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Accounting for human capital externalities with an application to the Nordic countries

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Abstract

Externalities caused by human capital accumulation have taken up considerable space in theoretical work on economic growth. However, less attention has been paid to this externality in traditional growth accounting exercises. This paper takes up the issue of growth accounting, suggesting a framework for quantifying human-capital externalities and illustrating it empirically using data from the five Nordic countries. Four sources of growth are identified, i.e. capital accumulation, labor force growth, and total factor productivity growth (TFP), where the traditional TFP measure is split into a part explained by human-capital formation and an unexplained part. By doing this I am able to attribute between 12 per cent and 33 per cent of growth in the Nordic countries to human capital investment.
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1. Introduction

The empirical literature on economic growth can broadly be categorized into three fields: (a) convergence regressions, (b) determinants-of-growth regressions, and (c) growth accounting exercises. The literature has mostly focused on the first two issues and papers on the last have been few and far between during the last decade. Furthermore, externalities caused by human capital accumulation have taken up considerable space in theoretical work on economic growth, cf. Nelson and Phelps (1966), Shell (1966), Romer (1986,1990), and Lucas (1988). Less attention has been paid to this externality in traditional growth accounting exercises, with the notable exception

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of Benhabib and Spiegel (1994), but their paper uses the Nelson and Phelps (1966) framework to quantify the effects of human capital accumulation and catch-up on total factor productivity and growth.[1] The paper presented here takes up the issue of growth accounting, suggesting a framework for quantifying human capital externalities and illustrating it empirically using data from the five Nordic countries.

The basis of growth accounting is the quantification of factor shares, and the empirical literature can be divided into two branches, depending on the method used to obtain their relative factor weight. One method, which is based on estimating a production function, originates in Solow's (1957) seminal paper. The other is the sources-of-growth methodology, which is an accounting approach based on national accounts. This approach was suggested by Jorgenson and Griliches (1967). Both approaches lack a satisfactory foundation in economic theory, as neither offers any explanation of how changes in inputs and improvements in TFP relate to elements, such as preferences, technology, and government policy, all of which can reasonably be thought of as fundamental to economic growth (cf. Barro and Sala-i-Martin, 1995). On the basis of traditional growth accounting exercises, the contribution of technology to growth in aggregate output is normally thought to be in the range of 30–50 per cent.[2] Such a large contribution from a component alien to the model is obviously disappointing as the aim of empirical research into economic growth is to observe its causes within an economic theoretical framework.

The point of departure here is the connection between formal education and human capital externalities. Previous studies show that private returns to formal education are considerably lower than social returns.[3] One reason might be that if innovations produce externalities, like in Romer (1990) and Aghion and Howitt (1992), then education, by its stimulus of innovations, also yields positive externalities, and consequently private and social returns to education differ, cf. Nelson and Phelps (1966). This results in too little demand for private education and consequently too little supply of formal human capital. Therefore, governments in most countries have found it necessary to subsidize formal education to internalize the positive externality involved, cf. Glomm and Ravikumar (1992, 1994a, 1994b, 1997), Zhang (1997), and Zhang and Casagrande (1998). In the highly stylized model presented here, the government is motivated to subsidize formal schooling because it observes the positive externality on returns to private capital and labor productivity through the accumulation of human capital. Since households demand too little education under a private education scheme, the government subsidizes human capital accumulation to internalize this positive externality for the economy as a whole.

[1] Authors such as Denison (1979), Maddison (1986), and Jorgenson and Fraumeni (1993) have addressed this in their growth accounting exercises by adjusting for improvements in labor quality due to increased education. Furthermore, in what they claim to be a growth accounting with externalities exercise, Benhabib and Jovanovic (1991) test whether the Romer (1986) model is valid, using both annual and quarterly US data. However, there is a clear difference between their study and this paper, viz., they are only concerned with obtaining factor shares for testing Romer's hypothesis of capital spillovers, but not with tracing the sources of growth.

[2] See, e.g., Christensen et al. (1980), Dougherty (1991), Elias (1992), and Young (1995).

[3] Cf. Psacharopoulos (1987) and the references therein.

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