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Effects of innovation on the European wood industry market structure

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ABSTRACT

This study primarily aimed to contrast the potential relationships between innovation and market concentration. Thus, the relationship between innovation and the European wood industry market structure was analysed. An empirical model was assessed through panel techniques, wherein the wood industry market structure was explained through business-related variables and additional variables associated with generating innovation. The primary conclusion of this study with respect to the European wood industry is that R&D spending and R&D personnel are key factors in explaining market concentration. However, the influence of these variables may be affected by the initial degree of market concentration in the industry.

1. Introduction

After several decades of theoretical and empirical research, the explanation of why innovation occurs at the firm level is still a challenging topic in the literature on innovation. Although it is difficult to define precisely the concept of innovation, a definition of the term, consistent with the main intuition could be, "An innovation is something original, new, and important – in whatever field – that breaks into (or obtains a foothold in) a market or society" (Frankelius, 2009). Schumpeter (1942) theorised that business size and market concentration are determining factors in business innovation and defines an innovation as a historic and irreversible change in the way of doing things.

Technological competence, generally measured by R&D intensity, has been considered one of the characteristic of the firms affecting innovation behaviour, a hypothesis that has also been widely corroborated in the empirical literature (Griliches and Lichtenberg, 1984; Audretsch and Feldman, 2004). The level of R&D expenditure and R&D personnel in the firm are two often used indicators of a firm's R&D intensity and could be used to show firm's priorities in utilising R&D activities as a means of expanding their innovation capacity. In this study, due to data limitations to measure the different types of innovations in forest industries, we use R&D spending and research personnel as proxy variables for innovation.

Economic theory suggests a two-fold relationship between market concentration and innovation, depending on which variable (concentration or innovation) is considered the dependent or the independent variable. This entails constructing a theoretical frame, which is centred on two main reciprocal propositions: (1) market concentration is an important factor in innovation and (2) business innovation is an important factor in market concentration. The first proposition has been researched more than the second and has generated an abundance of literature since Schumpeter (1942) theorised that business size and market concentration are determining factors in business innovation and defined an innovation as a historic and irreversible change in the way of doing things. For this particular field of research, some surveys can be found in the literature.

Kamien and Schwartz (1982) provide a wide discussion about the existing relationship between technological change and market structure, and especially the Schumpeterian hypothesis. Baldwin and Scott (1987) and Cohen and Levin (1989) are two comprehensive reviews on the relationship between technological change and market structure. More recently, Cohen (2010) presents a detailed discussion on the difficulties related to the measurement of concentration and on the ways to reflect accurately the nature or intensity of competition. The main conclusion of this work is that static measures of market structure can be poor metrics for assessing the relationship between innovation and competition.

Considered together, empirical studies on the relationship between market structure and innovation show that the impact of market structure on innovation varies with the product, industry, regulatory scrutiny and many other variables, thus indicating a heterogeneous, inconclusive pattern (Cohen, 2010). However, a greater consensus suggests that, although market concentration and innovation may be correlated, market concentration is not an independent factor of innovation (Cohen and Levin, 1989; Sutton, 1998) because it can be determined through additional exogenous more plausible variables, which includes innovation (Cohen, 2010). Thus, depending on the situation and the sector analysed, a two-fold relationship between market concentration and innovation can be found.

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Consistent with the above results, our study provides empirical evidence for hypothesis (2), as defined in the preceding paragraph (i.e., business innovation can yield market power to one or several companies, which explains industrial concentration in this sector). This hypothesis stemmed from Schumpeter (1942) and his "Creative Destruction" concept, which states that market structure is influenced by the success of companies' innovative activities. Innovation can create temporary market power, stimulate growth and contribute to market concentration. However, this market power may be eroded by competitor innovation and imitation (Levin and Reiss, 1984). The hypothesis that market structure is determined by innovation has not received as much attention in the literature as the opposing hypothesis; however, significant theoretical contributions must be acknowledged, such as those from Dasgupta and Stigliz (1980) and Nelson and Winter (1982). Among the studies that highlight a positive relationship between innovation and market concentration, we find the research of Kessides (1990). This paper states that although a significant portion of quantitative work in industrial organisations consists in the estimation of market structure–performance relationships, there are still measurement problems and weak theoretical models. Other empirical literature on industries includes Methé (1992) (the Dynamic Random Access Memory technology), Siegfried and Evans (1994) (the effects of advertising), and Koeller (1995) (manufacturing industries).

