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Does democracy cause innovation? An empirical test of the popper hypothesis

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ABSTRACT

Democratic countries produce higher levels of innovation than autocratic ones, but does democratization itself lead to innovation growth either in the short or in the long run? The existing literature has extensively examined the relationship between democracy and growth but seldom explored the effect of democracy on innovation, which might be an important channel through which democracy contributes to economic growth. This article aims to fill this gap and contribute to the long-standing debate on the relationship between democracy and innovation by offering empirical evidence based on a data set covering 156 countries between 1964 and 2010. The results from the difference-in-differences method show that democracy itself has no direct positive effect on innovation measured with patent counts, patent citations and patent originality.

1. Introduction

Democracies tend to pay close attention to respecting individual freedoms and to safeguarding individual rights, building institutions that also facilitate scientific and technological innovation and protect intellectual property. Many non-democratic countries, on the other hand, emphasize collective action and strong state leadership to achieve innovation and technical breakthroughs. Considering those two models of governance, Karl Popper, a prominent twentieth-century philosopher and political scholar, argued that democratic and liberal social structures are better at fostering innovation (Popper, 2005, 2012), whereas Kuhn (2012) expressed doubts regarding the importance of social and institutional factors in the process of subversive innovation and the emergence of new scientific paradigms.

The impact of a democratic system on economic development and development policies has been the object of much research in recent decades. Different studies have ascertained the correlation between democracy and growth, democracy and development, and democracy (culture or institutions) and developmental policy (Barro, 1996 Doucouliagos and Ulubaşoğlu, 2008; Helliwell, 1994; Heo and Tan, 2001; Lipset, 1959; Olson, 1993; Pourgerami, 1988; Przeworski, 2000; Rueschemeyer et al., 1992). Furthermore, several scholars who have emphasized the positive effect of innovation on development have also noted the correlation between developmental policy and innovation (Bottazzi and Peri, 2003; Guellec and De La Potterie, 2007; Nelson, 1993; Qian, 2007) and between growth, development and innovation (Bilbao-Osorio and Rodríguez-Pose, 2004). As a result, this kind of research has also hypothesized a link between democracy and innovation (Salahodjaev, 2015).

However, despite a sizeable theoretical and empirical literature, no firm conclusion has been drawn regarding the direct impact of democracy on innovation. At most, scholars have maintained that the positive effect of democracy on innovation is conditional on a combination of developmental background and state culture (Almond and Verba, 2015; Harrison and Huntington, 2000; LeMahieu, 1988; Moore, 1993). In fact, a lack of related data extending over a sufficient period of time has led to the neglect of Popper's hypothesis and the absence of its direct verification. This paper aims to fill that gap and to try to test Popper's hypothesis by examining the volume of patents issued by the United States Patent and Trademark Office (USPTO) and using those numbers, as well as data on citations and originality, as indicators of the innovation level, to study the direct impact of democracy on

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innovation. Although many indices ranking national innovation capabilities exist, data relating to patents better reflect the historical changes since the 1960s in terms of both their integrity and the time span of data available, thus solving the problem of data limitation that has affected past studies.

The paper is organized as follows. In the next section, we review the existing literature relevant to our topic. Section 3 then introduces the methodology, data, variables and econometric model used to test Popper's hypothesis. Section 4 describes the results of our data testing and examines their robustness. Section 5 concludes the paper by discussing the potential implications of our findings.

2. Literature review

Innovation is a multifaceted process. After an extensive literature review, seeking to be as comprehensive as possible, Crossan and Apaydin (2010, p.1155) proposed the following definition: "Innovation is: production or adoption, assimilation, and exploitation of a value-added novelty in economic and social spheres; renewal and enlargement of products, services, and markets; development of new methods of production; and establishment of new management systems". Many more authors have discussed how to define innovation, how best to measure it and how to foster it (Audretsch and Acs, 1988; Damanpour, 1992; Dibrell et al., 2008; Edison et al., 2013; Fruhling and Siau, 2007; Greenhalgh and Rogers, 2010; Hage, 1999; Palmberg, 2004). Since our study aims to test empirically the relation between democracy and innovation, we must focus on the most concrete and measurable forms of the latter. For our purpose, then, we define innovation as the creation of new products along with advances in the design of those products and in the process by which they are created.

Innovation, especially in the form outlined above and manifested by industry and technology patents, is seen as a crucial driver of economic growth and has become increasingly so in recent decades (OECD, 2000). This link between innovation and growth has been outlined in theoretical terms (OECD, 2010) and proven empirically, mostly through a focus on the important role of research and development spending on productivity increase (OECD, 2000). This holds true not only for developed economies, in which innovation has become the determining factor of firms' ability to compete in an age of rapid technological change and thus to sustain GDP growth (Mone et al., 1998), but also for developing countries hoping to catch up with their richer peers by imitating and importing foreign technologies as well as by encouraging domestic innovation (Zanello et al., 2015).

