The contributions of search and human capital to earnings growth over the life cycle

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ARTICLE INFO

ABSTRACT

This paper presents and estimates a unified model where both human capital investment and job search are endogenized. This unification enables us to quantify the relative contributions of each mechanism to life cycle earnings growth, while investigating potential interactions between human capital investment and job search. Within the unified framework, the expectation of rising rental rates of human capital through job search gives workers more incentive to invest in human capital. In addition, unemployed workers reduce their reservation rental rates and increase their search effort to leave unemployment quickly to take advantage of human capital accumulation on the job. The results show both forces are important for earnings growth and the interactions are substantial: human capital accumulation accounts for 50% of total earnings growth, job search accounts for 20%, and the remaining 30% is due to the interactions of the two.

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1. Introduction

A well established fact in labor economics is that the life cycle earnings profile is increasing and concave. In their review, Rubinstein and Weiss (2006) discuss three leading sources for this pattern of earnings growth: human capital accumulation, job search and learning about job, worker or match quality. Human capital theory argues that workers invest in human capital when they are young thus forgoing earnings and reaping the returns to investment when they become old. Search theory argues that workers climb up a job ladder, moving from low-paying to high-paying jobs. When they are young, workers are more likely to be in the lower tail of the earnings distribution. This triggers job-to-job mobility associated with higher growth. As they age, the chance of accepting better outside options declines and fewer job-to-job transitions and lower growth results. With learning earnings on the job change as information is revealed and workers move from poor matches to better ones resulting in across job earnings growth as well. Once the information has been revealed and a good match attained growth subsides. All three of these explanations have been studied extensively on their own and in isolation each can reproduce the observed shape of the life cycle earnings profile if not the full amount of growth.

Recently a new literature on quantifying the relative contributions of these sources of life cycle earnings growth has developed. For the most part this new literature has focussed on modeling the combination of human capital accumulation

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and job search.[1] Understanding the relative contributions of human capital accumulation and job search to life cycle earnings growth is important since they have different policy implications concerning training on the one hand and labor market mobility on the other hand. With very few exceptions this new literature uses structural models that treat the human capital accumulation process as deterministic through an exogenous learning-by-doing framework. Furthermore, they also commonly treat the search process as exogenous with constant job offer arrival rates. There are two papers that treat the search process as exogenous but endogenize the human capital accumulation process. In a largely conceptual rather than quantitative analysis, Rubinstein and Weiss (2006) endogenizes human capital using a Ben-Porath style investment function. Michelacci and Pijoan-Mas (2012) endogenizes the hours decision within a learning-by-doing human capital accumulation model with exogenous search. However, their focus is on inequality and not life cycle earnings growth. A common result in this literature is that human capital is found to explain more earnings growth over the life cycle than search.

In contrast to this prior literature, we develop and estimate a unified model where both human capital investment and search effort are endogenized to quantitatively examine the relative contributions of both mechanisms and their potential interactions to earnings growth over the life cycle. The decision-making in terms of human capital investment and job search are likely to be different within a unified framework. Consider a unified model where workers, facing a distribution of the rental rate of human capital, decide how much time to invest in general human capital within a Ben-Porath style investment model and how much effort to spend searching for a better job. In this setting, there are likely three interactions between human capital accumulation and job search. First, workers will likely invest more in human capital than they would without job search and with only a fixed rental rate of human capital. This is due to the upward drift in the distribution of the rental rate of human capital, inherent in the search model. Second, workers will likely spend more effort searching with human capital accumulation than without. This is because, without human capital accumulation, the return to search is only realized for a fixed level of human capital. With human capital accumulation, the return to search is greater since it is now realized for growing human capital. Third, because of human capital accumulation on the job, workers will likely reduce their reservation rental rate while unemployed in order to get a job to start accumulating human capital.[2] For the most part the existing literature has been able to identify only a subset of these interactions.[3]

In addition to quantifying the full extent of the interactions between human capital investment and job search effort over the life cycle, we examine whether allowing for the interactions within a unified model changes the implications for earnings growth. Since Rubinstein and Weiss (2006) established that the amount of human capital accumulated with (exogenous) job search and without is different, it follows from the arguments above that the amount of human capital accumulated will be different if the job search process is then endogenized. Furthermore, the job search process will also change if it is endogenized. Mortensen (2003) shows that search effort is a decreasing function of wages. The workers who earn higher wages search less because the chance for them to climb further up the job ladder is smaller. It is reasonable to believe that workers with different human capital levels also have different incentives to search. Unlike the existing literature, in our model search effort depends not only on the current rental rate but also on the level of human capital. In this way, the job offer arrival rates differ across worker attributes including human capital levels, rental rates, experience, and age.[4] Both of these factors will contribute to job search and human capital accumulation having different roles over the life cycle and potentially a different contribution to overall earnings growth.

To conduct this study we combine a partial equilibrium search model with a human capital investment model.[5] The search component of the model includes a search effort decision that determines the arrival rate of job offers both on and off the job. As is standard in search models reservation strategies are used to determine optimal transition patterns. In contrast to standard search models, here the reservation strategies depend on the level of human capital as well as current earnings and employment states. In the model human capital is governed by a Ben-Porath investment model where workers spend some of their working time investing in human capital and thus trade off current earnings for future growth in earnings. We chose an investment model for several reasons. First, it is arguably the most common human capital accumulation specification in labor economics. Second, it allows for the human capital accumulation process to be a function of the current rental rate as well as expected future rental rates derived through search. Third, there is evidence that the learning-by-doing model can be rejected by the data in favor of an investment-style model (see, for example, Belley, 2012). Finally, it allows us to contrast our results with the other work in this area that assumes a learning-by-doing human capital accumulation process.

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[1] Examples include Bunzel et al. (1999), Bagger et al. (2011), Barlevy (2008), Omer (2004), Yamaguchi (2010), Burdett et al. (2011), Sim (2009), Carrillo-Tudela (2012), Prat (2010) and Pavan (2011). Schönberg (2007) and Dustmann and Meghir (2005) are two examples using reduced form analysis. Sanders (2011) is a recent paper that combines learning with job search.

[2] We examine post-schooling outcomes and do not allow workers to return to school and/or enter training programs during unemployment.

[3] For example, Omer (2004) and Yamaguchi (2010) find that the reservation wage (or match quality) is lower with exogenous human capital accumulation than without, while Rubinstein and Weiss (2006) point out that workers will invest more in human capital with exogenous job search than without.

[4] Pavan (2008) also allows for more flexibility in search technology, but he assumes the job arrival rates are explicit functions of a series of individual observable and unobservable characteristics, rather than governed by a fundamental underlying mechanism.

[5] We develop a finite-horizon model with a fixed retirement date. This makes all of the decision rules non-stationary and renders solving for the general equilibrium rental rate distribution very difficult. To our knowledge such a general equilibrium model with wage posting has yet to be solved. The closest general equilibrium framework is Burdett et al. (2011). However, they assume labor market exits are stochastic in order to keep the environment stationary. They also do not incorporate endogenous search effort or human capital investment.