Intelligence 36 (2008) 711–718

Contents lists available at ScienceDirect

Intelligence

IQ, cultural values, and the technological achievement of nations

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ARTICLE INFO

Article history:
Received 29 January 2008
Received in revised form 22 April 2008
Accepted 29 April 2008
Available online 16 June 2008

Keywords:
National IQ
Intelligence
Patents
Cultural values

ABSTRACT

It is shown that the technological capabilities of a nation are related to national IQ. Nations with a higher percentage of high-IQ individuals generate more technological knowledge (as measured by patents granted per head of population) than other nations. Technological achievement is also shown to mediate the relationship between national IQ and per-capita GDP, suggesting that high-IQ nations are wealthier partly because they are more successful at generating technological knowledge. Additional variance in technological achievement, beyond that explained by IQ, is accounted for by cultural values; nations that value intellectual autonomy and social equality produce more technological knowledge. Intellectual autonomy was also found to moderate the relationship between technological achievement and national IQ, suggesting that technological progress is enhanced where high-IQ individuals live in an intellectually open environment.

1. Introduction

The most significant transformation of society in recorded history has been the Industrial Revolution which began in eighteenth century Europe. According to Hart (2007) the 'modern era', which began around 1500 CE, has witnessed dramatic changes in the human condition, which are comparable in scale to those caused by the advent of agriculture, which marked the transition from the Paleolithic to the Neolithic era about 10,000 years ago (p. 325). The massive increase of global wealth over the past 300 years is rooted in the explosion of technological knowledge which powered this revolution, and which has continued ever since. Today, technological progress remains a major driving force of the global economy, and the ability of a nation to create and exploit new technological knowledge is a key ingredient of its economic success and the wealth and well-being of its citizens. Drucker (1993) declared "In fact, knowledge is the only meaningful resource today. The traditional 'factors of production' have not disappeared, but they have become secondary." (p.42).

Technological achievement has traditionally been studied from an economic perspective (e.g., Acs & Audretsch, 1989; Bound et al., 1984; Evenson, 1993; Hall, Griliches, & Hausman, 1986; Pakes & Griliches, 1984; Scherer, 1965, 1983; Schmookler, 1966). Typically the focus of such studies has been the firm or the industry sector, with spending on research and development, or numbers of scientists and technicians, as explanatory variables. This paper however considers technological achievement at the national level, and the explanatory variables are psychological rather than economic.

Three general propositions are advanced and examined: first, that technological achievement is a function of national IQ; secondly, that technological achievement mediates the relationship between national IQ and national wealth; and finally that technological achievement is related to national culture.

The rest of this paper is organized as follows. The use of patent counts as an indicator of national technological achievement is described first. The three propositions to be tested are then discussed and the research hypotheses formulated. The variables used are then described, and the analysis and results presented, and finally the implications of the findings are discussed.

1.1. Patents as an indicator of technological achievement

Economists have long been fascinated by patent statistics as an index of innovation and technological achievement

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doi:10.1016/j.intell.2008.04.003

(Griliches, 1990), and patenting in the US has been widely used as a basis for international comparisons (Archibugi & Pianta, 1992). Archibugi and Pianta (1996) noted several advantages of using patent counts as indicators of technological achievement: patents are public documents, statistics are available over long time periods, and there is a high degree of international comparability. Furthermore, since obtaining patent protection is time-consuming and costly, most patent applications will be for products and processes that are expected to deliver high benefits.

A patent is a document issued by a national government agency or a recognized regional authority (for example the European Patent Office) which grants the applicant(s) exclusive intellectual property rights for a specified time. According to the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement, World Trade Organization) patents may be granted for any inventions, whether products or processes, in all fields of technology, provided that they fulfil three criteria. First, the invention must be new (i.e. not previously known or used); second, it must involve an inventive or "non-obvious" step (i.e. a step not easily made by someone trained in the relevant area); and finally it must be useful (i.e. capable of industrial application). The invention must also be described in sufficient detail to enable one skilled in the field to use it for the stated purpose (sometimes called the "enablement" criterion).

