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# The export technology content, learning by doing and specialization in foreign trade

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## Abstract

We examine empirically whether countries with relatively little production and export experience specialize in the production and export of more standardized and lower-technology products, and those with more production experience produce and export more recently developed and higher-technology products. Using panel data covering 127 countries and the period between 1970 and 1997, we find that export experience does help to account for the variation in export content. Exporting experience influences a country's export mix more than its production experience, suggesting that there may be a trade-induced component of learning by doing in foreign trade specialization.

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## 1. Introduction

Economists have long debated how learning by doing influences product proliferation, international trade, and economic growth.<sup>1</sup> They have also argued that potential productivity gains from learning by doing are largest for industries with high R&D and

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<sup>1</sup> A number of authors have emphasized the importance of learning by doing in economic growth, specialization and foreign trade. See Arrow (1962), Stokey (1991), Young (1991, 1993), Benarroch and Gaisford (2001), and Goh and Olivier (2002). Others have questioned the importance of learning by doing. See, for instance, Clerides et al. (1998) and Thompson (2001).

technology intensity and that such gains decline as industries mature.<sup>2</sup> If indeed the gains from learning by doing are related to technological intensity and they are bounded from above, then combining the interplay between learning by doing with the technology content of production could be fruitful for better understanding the flows of foreign trade. Nonetheless, empirical work on how learning can affect the technology content of exports and foreign trade has so far been sparse.

In this paper, we explore empirically how learning by doing, the technology content of exports and industry maturity might be related.<sup>3</sup> In particular, we investigate whether learning by doing helps to influence the nature of cross-country specialization in production and foreign trade: do countries with less production and export experience specialize in older and low-tech goods and countries with more experience concentrate on more recently developed and high-tech products?

Using panel data covering 127 countries and the period between 1970 and 1997, we find that learning by doing does help to account for the variation in export content. Countries with initially high export experience produce and export relatively new goods with higher technological intensity, whereas those with less experience deal with standardized goods with lower technological content. Furthermore, exporting experience appears to be much more relevant than production experience in determining a country's export mix, which suggests that there may be a trade-induced component of learning by doing in foreign trade specialization. Intra-industry trade, openness, and foreign direct investment also influence whether economies export mainly standardized products or non-standardized technology-intensive goods.

## 2. Related literature

This paper sits at the crossroads of two strands in the economics literature. First, there exists a number of empirical and theoretical papers that discuss the product/industry life cycle and explore its link with the patterns of international trade. Theoretical papers on this topic explore how the patterns of trade should evolve over the product life cycle. For

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<sup>2</sup> The empirical evidence that suggests productivity gains are bounded from above and, hence, that they are inversely related to the product life cycle is provided by [Levhari and Sheshinski \(1973\)](#). They show that the elasticity of output with respect to production experience is a concave (quadratic) function of the level of experience. Further, [Epple et al. \(1991\)](#) find that the gains from learning are decreasing in the level of knowledge. For more details on this literature, see [Young \(1993\)](#).

<sup>3</sup> Industries generally go through a three-stage life cycle. In the first stage, its products are relatively new and they undergo intense innovation. Markets for those products are not well-defined or standardized. In the second stage, a dominant PRODUCT design begins to emerge and sales increase. In the final stage, manufacturing starts to become standardized, product innovation is incremental rather than radical, and competition is based largely on price and cost minimization (for more details, see [Hobday, 1995](#)).

In what follows, we will draw on the negative association between the age/maturity of industries and the technology content of the representative products they produce. Put differently, our working premise is that younger industries produce, on average, higher-tech products and more mature industries offer, on average, lower-tech products (for empirical support, refer to footnote 5). A sufficient but not necessary condition for the age of industries to be negatively associated with the technology content of their products is the existence of decreasing returns to innovation within each industry.

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