



Social capital, innovation and growth: Evidence from Europe

İ. Semih Akçomak^a, Bas ter Weel^{a,b,*}

^a Department of Economics, UNU-MERIT, Maastricht University, P.O. Box 616, 6200MD Maastricht, The Netherlands

^b CPB Netherlands Bureau for Economic Policy Analysis, P.O. Box 80510, 2508GM The Hague, The Netherlands

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ABSTRACT

This paper investigates the interplay between social capital, innovation and per capita income growth in the European Union. We model and identify innovation as an important mechanism that transforms social capital into higher income levels. In an empirical investigation of 102 European regions in the period 1990–2002, we show that higher innovation performance is conducive to per capita income growth and that social capital affects this growth indirectly by fostering innovation. Our estimates suggest that there is no direct role for social capital to foster per capita income growth in our sample of European Union countries.

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1. Introduction

In the economic literature social capital has been identified as an important determinant in explaining differences in income. Knack and Keefer (1997) and Zak and Knack (2001) have shown for a cross-section of countries that countries with higher levels of measured trust are richer. It is however not clear *how* social capital improves economic outcomes.

This paper argues first that current levels of social capital are formed by historical institutions and investments, such as early literacy, past political institutions and universities. This follows important recent empirical research by Hall and Jones (1999), Acemoglu et al. (2005) and Tabellini (2005), who basically apply the arguments developed in North (1981) that history matters for current economic outcomes.

Second, the idea that social capital improves economic outcomes is appealing, but it seems necessary to identify a third factor through which social capital improves outcomes. This paper suggests that innovation is an important channel by which social capital improves income growth. The idea is that more advanced historical institutions have established a higher stock of social capital. Social capital in turn influences the innovation process because the financing of risky innovative projects requires that researchers and capital providers trust each other. When they do so, more successful projects are carried out, which improves innovation outcomes by means of more patents. Finally, as shown by Grossman and Helpman (1991) and Aghion and Howitt (1992), higher innovation output yields higher income per capita.

In the theoretical background of this paper we integrate social capital in a simple model of production. In this set up the accumulation of capital generates knowledge which benefits society and increases income. Knowledge grows because of

* Corresponding author. Tel.: +31 70 3383396; fax: +31 70 3383350.

E-mail addresses: s.akcomak@merit.unimaas.nl (I.S. Akçomak), b.ter.weel@cpb.nl, b.terweel@merit.unimaas.nl (B. ter Weel).

research effort and the rate by which new discoveries are made. This way of modelling is consistent with the approach introduced by Romer (1986) and further developed by many others (see Aghion and Howitt, 1998 for a review). We amend the accumulation of knowledge by introducing the stock of social capital. The stock of social capital has a positive effect on the accumulation of knowledge, which in turn increases output. The idea is that social capital has a positive effect on the investment in innovation. When researchers live in areas with a larger extent of social networks and have high norms, venture capitalists are more likely to invest in risky projects. This argument is similar to the one used by Guiso et al. (2004), who argue that social capital yields higher financial development. We argue that it induces innovation.

We bring our framework to the data by applying it to 102 regions in the EU-14 (Luxembourg is excluded). The regions of the EU-14 are from a homogeneous set of countries that have operated under similar judicial and financial-economic regulation for some time now. Hence, variability in current formal institutions and capital markets is likely to be of minor importance only when investigating regional differences in economic performance. This is an important advantage of our approach, since the results presented in Knack and Keefer (1997) are based on a set of countries including next to OECD member states also less-developed countries (such as India, South Africa, Nigeria and Turkey) and a number of South-American countries that seem to be hard to compare in terms of economic conditions and institutions. Indeed, as shown by Beugelsdijk et al. (2004), the presence of poor countries in cross-country samples affects both the significance and size of the effect of social capital on growth. So, showing that social capital affects welfare, even within a homogeneous group of countries, improves the credibility of our estimates.

There are important differences between EU regions and even between regions within a country in terms of social capital and innovation performance. Recent work by Moesen et al. (2000), Beugelsdijk and van Schaik (2005) and Iyer et al. (2005) shows that nearly all dimensions of social capital display relatively large differences between regions. For instance, in our data the ratio of the highest and lowest trust score is around 1.2 in Germany and the UK and about 1.6 in Spain and Italy (with trust measured by aggregating the information from individuals to the regional level on a scale from 1 to 10). In addition, there are also differences in innovation inputs and performance and income across and within EU countries (e.g., Gambardella et al., 2002; Bottazzi and Peri, 2003; Bilbao-Osorio and Rodriguez-Pose, 2004; European-Commission, 2001). We discuss these differences in detail in Section 3. Finally, regional policies are increasingly strengthened and EU countries are delegating more responsibilities to regions for the design and implementation of innovation policies (e.g., European-Commission, 2003). This adds to the importance of the regional dimension of this research.

The creation of social capital and its measurement over time is important for the validity of our empirical analysis. Countries such as Italy, Spain, the UK and Germany were once composed of self-governed small states. For instance, in the 18th and 19th centuries there were important social and economic differences between Italian regions under Papal order and regions that were free or between Hamburg and the other German regions under Prussian order. We collect data for past political institutions, the presence of universities, literacy, and urbanization from 1600 onwards and show how historical developments affect the current stock of social capital. The argument is that these historical institutions have contributed to the early development of social capital (e.g., Tabellini, 2005) and in Appendix B we present the approach to dealing with these historical data.

We use information from the European social surveys (ESS) and the European values study surveys (EVS) to obtain measures of the current stock of social capital. Innovation indicators are taken from Eurostat's regional database, which contains information on the number of R&D workers and the number of patent applications. Economic performance is measured as gross domestic product (GDP) per capita growth in the period 1990–2002.

The empirical analysis consists of three steps. We first establish a causal link between social capital and income per capita. Running regressions using historical institutions as instruments for current social capital results in robust and significant positive effects of social capital on income per capita. These estimates are economically meaningful and consistent with estimates from the literature (see Durlauf and Fafchamps, 2005 for an overview). Next, we estimate the relationship between innovation output and social capital, using the relative number of patent applications as the dependent variable. Again we instrument social capital by using information about historical institutions. The estimates suggest that a higher stock of social capital yields higher levels of innovation. Finally, we apply a 3SLS strategy to estimate how historical institutions and investments influence current social capital, which in turn has an impact on innovation, which is a determinant of current income. Of course, social capital is also entered directly to address a possible direct link between social capital and income. The 3SLS estimates suggest a strong effect of innovation on income through social capital, but no direct effect of social capital on income. The estimates reveal that social capital is a determinant of innovation, which in turn explains on average approximately 15% of the change in income per capita in the 102 EU regions in our data between 1990 and 2002.

This paper proceeds as follows. Section 2 presents the theoretical background of the linkages among social capital, innovation and income. The data and descriptive statistics are presented and discussed in Section 3. In Section 4 we explain our empirical strategy. Section 5 contains the estimates and robustness and stability analyses. Section 6 concludes.

2. Theoretical background

Most of the existing literature focuses on the relationship between economic outcomes and innovation (e.g., Aghion and Howitt, 1998) or on the role of social capital for economic growth (e.g., Knack and Keefer, 1997; Zak and Knack, 2001). Our

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