The legal procedures for obtaining patent protection differ somewhat from country to country, but typically, an initial application is filed containing a full description of the invention, and claims defining the scope of protection requested; the patent office then conduct a search for any earlier published documents which affect the novelty or inventive step of the invention, and then the application is published (normally about 18 months after filing). The applicant then requests examination of the claims, and the patent office carries out a detailed examination, raising objections if appropriate and giving the applicant an opportunity to amend the application to overcome them. If all the objections are successfully surmounted, a patent is then granted, providing the applicant with protection for a specified period, usually about 20 years.

1.2. Technological achievement and national IQ

The analysis of IQ scores from a wide range of countries has revealed substantial differences amongst nations. (Lynn & Vanhanen, 2002, 2006). Estimates of mean national IQs range from 60–70, typical of many countries in sub-Saharan Africa, to 95–100 in Europe, and to 105 or more for some countries in the Far East. National IQ has been found to correlate with a variety of other national indicators such as per-capita GDP (Lynn & Vanhanen, 2006); average educational achievement (Lynn, Meisenberg, Mikk & Williams, 2007; Lynn & Mikk, 2007), economic growth (Weede & Kämpf, 2002); and educational enrolment, agricultural labour, and indicators of infant health (Barber, 2005). Importantly, Rindermann (2007a,b) has discovered a positive manifold encompassing national IQ scores and tests of academic achievement that suggests the existence of a g-factor (big G) of differences in national cognitive ability.

Devising an invention worthy of patenting clearly requires intelligence, and the level of patenting activity in a nation should therefore be a function of national IQ. As Hart (2007) has remarked, it seems plausible to assume that most important inventions and innovations are made by persons with far greater than average intelligence (p. 23). The decisive influence on national patenting levels should thus be the number of high-IQ individuals in the population, rather than the mean national IQ. The simplest model is that the number of patents produced by a country is proportional to the number of high-IQ individuals in the population. To avoid statistical complications arising from large differences in country populations, it is convenient to work in proportions rather than raw numbers. This suggests the following hypothesis:

H1. The number of patent grants per million of population is proportional to the percentage of high-IQ individuals in the population.

1.3. Technological achievement as a mediator between national IQ and national wealth

It is proposed that technological achievement mediates the relationship between IQ and wealth; in other words, high-IQ nations generate more technical knowledge, which in turn leads to increased national wealth.

There is strong evidence for a positive association between national mean IQ and national wealth (Dickerson, 2006; Lynn & Vanhanen, 2002, 2006; Whetzel & McDaniel, 2006), and between IQ and economic growth rates (Weede & Kämpf, 2002). However, much remains to be understood about the mechanisms underlying these relationships. Shapiro, writing from an economic perspective, observed that: "… less than one-third of the growth rate of output per worker over the years from the turn of the [20th] century can be attributed to the rise in capital per worker. Over two-thirds of the growth rate of output per worker has therefore to be attributed to all other factors covered by the catchall called technological advance" (Shapiro, 1970, p. 493). Similarly, Rosenberg, Landau and Mowery (1992 p. 1) observed: "Research carried out over the last 30 years demonstrates that technological change is an important contributor to productivity growth and therefore to growth in the income and wealth of nations". One plausible conclusion that might be drawn here is that high-IQ nations are wealthier than low-IQ nations because they are better able to innovate and generate technological knowledge. In other words:

H2. The relationship between national IQ and national wealth is mediated by levels of patenting activity.

1.4. Technological achievement and national culture

Although culture is a broad and variously conceived construct, a definition accepted by many anthropologists says that culture " … consists in patterned ways of thinking, feeling and reacting…" and its essential core is "… traditional (i.e. historically derived and selected) ideas and especially their attached values." (Kluckhon, 1951, p.86). A simpler definition, intended to embody the essence of Kluckhon's description, has been suggested by Hofstede: culture is the "collective programming of the mind that distinguishes one group or category of people from another." (Hofstede, 2001, p.9).