

## Notes on Geography

The central role of geography in economic development and innovation has long been recognized by social scientists (Marshall, 1890; Montesquieu, 1989; Smith, 1776). More recently, a substantial empirical literature in economics has suggested that geography plays an important role in shaping the distribution of income across countries and is a major driver of economic growth and prosperity (Gallup et al., 1999; Spolaore & Wacziarg, 2013). This thought goes back at least as far as Adam Smith (1776), who argued that “access to water reduced the cost of trade and gave merchants access to larger markets.” He noted that larger markets gave entrepreneurs incentive to specialize and innovate, which, in turn, stimulated the development of civilization along coastal areas where trade was easier. Even today, countries that are landlocked are, on average, much poorer than countries that have coastal access (Spolaore & Wacziarg, 2013). Of the 28 non-European landlocked economies in the world, there is not a single high-income country (Gallup et al., 1999). The poorest countries in South America are landlocked, including Bolivia and semi-landlocked Paraguay. Africa is the most landlocked continent in the world, with only one major river, the Nile, connecting countries within the continent. Not surprisingly, eleven of its fifteen landlocked nations are some of the poorest countries in the world, with per capita incomes of \$600 or less (World Development Indicators, 2016). These are precisely the countries that are also found at the bottom of international rankings on innovation (Global Innovation Index 2016 Report, 2016) and have some of the highest rates of necessity-motivated entrepreneurship (GEM, 2016).

Poorer and less innovative countries also tend to be concentrated overwhelmingly in the tropics<sup>1</sup> (Sachs, 2001). Economic underdevelopment in these regions can be partly explained by

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<sup>1</sup> Tropical countries fall between 23.45 degrees North and South latitudes.

the negative effects of geography on two detrimental ecological handicaps: low agricultural productivity and the prevalence of infectious diseases. Tropical climates tend to be disadvantageous for photosynthesis, and the soil in these regions are prone to depletion due to heavy rainfall. Also, crops are often attacked by a host of pests and parasites that only thrive in hot climates (Masters & McMillan, 2001). Consequently, tropical plants tend to pack significantly fewer carbohydrates and are less nutritious. Even more importantly, a key determinant of the likelihood of increasing wealth over time has been the abundance of large domesticated animals, such as oxen or horses, which played a key role in liberating significant portions of the workforce from having to plow the land by hand. In tropical regions, however, domesticated animals historically have been the victims of a devastating array of diseases, such as trypanosomiasis, or sleeping disease (carried by the tsetse fly), which has been particularly harmful to domestic animals by making them lethargic or inactive (Swallow, 2000).

As with animals, humans in tropical regions have also been exposed to a terrifying array of diseases borne by insects and bacteria, such as malaria (Gallup et al., 1999; Sachs & Malaney, 2002). The prevalence of infectious diseases has greatly pushed up morbidity and mortality rates. In turn, unfavorable health and malnutrition conditions compound these effects by curbing the capacity of such societies to innovate and invest in human capital, which tends to impede technological development, diffusion of knowledge, and ultimately productivity (Gallup et al., 1999; Thornhill & Fincher, 2014). Virtually all of the low-income countries in the world today are simultaneously affected by at least five tropical diseases (Sachs, 2001). It follows logically that geographic latitude plays a major role in economic development, which explains its inclusion as a primary determinant in regression tests reported in economic growth studies (Spolaore & Wacziarg, 2013).

Geography can also affect growth and innovation indirectly. A good example of this can be found in the settlements of European colonizers in the New World after 1500 (Acemoglu, Johnson, & Robinson, 2003, 2001; Diamond, 1999). Through its impact on outcomes such as crop yields and the spread of germs, geographical conditions consequently shaped the economic and political institutions that took form to manage these challenges (Acemoglu et al., 2005). The prevalence of infectious diseases has also affected the emergence of cultural values, such as individualism-collectivism (Nikolaev et al. 2017), and can explain a significant share of current variations around the world related to economic development, human capital, and the propensity of societies to welcome and adopt new ideas (Thornhill & Fincher, 2014).

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