As there are many studies that analyse the effects of innovation in the wood industry, a thorough literature review of these works would be beyond the scope of this study. Thus, we will concentrate on those studies that are more relevant for our present research. A central point in most of the papers related to innovation in the wood industry addresses the irreversible changes in the economic and socio-cultural environments surrounding the industry (Globerman et al., 1998). Other authors, such as Cohen and Kozak (2001) and Schaan and Anderson (2002) note the importance of understanding the interactions among the performers in the forest sector to explain forest sector innovation. Additionally, Välimäki et al. (2004) presents the results of two studies where the indicators for innovations in wood product industries are analysed, and Bull and Ferguson (2006) analyse the factors influencing the success of wood product innovations using a qualitative case study method.

Crespell et al. (2006) suggest that innovation is an essential factor in maintaining competitiveness in certain wood industry sectors. One principal result of this research is that the propensity to innovate and market orientation is found to be positively correlated and that high- and medium-innovative mills are consistently different from low-innovative mills.

However, Diaz-Balteiro et al. (2006) reject a significant relationship between innovation and efficiency in the wood, paper and furniture industries. Furthermore, although Rametsteiner and Weiss (2006) acknowledge the importance and necessity of innovation for business success in the wood industry, they also note that certain countries do not include innovation policies or strategies for forestry industries. Following this line of research, certain studies, such as Alfranca et al. (2009), have found empirical evidence that environmental and quality strategies tend to exert positive effects on the specific innovation activities of firms in spite of the fact that a substitution relationship is found between the existence of quality management systems and R&D subsidies.

Nybakk and Jenssen (2012) contend that because innovation can be understood as a tool for companies, firms could behave strategically in relation to innovation. Hansen et al. (2007), analysing innovation in the global forest products industry, suggest that as firms have significant opportunities to increase innovation, they can thereby increase competitiveness. Knowles et al. (2008) define innovation in forest industries as a firm's propensity to adopt and/or create new products, new processes or new business systems. This definition has been adopted by many empirical studies in the sector, such as Crespell and Hansen (2008), Nybakk et al. (2011) and Nybakk and Jenssen (2012).

Industrial concentration is typically considered to be a key element in defining market structure. There can be many sources of market concentration, and changes in a specific industry concentration may reflect technological opportunities or economies of scale and the net effect of multiple factors that influence business decisions and growth in an uncertain manner, such as entry barriers and market size. This notion applies to the wood industry sector, and the factors that determine its industrial concentration are likely complex. Therefore, it would be interesting to clarify the elements that determine this sector's market structure. Although the wood industry's geographical concentration has recently been studied (Sun and Zhang, 2001; Bowe et al., 2004; Herruzo et al., 2008), few studies have analysed the market concentration.

Two outstanding studies on this issue are Ellefson and Stone (1984) and Lamberg et al. (2006). The first describes the economic organisation of 39 wood-based industries, covering aspects such as strategic control of raw materials, mergers, corporate political activities and the role of industrial associations. Lamberg et al. (2006), however, address specific aspects of the forest industry, including the presentation of case studies, analyses of family-owned firms, and game-playing oriented explanations for the evolution of the forest industry. The case studies are based on firms in Canada, Finland, Sweden and the USA.

The main objective of this study is to explore the relation between innovation and market concentration in the wood industry in a large group of European countries. In short, we analyse the potential impact of a firm's innovation on market concentration in the wood industry using R&D spending and R&D personnel as proxy variables that focus on innovation. Empirical models were assessed through panel techniques, wherein the wood industry, market structure was defined by R&D expenditure and personnel as well as business-related variables. The study was conducted in the wood industries of a large number of European countries, as comprehensively defined by the NACE[1] 20, which includes the manufacture of wood and wood and cork products, except furniture, and articles of straw and plaiting materials. This paper is structured as follows. Section 2 describes the data sources and defines the variables considered as indicators in the explanatory model. Section 3 indicates the primary characteristics of the market concentration indices and presents the hypotheses. Section 4 summarises the results from the models assessed. Section 5 discusses the generated results and the conclusions.

2. Data sources

The data used in this study are from two secondary sources: AMADEUS and EUROSTAT. These databases and their relationship with the variables used are described in more detail herein. The variables that are defined in Table 1 refer to the manufacture of wood and products made of wood and cork, with the exception of furniture and the manufacture of articles made of straw, and plaiting materials on the market in the NACE 20, from now on the "wood industry". The panel of countries in this sample includes Finland, Belgium, Austria, Denmark, Greece, Slovenia, Norway, Poland, Spain, the Czech Republic, Lithuania, Portugal, the United Kingdom, Estonia, Sweden, France, Germany, Hungary and Italy between 1996 and 2007. This period allowed the highest number of countries in the panel, for all eventual variables in the model.

2.1. Economic and financial data

AMADEUS[2] is a European database that includes financial and economic information for 19 million public and private companies

[1] NACE is the acronym for "Nomenclature statistique des activités économiques dans la Communauté européenne" [Statistical classification of economic activities in the European Community].

[2] (http://www.bvdinfo.com/en-gb/products/company-information/international/amadeus).