

An Empirically Based Operational Definition of Elite Sport System: A Country-Specific Panel Data Analysis of Olympic Success

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Background

Competition in international sport is getting keener and more nations are adopting strategic approaches to improve their elite sport system for producing more world-class athletes. It is argued that approximately 50% of the medal-winning capability of countries in the summer Olympics is explained by “the big 2” (Buts, Du Bois, Heyndels, & Jegers, 2011, p. 137) —per capita GDP and population size —and the rest are the effects of the competitiveness of a nation’s elite sport system (De Bosscher, Shibli, Westerbeek, & van Bottenburg, 2015). Recently, several authors have tried to structure the different building blocks of an elite sport system (e.g., De Bosscher, De Knop, van Bottenburg, & Shibli, 2006) and to quantify and evaluate the system (e.g., De Bosscher, De Knop, van Bottenburg, Shibli, & Bingham, 2009). In economics literature, for the past several years, various researchers have been working on the development of proxy variables to represent the quality of the elite sport system of each country (Funahashi & Mano, 2012). Martin, Arin, Palakshappa, and Chetty (2005) and Luiz and Fadal (2011) introduced the presence or absence of a high-performance center as a surrogate variable reflecting the public policy efforts to improve sporting success. Forrest, Sanz, and Tena (2010) utilised the amount of the government spending on the ‘recreational, cultural and religious affairs’ (United Nations, 2000) as a variable to replace the sports budget of each country that cannot be obtained exhaustively. In a somewhat different perspective, Hoffmann, Ging, and Ramasamy (2004) and Matros and Namoro (2004) proposed previous hosting experience as a variable representing the maturity of sports culture and policies that will be improved by hosting the Olympics. Furthermore, the number of participating athletes was presented to be an effective explanatory variable that captured the focus on sports policy of the country (Moosa and Smith, 2004). However, we should point out that it is insufficient to regard the above-mentioned variables as accurately grasping the competitiveness of the elite sport system of each country due to its unobservability.

Panel data analysis (PDA) might allow overcoming some of this problem. In PDA, the existence of unobservable determinants that are country-specific, such as the elite sport system, can be acknowledged and taken into account in the estimation procedure (Baltagi, 2012). By including country-specific intercept terms in equation, the model can control for heterogeneity among countries—competitiveness of elite sport system —that are otherwise not accounted for by other independent variables. We therefore aim at quantification of the competitiveness of each nation’s elite sport system by applying PDA techniques. In the current study, the elite sport system was operationally defined as unobservable characteristics of each country that affected medal performance.

Theoretical framework and Data Analysis

The econometric specification we use is the following:

$$Y_{it} = \alpha + \beta X_{it} + \mu_i + \varepsilon_{it}$$

where Y_{it} represents the number of medals won by nation i during the Olympics of the year t , depending on the regression being run. α is a constant term; β is a vector of parameters; X_{it} is a set of variables commonly used in the literature to control for the medal-winning capability

of the nation, namely log population size, log per capita GDP (in ppp US\$), and the host country dummy during the year t ; μ_i is a country-specific unobservable effect (i.e., operational definition of the elite sport development system in this study), ε_{it} is the disturbance term for country i in period t . In this model, political factors which have been identified as an important variable in previous researches (e.g., communism), is included in the country-specific fixed effects μ_i .

We obtained the medal data from ESPN.com. Population and GDP data were taken from the World Bank Open Database. The subjects of analysis were 108 nations whose socioeconomic data were available and that earned one or more medals in the past six summer games since the 1996 Atlanta ($n = 648$).

Results and Discussion

As previous studies, population size and host country were positive and significant determinant of success. Our fixed effects model could explain 94% of the variance in Olympic medals (Adjusted $R^2 = 0.94$). The test conducted showed that fixed-effects model provide a preferred results; each country's elite sport development system was successfully quantified (i.e., country-specific effect score). In this estimation, the United States was identified as the country with the most effective elite sport development system followed by Russia, China, Germany, Great Britain, France, Italy, South Korea, and Japan. Our analysis suggested that the quality of the elite sport system is certainly associated with the size of the country. The results indicated a reasonably good criterion-related validity since the estimated country-specific effects correlated with the results of De Bosscher et al. (2015) who computed the quality of elite sport system in 15 nations with a more comprehensive approach ($r = 0.70$).

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