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Risks and returns to educational fields – A financial asset approach to vocational and academic education

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ABSTRACT

Applying a financial assets approach, we analyze the returns and earnings risk of investments into different types of human capital. Even though the returns from investing in human capital are extensively studied, little is known about the properties of the returns to different types of human capital within a given educational path. Using information from the German Micro Census, we estimate the risk and returns to 75 fields of education, differentiating between vocational and academic education. We identify fields of education that are efficient investment goods, i.e. high returns at a given level of risk, and fields that are chosen for other (non-monetary) reasons. Furthermore, we rank fields of education by their return per unit of risk and find that university education is not always superior to other types of education.

1. Introduction

The positive effects of investments in human capital on the level and evolution of earnings, employment, and other aspects of well-being is one of the most robust and important empirical findings in labor economics (see e.g. Blundell, Dearden, Meghir, & Sianesi, 1999; Oreopoulos & Salvanes, 2011; Psacharopoulos & Patrinos, 2004). In developed countries, education is an important resource for the economy and assumed to be one of the key determinants in technological development, production and, thus, ultimately economic growth. Therefore, politicians seek to increase the population's educational level (see e.g. EUROPE 2020 – indicators (European Commission, 2010)). As increasing a country's overall educational level requires individuals to invest in their education, researchers focus on the individual's (economic) benefits of education, mainly the increase in earnings due to investments into more education.

Even though the returns from investing in human capital in general are widely studied, little is known about the properties at a more disaggregated level, i.e. field specific returns to education. Standard economic models of schooling decisions model the average returns to years of schooling by comparing future income streams to the costs associated with an additional year of schooling but do not differentiate between fields (Becker, 1964; Mincer, 1974). Recent literature incorporates heterogeneity across different educational investments. The highest expected earnings are usually found for fields in social science, mainly business and law, as well as medical subjects, while humanities and arts are rather unattractive investments in terms of monetary returns (Walker & Zhu, 2011).[1]

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[1] Other studies are Ammermüller and Weber (2005) and Wahrenburg and Weldi (2007) for Germany, Arcidiacono (2004) for the US, Boudarbat and Montmarquette (2009) for Canada, Kelly, O'Connell, and Smyth (2010) for Ireland and Chevalier (2011) for the UK.

Another stream of literature acknowledges the differences in returns to fields of education and suggests that the college major choice is – apart from non-pecuniary factors as preferences or ability – guided by these differences in expected earnings (see e.g. Arcidiacono, 2004; Arcidiacono, Hotz, & Kang, 2012; Beffy, Fougre, & Arnaud, 2012; Berger, 1988; Boudarbat & Montmarquette, 2009). But if individuals are risk averse, the returns themselves are only one determinant that affects the decision process. As with financial investments, human capital investments are influenced by the risk associated with the investment, i.e. the uncertainty of realizing the expected returns. Empirical literature, incorporating risk in educational decision models, where education is modelled as homogeneous good, find that the investment decision is largely influences by risk (see e.g. Belzil & Leonardi, 2007; Carneiro, Hansen, & Heckman, 2003; Fossen & Glocker, 2011; Hartog & Vijverberg, 2007).

While risk is undoubtedly an important determinant in financial investment decisions, it is often neglected in the human capital investment decision. Relatively little research, thus, tries to understand how the risk-return trade-off for different human capital investments compare at the margin. Palacios-Huerta (2003) is the first to empirically analyze risk properties of various human capital returns. He presents an empirical comparison of risk adjusted human capital investments to financial investments. Christiansen, Joensen, and Nielsen (2007) take up his approach and analyze the risk-return trade-off in human capital investments using Danish labor market data. In both studies, the authors compare the risk properties of human capital assets by applying a framework that is standard for the analysis of financial assets. The approach by Christiansen et al. (2007) allows for the human capital to be analyzed analogously to financial investments, incorporating the unexplained variance of the returns, the earnings risk, into the evaluation of the benefits from education. Tuor and Backes-Gellner (2010) follow a similar approach investigating differences in the risk-return properties of different paths of education – vocational and academic education, as well as a combination of both. The above studies indicate that different educational investments exhibit not only differences in returns, but also differ with respect to their risk properties.

From a political perspective it is important to have information on the financial attractiveness, measured by the risk and returns, of an educational field for various reasons. First, the information can serve as an instrument to evaluate the demand for graduates on the labor market. In Germany, for example, it is controversially discussed as to whether there is a lack of graduates from engineering fields or, more broadly, from STEM-fields.[2] While some experts claim that there is a lack of skilled engineers and demand that politicians take action (see e.g. Anger, Koppel, & Plünnecke, 2011), others do not share this opinion (see e.g. Brenke, 2010). Identifying the field specific returns and associated risks could serve as a tool to evaluate the demand for graduates of a certain field of education on the labor market, with high earnings and low levels of earnings variance indicating a high demand for skilled labor in a specific field.

Second, an information deficit among prospective students or incorrect perceptions about returns to fields and levels of education could lead to an inefficient sorting into the fields and, consequently, to a lack of skilled workers in certain fields. In that case, improving the students' knowledge about the financial attractiveness of the various paths and fields of education could be a policy measure that enhances the sorting of students across fields.

We contribute to the literature and the political discussion by comparing the life-cycle risk and returns to a large number of educational fields in Germany. While Christiansen et al. (2007) compare risk and returns of graduates at a certain point in time, we consider the entire (working) life-cycle. The advantage of looking at the whole life-cycle becomes obvious when looking at the differences in age-earnings profiles depending on educational levels (see e.g. Figs. B1 and B2). Since the profiles do not run in parallel, comparisons at a single point in time might vary substantially, depending on the chosen moment.

Risk and returns to fields of education have not been compared for the case of Germany yet. Germany provides an interesting framework for studying returns and risk properties to different types of education for various reasons: In Germany upper secondary high school graduates can choose between vocational education, education at a university of applied science or at a university. These educational levels have different characteristics, for example, different lengths of study, qualification levels or levels of specialization. Despite the different characteristics, they offer, in many cases, similar fields of education. For example, a person interested in business or manufacturing can choose between all three educational levels. Hence, for a decision maker it is not only interesting to know how earnings and earnings risk vary across the educational levels on average but also how earnings vary between the educational levels for one specific field. The results are also interesting at an international level, since the German system of vocational training is often praised and held as a model for adoption in other countries (see e.g. OECD, 2010).

Using a large German data set, the German Micro Census, we are able to estimate the returns and earnings variances for 75 fields of education. We estimate the returns to different fields and levels of education by extending the standard Mincer wage equation to allow for different fields of study. By analyzing the risk-return trade-off for a large number of fields, we identify fields that are most attractive in terms of investment goods and fields that are likely to be chosen for other reasons, e.g. for consumption purposes. The design of the German education system allows us to restrict our sample to upper secondary school graduates who obtained a university entrance certificate. This group can be assumed to have a rather homogenous level of general ability, since only the more academic able students achieve the secondary school degree. In 2010, for example, only half of students in the respective age cohort left school with an upper secondary

[2] STEM-fields include fields in natural science and computer science, technical fields, engineering and mathematics.