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Search Complementarities, Aggregate Fluctuations, and Fiscal Policy

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We explore the effect of search complementarities in an economy populated by firms that must match among themselves to form long-lasting joint ventures to produce output, a central feature in the inter-firm linkages embedded in contemporary value-added chains.

If the probability of a match is supermodular in the search effort exerted by firms, an increase in the search effort by one firm will raise (under some conditions on the search costs function) the other firm's search effort. Conversely, a decrease in the search effort by one firm will lower the other firm's search effort. Depending on fundamentals (i.e., payoff-relevant variables such as productivity or the discount factor), this strategic complementarity begets a unique static Nash equilibrium (i.e., an equilibrium for the current period) where both firms search with low effort, a unique static Nash equilibrium where both firms search with high effort, or multiple static Nash equilibria with different search efforts.

To explore this amplification and propagation mechanism, we embed this mechanism in a quantitative business cycle model. Households are subject to discount factor shocks, and firms experience productivity shocks. Since households own the firms in the economy, the discount factor shocks also affect how firms discount the future. Thus, in our model, the return from establishing a joint venture between firms depends on fundamentals and on the search effort of potential partners. The latter dependence generates a region of state variable values where there is a unique passive static equilibrium (where firms search for partners in the current period with zero effort), a region where there is a unique active static equilibrium (where firms search for partners in the current period with positive effort), and a region where both static equilibria exist. In this case, we will assume that the economy stays in the same static equilibrium as in the previous period: if yesterday firms did not search, today firms still do not search; if yesterday firms searched with positive effort, today firms still search. History dependence is both an intuitive and transparent

equilibria selection device and a well-documented predictor of empirical behavior in coordination games similar to ours.

Since in the active static equilibrium, firms post more vacancies, output is higher, and unemployment lower than in the passive static equilibrium, shocks to the discount factor induce large aggregate fluctuations by switching the economy between the regions of uniqueness and the multiplicity of static equilibria. The shocks create strong non-linearities and bimodal ergodic distributions of endogenous variables, where the mass around each mode is generated by the economy living in each static equilibrium.

We show that search complementarities can transform transitory negative shocks into protracted slumps: a large negative shock sends the economy to the passive static equilibrium and we must wait for another large positive shock for the economy to leave it. This phenomenon might explain the aftermath of the Great Recession in the U.S., where output has remained below trend after the onset of the crisis and employment-to-population ratios are still depressed. Through the lenses of our model, the economy moved in 2008 to a static equilibrium with less search, and it has not abandoned it even after the original adverse shocks evaporated.

Quantitatively, if the model starts from the active equilibrium deterministic steady state, a one-period adverse shock to the discount factor of 12% moves the system to the passive static equilibrium, increasing the unemployment rate by 3.2% and reducing output by approximately 15%. The drop in output is in the ballpark of the one observed for the U.S. in the Great Recession measured as a deviation with respect to trend. Using a DSGE model, Justiniano and Primiceri (2008) estimate a standard deviation of the discount factor equal to 5% in the U.S. post-war period. A reduction of 12% in the discount factor is approximately a two-and-a-half standard deviation fall in the discount factor, a low probability but not a rare event. Smaller shocks to the discount factor fail to move the system away from the original static equilibrium, and the properties of the system are similar to those of conventional business cycle models.

The model matches U.S. business cycle statistics, in particular along two moments that have proven to be challenging to replicate in the past. First, the economy generates a strong internal propagation of shocks. The autocorrelation of the variables is larger and closer to the observed data than in standard models without the need to assume highly persistent exogenous shocks. In our model, instead, persistence comes from history dependence. Second, our economy generates endogenous movements in labor productivity and more realistic volatility of unemployment than alternative business cycle models.

We use the model to investigate the role of fiscal policy. If the government increases its expenses (modelled as a rise in government-owned firms such as a new public school), the search incentives for private firms increase, and the economy can switch from a passive static equilibrium to an active

one. Thus, the fiscal multipliers can be as high as 3.5 when the fiscal stimulus is of just the right size to move the economy from the passive to the active static equilibrium. On the other hand, if search effort is already high (or the fiscal expansion too small in a passive static equilibrium), the fiscal multiplier will be as low as 0.15. Thus, the magnitude of government intervention is critical to foster economic recovery in the passive static equilibrium, while it plays a limited role in the active static equilibrium.