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Essays in Macroeconomics

My primary research concentrates on the macroeconomic perspective of labor markets and labor flows. I also work on designing algorithms to solve dynamic economic models.

My job market paper titled “Job Specialization and Labor Market Turnover” explores the secular decline in the labor market turnover over the recent decades. The turnover measures like job finding rate, job separation rate, employer to employer transitions obtained from worker flow data, or the measures like job creation rate, job destruction rate obtained from firm side data, exhibit a secular decline over time. Even though there has been a growing number of empirical works documenting the patterns of labor market turnover over time, not much investigation has been done regarding the underlying economic factors driving this decline. This paper contributes to this gap in the literature. I propose that there has been an increase in the specialization of jobs and this can lead to the fall in labor market turnover that we see in the data. Job specialization is defined as the impact of mismatch on match productivity, where mismatch is the distance between skills/ability of a worker and the skill requirements of a job the worker is currently in. If a job has zero specialization, then anyone is suitable for doing the job and hence mismatch has no effect on productivity. If a job is highly specialized, even a small mismatch can have a huge negative impact on productivity. To obtain a measure of mismatch, I make use of individual level worker data from NLSY79. The skill endowments of the workers are measured using the ASVAB test scores that the sample members of NLSY79 were made to undertake. I combine the data on individual skill endowments with data on skill requirements obtained from O*NET to construct a measure of mismatch. I incorporate this measure of mismatch in a standard Mincerian wage regression to obtain an estimate of job specialization. I show that on average, jobs are specialized and the specialization of jobs has increased by 15 percentage points post 1995. To investigate how this increase in job specialization can affect labor market turnover, I write down an equilibrium labor search and matching model with two-sided ex-ante heterogeneity. Workers having different skill endowments and the jobs having different skill requirements are located on a circle of unit length. The productivity of a match decreases with mismatch, which is defined to be the distance between the worker and the firm involved in a match. The effect this mismatch has on match productivity measures job specialization. I show that as the jobs get more specialized, my model can explain more than 50% of the fall in labor market turnover that we see in the data. As the specialization of jobs increases, the substitutability between different skills falls. This causes the well-matched firms and workers to hold on to their matches for a longer period of time, as it is harder to find the right match in the future. This leads to an increase in the proportion of well-matched workers and firms in turn resulting in the decline of labor market turnover.

My second paper titled "A Stochastic Simulation based Algorithm for Solving Dynamic Economic Models" provides an algorithmic framework for solving economic models. One of the most important bottlenecks in writing elaborate dynamic economic models is the curse of dimensionality, i.e. there is an exponential increase in the computational complexity with each additional problem dimension. Various literatures in the field of Operations Research and Reinforcement Learning have shown that the stochastic simulation algorithms help in relaxing this curse. I develop an algorithm using this framework and demonstrate its scalability and robustness by solving a multi-country business cycle model with 12 continuous state variables. I show that my algorithm achieves a concave increase in computational complexity and hence relieving the curse of dimensionality. This is because the algorithm learns the ergodic set of the model over simulations and does not iterate on a pre-specified grid over the state space. I extend this framework to discrete choice dynamic programming problems by solving the lumpy investment model of Khan and Thomas (2003).