs are equal to twenty weeks of production, and the time-series standard deviation of uncertainty is equal to about 35% of its mean value, then the volatility of the model's job-finding rate is on par with its empirical counterpart. I discuss evidence on the plausibility of these values.

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[2] In the case of start-up costs associated with the equipment that can be re-sold, but at a discount, the amount of that discount represents the lost start-up cost.

[3] Moreover, in contrast with the "real-option effect," no option is relinquished when the job is created, since it can still be destroyed subsequently. Furthermore, delay will not mitigate the problem created by the noise, as additional information will not be obtained by delay. Instead, reduced job creation here stems from the increased creation costs associated with the false positives and the false negatives.