

# Chapter 1

## Measuring Cross–Border Regional Integration with Composite Indicators: The Oresund Integration Index

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### ABSTRACT

*Earlier quantitative studies on cross-border regional integration processes have commonly neglected Science, Technology, and Innovation (STI) indicators: even the most notable example of a composite indicator approach to measuring cross-border regional integration, i.e. the Oresund index, lacks a sub-category for STI. Consequently, by ignoring cross-border innovation and knowledge flows, the Oresund integration index fails to take into account one of the most important drivers of economic growth in cross-border regions. Therefore, a new composite STI indicator (sub-category) was introduced to strengthen the Oresund integration index. This was compiled from patent, publication and collaborative R&D project data. The findings show that this index performs reasonably well in depicting STI integration, while at the same time remaining simple and straightforward enough to be adopted in other cross-border regions.*

### INTRODUCTION

Cross-border regions (CBRs) and their integration processes have been in the eye of political and scholarly debates for decades. However, measurement problems, related to data availability issues (not the lack of data *per se*, but the laborious process of gathering this data) and the choice of appropriate indicators to describe integration, have persistently hampered the quantitative investigation of these regions. Therefore, most quantitative studies on the subject have been restricted to studying a distinct feature of integration (with a limited set of individual indicators) including such aspects as the impacts of infrastructure projects on cross-border accessibility (Knowles & Matthiessen, 2009), labour market dynamics and commuting behaviour (Schmidt, 2005) or the more intangible issues of cultural and linguistic similarity (Bucken-

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Knapp, 2001; Gregersen, 2003). An interesting exception has been developed in the Danish-Swedish CBR of Oresund (Öresund for Swedes and Øresund for Danes); namely the Oresund integration index (Öresundskomiteen, 2013) – henceforward referred to as “the Index” – calculated largely on the basis of the raw values of indicators in the Öresund database (Örestat, 2015).

The local authorities (that is, the Oresund Committee) responsible for raising awareness as well as studying and facilitating cross-border regional integration have collected data on various sub-categories of cross-border regional integration dating back to 2000, when the Oresund bridge (and a tunnel) – henceforward “the Bridge” – crossing the Oresund strait – henceforward “the Strait” – was opened, which significantly reduced travel times across the Strait, compared to ferry-traffic. In addition to the Oresund region being one of the most commonly used examples of cross-border regional integration (Nauwelaers, Maguire & Ajmone Marsan, 2013), the Index is exceptional since it is the only example of a CBR, where a time-series approach has been employed to study cross-border regional integration, together with composite indicators. In contrast, the other existing examples of studies focusing on cross-border regional integration commonly apply a cross-sectional approach with fixed years of analysis and a limited number of indicators (e.g. BAK Basel Economics, 2008; Decoville, Durand, Sohn & Walther, 2013). The Index uses a weighting scheme that allows the inclusion of various indicators of integration into a single composite indicator. This Index is then compared to the base year, 2000, to indicate, whether the region has moved towards, what can be labelled, a more integrated CBR or has drifted apart despite the improvements in infrastructure, as well as the political will and emphasis laid on promoting integration. The Index consists of five distinct sub-categories of integration, containing from three up to five individual indicators, including:

1. Labour markets,
2. Housing markets,
3. Business,
4. Culture, and
5. Transport and communication.

Despite being a notable example of time-series data and composite indicator approaches to cross-border regional integration, the Index still lacks a component (or sub-category) that takes into account what is arguably one of the most important drivers of regional economic development and competitiveness, namely the component (or sub-category) of *science, technology and innovation (STI)*. In short, as noted by Nauwelaers et al. (2013), the Index fails to capture cross-border knowledge and innovation flows, against a background of STI in cross-border regional integration and economic development in CBRs having been highlighted as essential in, for example the emerging field of cross-border regional innovation systems (CBRIS) (Lundquist & Trippel, 2009). However, despite the well-developed conceptual background which can potentially guide the measuring of the innovativeness of CBRs, the literature on CBRIS has rarely quantified cross-border regional integration in terms of scientific and innovation collaboration.

Therefore, the aim of this paper is to strengthen the Index by adding a new sub-category, which specifically addresses the essential parts of the economy related to STI indicators in a cross-border context. The new sub-category was constructed from relevant indicators, also recommended by the OECD (2013), collected from existing databases, including:

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