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# Experience vs. obsolescence: A vintage-human-capital model

Matthias Kredler

*Departamento de Economía, Universidad Carlos III de Madrid, Calle Madrid 126, 28903 Getafe, Spain*

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## Abstract

I introduce endogenous human-capital accumulation into an infinite-horizon version of Chari and Hopenhayn's (1991) [4] vintage-human-capital model. Returns to skill and tenure premia are highest in young vintages, where skill is scarcest and agents accumulate human capital fastest. As the vintage ages, the skill premium decreases and vanishes entirely upon vintage death. Workers run through cycles of human-capital accumulation: their wages rise as they accumulate skill, undergo downward pressure as the technology ages, and finally drop sharply when the worker switches to a new technology. The results are in line with German linked employer–employee data: tenure premia are highest in young establishments, as well as in fast-growing industries, occupations and establishments. A calibration exercise suggests that human-capital accumulation is the most important determinant of workers' wage profiles, whereas changes to the price of skill and vintage productivity gains play a smaller quantitative role.

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## 1. Introduction

Returns to skill vary substantially across industries, occupations and firms. This paper argues that this is what we should expect when skill is specific to technologies. The basic mechanism I propose is as follows. New technologies, in which skill is scarce, offer high returns to skill in

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*E-mail address:* [matthias.kredler@uc3m.es](mailto:matthias.kredler@uc3m.es).

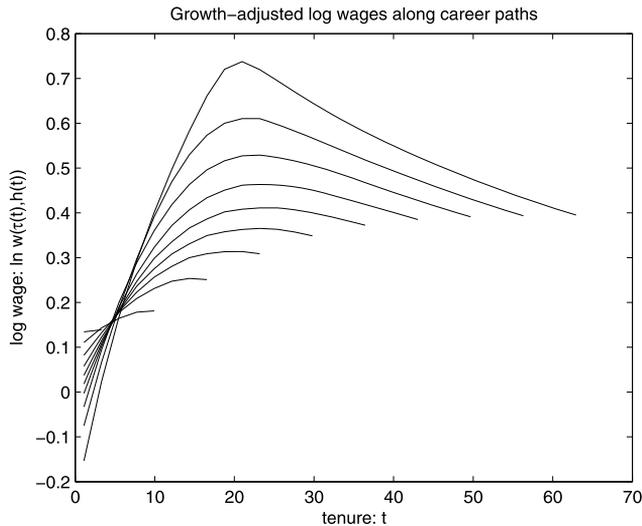


Fig. 1. Tenure-earnings profiles over career.

order to provide incentives for rapid skill accumulation. In old technologies, however, there is an abundance of skilled workers, but firms in these technologies face problems filling vacancies at the entry level. Workers know that the technology is at risk of becoming obsolete and are thus reluctant to enter. In order to lure workers into these old technologies, firms have to compensate workers with higher entry wages.

To develop these ideas, I build a vintage-human-capital model with endogenous human-capital accumulation. As in Chari & Hopenhayn [4], human capital is tied to a technology and is lost when the technology is phased out. In each vintage, different levels of human capital are used in production. Unlike in Chari & Hopenhayn's [4] two-period overlapping-generations model, however, human-capital accumulation is endogenous and the possibly infinite lives of individuals allow for rich patterns in tenure-wage profiles (shown in Fig. 1).

In the model, workers run through cycles of skill formation. They enter into a vintage, accumulate skills and finally re-locate to a new vintage once the technology becomes obsolete. If different skill levels are complementary, then workers enter all active vintages. This is true even for the oldest technologies because firms need to fill vacancies of low-skill workers. Since workers are ex-ante homogeneous, all technologies have to be equally attractive for workers at entry. This requires old technologies to pay higher entry wages in order to make up for the shorter duration of the career. This is apparent in the shortest earnings profiles in Fig. 1, which pertain to workers entering old technologies.

Skill accumulation is fastest in the newest vintages, in which skilled labor is scarce. For these workers earnings growth is fastest, as we see in the longer profiles in Fig. 1. Entrants into frontier technologies have the lowest entry wages. They can reap the benefits from their skills over a long time, which makes these careers especially attractive. In equilibrium, entry into young technologies increases until the return of the career is equal to that of old technologies. Since skill is abundant in old technologies, human-capital accumulation is slowest and earnings profiles are flattest in old vintages.

We also see in Fig. 1 that many workers experience wage losses towards the end of their career. These are driven by *obsolescence*, the fact that the relative price of skill falls as the vintage ages.

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