The role of ICT knowledge flows for international market share dynamics

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\textbf{ABSTRACT}

This paper investigates the role of Information and Communication Technologies (ICTs) related knowledge flows for international market shares. Using bibliometric data on scientific publications, we analyse the relationship between the strength of 14 OECD countries in four ICT-related scientific fields and the ability of those countries to maintain and acquire export market shares in the OECD market, across 16 manufacturing industries over the period 1981–2003. We find that domestic and foreign ICT-related scientific knowledge flows have a positive and significant impact on export market shares in ICT industries, while only domestic flows positively affect export shares in non-ICT industries. We also find that small open economies benefit more than other countries from foreign knowledge flows both in ICT and in non-ICT industries.

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1. Introduction

International competitiveness is generally understood to refer to "the ability of a country to expand its [market] shares in domestic and world markets" (Magnier and Toujas-Bernate, 1994: 495, our insert in brackets). Such competitiveness of nations continues to be a concern for people working in academia (e.g., Leon-Ledesma, 2005) and for policy-makers (e.g., Obama and Biden, 2008). Even though many academic papers have been written about the drivers of international competitiveness, we still need to know much more about what determines it. Although few would deny the importance of standard price factors in affecting competitiveness or export market shares, there is an emerging consensus in the literature that non-price factors – particularly those related to technology – are a major determinant (e.g., Fagerberg, 1988; Amendola et al., 1993; Magnier and Toujas-Bernate, 1994; Amable and Verspagen, 1995; Carlin et al., 2001; Montobbio, 2003). In general, studies that look at the technology factor have relied on "own-industry" technological activities, typically measured as research and development (R&D) spending or patenting activity.

Recently, attempts have been made to incorporate technological flows (or "spillovers")\textsuperscript{1} in models of international market share dynamics either by looking at embodied R&D flows between industries (Fagerberg, 1997; Laursen and Meliciani, 2000; Laursen and Meliciani, 2002) or by estimating the effect of national and international knowledge stocks for trade performance (Gustavsson et al., 1999; Leon-Ledesma, 2005). Although there are not many papers looking at such flows, the ones that exist have generally found support for the idea that intra-industry and inter-industry domestic knowledge flows matter for international export market shares, while the support for the importance of international knowledge flows, in this context, is much more limited. However – to our knowledge – no paper exists which looks at the role of national and international ICT knowledge flows in determining competitiveness while attempting to trace actual interactions between countries. Information and Communication Technologies (ICTs) have become centrally important in many industries of the economy and have

\textsuperscript{1} While spillovers – in this and other contexts – are difficult to distinguish empirically from knowledge flows (as they both involve science–industry transactions), in our view there are at least two conceptual differences. First, knowledge flows, as opposed to spillovers, do not necessarily involve externalities; and second, they are consistent with a two-way interaction between actors rather than involving the one-way transfer of technology from one actor to another. In this paper, we adopt the notion of knowledge flows.
Section 3 describes the data and the construction of the knowledge technology and ICT-related knowledge flows for competitiveness. In order to determine the importance of each country as a knowledge source to any of the other countries in the analysis. In this context we are using data on international co-publications in ICT fields of science, so that countries with superior products gain market share at the industry level. However, there is also a positive effect: an increase in foreign knowledge increases the market share of foreign firms reducing national market shares in terms of gains or losses. As mentioned in the introduction to this paper, there is plenty of empirical support to back up this claim.

Recently, theoretical and empirical models have begun to incorporate international knowledge flows as determinants of export performance. Since technology can be nationally produced or available through international knowledge flows, the export demand function will also depend on the national and international stock of knowledge. Provided the arguments concerning the expected positive effect of national knowledge leading to increased exports, the impact of foreign knowledge is ambiguous (Leon-Ledesma, 2005). There is a negative effect: an increase in foreign knowledge increases the market share of foreign firms reducing national exports. However, there is also a positive effect: an increase in foreign knowledge may increase knowledge flows and may hence

2. The role of ICT-related knowledge flows for international market shares

2.1. Theory

In the standard specification, the quantity of export demand is modelled as a function of three factors: the level of income in the importing region; the price of the imported good; and the price of domestic substitutes (Goldstein and Khan, 1978; Magnier and Toujas-Bernate, 1994; Leon-Ledesma, 2005). Accordingly, one would expect relative prices to be a central determinant. However, the well-known “Kaldor paradox” is based on the finding (Kaldor, 1978) that the fastest growing countries in terms of exports share also experienced the highest rise in unit labour costs. Although later research (e.g., Magnier and Toujas-Bernate, 1994; Laursen and Melciani, 2000; Carlin et al., 2001) has shown that unit labour costs can help explain export shares with the expected negative sign, relative prices – as proxied by unit labour costs – are far from being able to explain a lion share of countries export shares in most industries. In the standard literature, other non-price influences are lumped together in the income elasticities of imports and exports. Here, a higher than average income elasticity of exports implies that a country will benefit more than others from growth of world income.

The determinants of this elasticity may, however, be many (McCombie and Thirlwall, 1995), but common to most of them is that they are based on technological advantages as a result of investments in R&D. It may reflect the commodity composition of the vector of exports, as some industries experience higher than average demand growth, as income increases. In particular, high-tech products typically have a higher than average demand growth (Amable and Verspagen, 1995). In this paper, however, we focus on drivers of international export competitiveness at the industry-level, so we can discount this effect. More pertinent to this paper, the elasticity may also reflect the quality of the exported goods; either/or in terms of a higher reliability of the goods or in terms of the new and better features resulting from product innovations, so that countries with superior products gain market share over other countries. A supply-side explanation (Krugman, 1989, p. 1039) pertains to the possibility that fast growing countries expand their export market shares, not by reducing their relative prices, but by expanding the range of goods they produce as their economies grow. Although Krugman does not seriously endogenise product variety (it is assumed to be proportional to the labour force), it is likely to be a function of investments in innovation (Leon-Ledesma, 2005). All of these mechanisms suggest that a given country’s level of technology should affect the country’s market share in terms of gains or losses. As mentioned in the introduction to this paper, there is plenty of empirical support to back up this claim.

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