

# **New frontiers in measuring innovation: Using efficiency evaluation techniques**

## **Extended abstract**

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Industries differ with respect to the amount of entrepreneurial activity they generate and sustain (Eckhardt, 2002). Because entrepreneurship implies the nexus of individuals and opportunities (Shane, 2000; Venkataraman, 1997), it is reasonable to assume that the amount of opportunities to which corporations and individuals respond differs between industries. Extant research acknowledges this fact by trying to measure ‘entrepreneurial,’ ‘technological,’ or ‘innovative’ opportunities available in different industries for exploitation. Yet, the operational representations of these concepts employed in empirical studies are often somewhat incomplete in that they do not comprehensively map different components included in the notion of opportunity by the works of entrepreneurship and innovation research classics.

For instance, Zahra (1996) measures technological opportunities with the respondents’ perceptions of opportunities for product innovation, technological innovation, R&D spending, and technological breakthroughs in their industries and verifies the measure with the archival data on three-year industries’ average R&D spending. Tihanyi et al. (2003) and Baysinger & Hoskisson (1989) consider average industry R&D divided by average industry sales to account for such opportunities. Yet, while such measures can account for ‘new product’, ‘new process’, and ‘new materials’ types of innovation (Schumpeter, 1934) they do not capture innovation that has to do with ‘new organization of an industry’ or ‘new markets’ adequately. The latter – bringing new markets up to speed with the technological advancements developed elsewhere – overlaps with the notion of arbitrage opportunities advocated in the works of Kirzner (1997). To date, arbitrage opportunities have not been operationalized in the entrepreneurship and innovation literatures even though they are an important determinant of entrepreneurial and innovative activity.

In our research we elaborate upon employing a group of methods collectively known as efficiency evaluation techniques to estimate the amount of innovation and arbitrage opportunities available for exploitation to firms in different industries as well as gauge the rates of realized corporate innovation. The technique allows estimating innovative dynamics in the aggregated form, without distinguishing between new product, new process, and other forms of innovation. The measure of innovation derived from these techniques could thus be used as an addition to the more traditional measures such as R&D spending or patent-based proxies for innovation.

One of the side benefits of using the suggested way of quantifying innovation is that the estimates are based on culturally universal data and are thus equivalent, making comparability of the measurements possible. This is not always the case, especially if psychometric scales are employed to collect data in several countries (Ryan, Chan, Ployhart, & Slade, 1999). Because our estimates possess equivalence, their use in a cross-country context is justified for drawing inferences about substantive issues (Church & Lonner, 1998; Ghopade, Hatrup, & Lackritz, 1999; Vandenberg & Lance, 2000). Importantly, the technique’s requirements for data are very reasonable which facilitates the research that builds on their use. We demonstrate the application of the technique in the multi-industry international dataset that includes over five thousand firm-year observations over a six-year period.