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Biogeography and long-run economic development

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Abstract

The article models the transition from a hunter–gatherer economy to agricultural production, a crucial event in history which made possible the endogenous technological progress that ultimately led to the Industrial Revolution. We further present evidence showing that geographic and initial biogeographic conditions exerted decisive influence on the location and timing of transitions to sedentary agriculture, to complex social organization and, eventually, to modern industrial production. Evidence from a large cross-section of countries indicates that the effects of geography and biogeography on contemporary levels of economic development are remarkably strong, a result that contrasts with several recent studies where the effect runs solely through institutions.

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1. Introduction

During recent years, there has been an increasing awareness that geography affects economic development and growth. For instance, temperature, disease environment, and conditions for transport have been shown to influence agricultural productivity directly (Bloom and Sachs, 1998; Sachs, 2001). Geographical factors are also believed to have played an indirect role by setting the basic conditions in which social

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institutions are formed (Acemoglu et al., 2001; Easterly and Levine, 2003) and by defining environmental constraints to population growth (Kremer, 1993; Galor and Weil, 2000).

The argument made in this paper is that biogeography had a fundamental impact on economic development already in prehistory. Favorable biogeographic initial conditions – in particular the prevalence of plants and animals suited to domestication – expedited the transition from hunter–gatherer to sedentary agriculture in advantaged areas, leading to the rise of early “civilization” and conferring a development head start of thousands of years over areas less well endowed. In our model of long-run economic development, we show that the impact of this head start should still be detectable in the contemporary international distribution of prosperity. Empirical evidence from a large cross-section of countries supports this hypothesis.

The notion that geography broadly conceived matters for societal development is not new. At least as early as the eighteenth century Montesquieu (1750) advanced a theory featuring the political influence of climate. In more recent studies of the links between geography and economic development, one regularity always stands out: The majority of poor countries in today’s world are found in the tropical climate zone; near the equator (Hall and Jones, 1999; Sachs, 2001). Among the factors believed to hamper agricultural productivity and development in the tropics are severe heat, discontinuous water supply and debilitating diseases (Landes, 1998), poor photosynthetic potential for annual plants (Bloom and Sachs, 1998), the absence of winter frosts that kill harmful organisms (Masters and McMillan, 2001), and (in Africa) deficient natural conditions for transport (Gallup et al., 1999).

Some recent work has focused on geography’s indirect influence on today’s levels of development through its impact on patterns of colonialism. Acemoglu et al. (2001) argue that climate and the associated prevalence of mortal diseases affected decisively where colonizers from the Western world decided to create permanent settlements. In regions with high mortality rates “extractive institutions” were built, whereas durable settlements with good institutions typically were installed in colonies with a temperate climate, such as North America, Australia and New Zealand. In two related papers, Rodrik et al. (2002) and Easterly and Levine (2003) attempt to determine empirically whether the “geography hypothesis” of a direct influence on development, or the “institutions hypothesis” of an indirect effect of geography via institutions, has better explanatory power. They conclude that geography’s effects are indirect, running entirely through institutional development, which supports the general line of argument in Acemoglu et al. (2001).

However, whereas Acemoglu et al. start their analysis at the onset of colonization around 1500 AD, we contend that a more defining historical era – the one that ultimately gave Europe the ability to colonize the rest of the world – is the period of the Neolithic revolution, some 10,000 years ago. This fundamental shift in economic production and associated living conditions has not often been analyzed by economists. Early attempts at establishing analytical frameworks with some focus on property rights were provided by Smith (1975) and North (1981, Chapter 7). Drawing on a large archaeological and anthropological literature, Morand (2001) uses a Nash bargaining setup to model the transition from hunting–gathering to settled agriculture, and then

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