Medical technology and the production of health care

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Abstract This article investigates the factors that determine differences across OECD countries in health outcomes, using data on life expectancy at age 65, over the period 1960 to 2007. We estimate a production function where life expectancy depends on health and social spending, lifestyle variables, and medical innovation. Our first set of regressions include a set of observed medical technologies by country. Our second set of regressions proxy technology using a spatial process. This article also tests whether in the long-run countries tend to achieve similar levels of health outcomes. Our results show that health spending has a significant and mild effect on health outcomes, even after controlling for medical innovation. However, its short-run adjustments do not seem to have an impact on health care productivity. Spatial spill overs in life expectancy are significant and point to the existence of interdependence across countries in technology adoption. Furthermore, nations with initial low levels of life expectancy tend to catch up with those with longer-lived populations.

Keywords Life expectancy · Health care production · Health expenditure · Spatial dependence

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1 Introduction

The last few decades have witnessed rapid growth in health expenditure. From 1960 to 2007, health care expenditure in OECD countries increased, on average, from 3.8 to 9.0% of GDP. Considerable attention has been given to understanding the factors that have produced such growth. This includes looking at the relationship between health spending and income, and reviving economic theories linked to the low productivity of the health sector, such as the Baumol (1967) cost disease theory. An alternative explanation for the rise in health spending is that over time people tend to demand and obtain higher quality of health care (Skinner et al. 2005). There continues to be a live discussion on whether, ceteris paribus, higher health spending corresponds to better health outcomes. A number of empirical studies support the hypothesis of a flat curve of health care expenditure, namely that more spending does not have a significant impact on health outcomes (Fisher et al. 2003; Skinner et al. 2005; Fisher et al. 2009). Other studies, for example the work by Baicker and Chandra (2004), even find a negative correlation between health quality measures and health spending.

Jones (2002) formalizes and empirically tests a model where health expenditure and life expectancy are endogenous variables driven by technological progress. He finds little association between changes in life expectancy and changes in health expenditure (as a share of GDP) in the US. However, interestingly enough, the author also finds that a large fraction of the increase in health spending over time is driven by medical advances. Hall and Jones (2007) estimate an health production function for the US that relates age-specific mortality rates to health spending and technology. Their finding support the theory that the rising health expenditure relative to income occurs as consumption of non-health goods and services grows more slowly than income. As people get richer and saturated with non-health consumption, they become more willing to devote their resources to purchase additional years of life. Skinner and Staiger (2009) develop a macroeconomic model of productivity and technology diffusion to explain persistent productivity differences across US hospitals. Focusing on US Medicare data, they find that cost-effective medical innovations explain a large fraction of persistent variability in hospital productivity, and swamp the impact of traditional factor inputs. In addition, they argue that there is a clear polarization in health care productivity between hospitals that usually tend to adopt less technology, the so-called “tortoises”, and those that traditionally adopt more technology, the “tigers”. Survival rates in low-diffusion hospitals lag by roughly a decade behind high-diffusion hospitals.

That technological progress has an important impact both on health outcomes and spending is well known. Medical advances allow ill people that could not be treated in the past to be cured today. In some cases, technology progressively reduces the cost of treatments. For example, in the case of acute myocardial infarction, new technologies have the characteristic of being less invasive, ultimately reducing hospital stays, rehabilitation times, and health costs. The less invasive coronary stents delivered percutaneously, as well as drug eluting stents, are gradually taking over bypass surgery. Using US data, Cutler and Huckman (2003) examine the diffusion over the past two decades of percutaneous coronary interventions to treat coronary artery disease. They find that percutaneous coronary interventions improve health productivity,