Turning to the literature on democracy, the existing research has focused not only on the factors supporting or strengthening it but also on the spillover effects of a democratic political system on a country's socio-economic situation. Some studies have argued that democracy brings good governance and builds states' capacity to promote economic and social development (Bäck and Hadenius, 2008; Berg-Schlosser, 2004; Held, 1995; Hirst, 2000; Thompson, 2004). On this basis many have suggested that democratization should be a primary goal for all developing countries (Diamond et al., 1989; Kohli, 1993; Leftwich, 1993). However, the arguments raised in favour of democracy are accompanied by the risk of circular reasoning (democracy favours development but development also facilitates democratization), which is why they have often come under scrutiny in their relation to economic growth. Obviously, other factors (such as education, culture, history and resource endowment) also boost national development. Furthermore, fostering an "innovative society" has gained increasing prominence as a primary goal for developing countries, as more and more studies have argued that innovation has been the determinant factor of social and economic change around the world in the twentieth and twenty-first centuries (Freeman, 1995; Gann, 2000). Nevertheless, along with the establishment of a "modern society" and the importance of technological innovation (Bayly, 2004), the inherent value of a democratic political system continues to fascinate, and the "transition to democracy" has remained a central topic in both the study and the practice of politics.

As regards the relationship between democracy and innovation in research, statistical data from Google Books Ngram demonstrate that references to both democracy and innovation have grown continuously in the academic literature, especially after 1950. Since the Second World War, countries around the world have experienced democratic transitions and consolidations as well as democratic retreats or breakdowns (Haggard and Kaufman, 1995; Morlino, 2012; O'Donnell, 1996), making sure that the popularity in academia of the term "democracy" would not decrease. Meanwhile, the volume of patent applications in virtually all countries increased after the Second World War (Jaffe and Trajtenberg, 2002). According to many scholars, patents are an important indicator of the national stock of intellectual property as well as a critical driver of national development and innovation (Chang, 2001; Idris, 2003; Maskus and Fink, 2005; Oddi, 1987). Certainly, the increase in the number of inventions and patents, as the symbol of technological development, requires not only a peaceful and stable domestic and international environment, good economic conditions and material guarantees (Stiglitz, 2008) but also, critically, a free environment that encourages individual initiatives. Democratic systems are supposed to provide such an environment, which brings us back to Popper's hypothesis, with which this article opened.

This research focuses on a significant indicator that has often been neglected in past political studies, namely innovation performance, measured by the volume of patents in different countries, which plays a critical role in pushing forward socio-economic development. The existing research has analysed the influence of democratic systems on economic development (Acemoglu et al., 2008; De Haan and Siermann, 1996; Doucouliagos and Ulubaşoğlu, 2008; Gerring et al., 2005; Leblang, 1996). However, such research can suffer from too much abstraction and a lack of empirical data on the relationship between democracy and innovation performance. This paper seeks to fill the gap in the existing literature by testing Popper's hypothesis on the basis of the patent data for different countries, all taken from the United States National Bureau of Economic Research (NBER) database, and of the democracy score of those countries according to various sources, including the Polity IV Project database. Many studies have used the patent data of the NBER (Ginarte and Park, 1997; Griliches, 1990; Heller and Eisenberg, 1998) and of the Polity database (Aisen and Veiga, 2006; Miguel et al., 2004; Mobarak, 2005; Taylor, 2007), giving credence to their quality and sound structure.

3. Empirical framework

3.1. Variables and data

Although "[not] all innovations are contained in patents, [and not] all patents have innovative content" (Boldrin et al., 2011), patent data remain a unique resource for the study of innovation (Griliches, 1990). Therefore, following the trend of much existing research (Acharya and Subramanian, 2009; Griffith et al., 2006; Hsu et al., 2014), we use such data as the measure for innovation. Specifically, the study uses the US NBER patent data, which contain detailed information on patents granted by the US Patent and Trademark Office (USPTO) between 1964 and 2015, to construct proxies for innovation. We prefer the USPTO data to those of the World Intellectual Property Office (WIPO) due to a large amount of missing data in the latter as well as the fact that patents in different countries sometimes represent very different levels of innovation. The patents granted in one country may not be considered innovative in another country and would perhaps not have been granted by foreign patent offices. Since the United States is the largest technology consumer market in the world, it has commonly been assumed in prior studies that all important innovations have been patented by the US Patent and Trademark Office (Acharya and Subramanian, 2009; Griffith et al., 2006; Hsu et al., 2014). Thus, the