



The role of factor conditions in high-technology exports: An empirical examination

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Abstract

Fostering competitiveness in high-technology industries is important to national economies because high-technology industries are associated with high value-added production and high compensation levels. The results of high-technology activity diffuse to other economic sectors, leading to increased productivity and business expansion. The objective of this study is to examine the role of factor conditions (human resources and technology) in export performance in high-technology industries. So far, no empirical research has been done on the relationship between the state of factor conditions in a nation and high-technology export (HTX). The study also examines the relative importance of other variables such as inward investment, domestic rivalry (DR), home demand, and exchange rate (ER) in determining export performance in high technology. The findings are supportive of the fact that (a) the level of factor conditions in a nation is a strong predictor of export performance in high technology and (b) other variables such as inward investment, domestic rivalry (DR), and home demand also influence high-technology export (HTX). A proper understanding of this relationship will help managers and public officials to devise appropriate policies for encouraging the growth and expansion of high-technology export (HTX).

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1. Introduction

The term “high technology” is broadly used to refer to firms and industries whose products or services embody innovative and advanced technologies. Such firms have in common a reliance on advanced scientific and technological expertise and are often identified by high research and development (R&D) expenditure (employment) relative to turnover (total workforce), respectively (Keeble & Wilkinson,

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2000). High-technology sectors include aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery (United Nations, 1998).

Over the last two decades, U.S. high-technology industries accounted for 19–26% of world high-technology exports (HTX), which was at times the level achieved by all U.S. manufacturing industries. In 1998, the latest year for which data are available, exports by U.S. high-technology industries accounted for about 20% of world high-technology exports (HTX). Japan was second with 9.7% followed by Germany with 6.5% (National Science Foundation, 2002). Some developing nations, especially in Asia, have devoted increasing resources toward the manufacture and export of technology-intensive goods.

Many countries have now embarked on technology-based industrial development. New Silicon Valleys have begun to sprout in many parts of the world. Over the last two decades, many west European countries have launched entrepreneurial centers often based on newly established university incubation and venture capital firms. Japan has committed several million dollars on research cities throughout the country. China is providing incentives and subsidies to help grow its technology park while Singapore is investing in overseas start-ups to attract high-technology opportunities. A similar trend is evident in many other Third World countries (Keeble & Wilkinson, 2000).

Presently, developed countries account for the bulk of high-technology exports (HTX). In 1999, they exported over US\$776 billion worth of high-technology goods and services accounting for over 80% of global exports, while middle- and low-income nations accounted for a mere 19% and 0.30%, respectively. A mapping of the geography of high-technology exports (HTX) patterns shows an uneven distribution of such exports across nations. In 1999, just 10 countries (5 developed and 5 developing nations) accounted for about three-quarters of world trade in high-technology exports (HTX) (World Bank, 1997–2002).

For many developing countries, past strategies of protected import substitution impeded the efficient exploitation of their endowments or the creation and development of new technology-based advantages. A leap into the world of high-technology competitiveness is impossible without, *inter alia*, the development of domestic capabilities (skill, capital, and technology) as well as the liberalization of their trade and investment regimes (United Nations, 1999).

A wealth of research exists on the internationalization and modes of entry of high-technology firms. However, no empirical study has yet investigated the determinants of performance in high-technology exports (HTX). While some scattered literature exists on the importance of skilled manpower or infrastructure for high-technology investment and exports, there is a dearth of systematic, empirical work on the subject. A greater understanding of the determinants of high-technology exports (HTX) could provide one of the critical “missing links” in existing research. Given the enormous efforts by many countries to promote the development of “strategic industries” over the last decade, the topic is timely and of potential interest to academicians and policy makers. The study suggests that countries should, *inter alia*, invest sufficient resources in factor creation such as math and science education (MS), training of scientists and engineers in R&D (SE), research collaboration (RC), etc., to create and sustain competitiveness in high technology.

2. Past research

National competitiveness is viewed as the “collective” competitiveness of the corporations that exist within a national border. A variety of approaches describe the sources of national competitiveness. Modern neoclassical trade theory, developed from the seminal works of Marshall (1964), Ricardo (1996), and

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