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# Weighing China's export basket: The domestic content and technology intensity of Chinese exports

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ABSTRACT

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In this paper we use new, detailed, and comprehensive linked firm-transaction data to measure the domestic content and technology intensity of Chinese exports over the period 2000–2007. We evaluate the extent of value-added in China's exports, using a modification of a method proposed by Hummels et al. (2001) which takes into account the prevalence of processing firms. In addition, we provide new estimates of the skill-and technology-intensity of China's exports. Our estimates of value-added suggest that the domestic content of China's exports increased from only 53% to about 60% over the period 2003–2006. Our cross-firm analysis reveals that processing exporters have value-added shares approximately 50% lower than non-processing exporters, even after accounting for ownership, location, and industry. We also show that Chinese exports have become increasingly sophisticated, largely driven by skill and technology improvement within industries. *Journal of Comparative Economics* **41** (2) (2013) 527–543. Leverhulme Centre for Research on Globalisation and Economic Policy (GEP) and School of Economics, University of Nottingham, United Kingdom; Department of Economics, University of Gothenburg, Sweden; School of Economics and Management, Harbin Engineering University, China; Queen's University Management School, United Kingdom.


## 1. Introduction

China's export growth in the first decade of the 21st century has been remarkable. According to the WTO, China's share in world exports grew from 3.3% in 1997 to 8.7% in 2007, and China's share in total world trade in manufactured goods jumped from 4.7% in 2000 to 12% in 2007, making the country now the largest exporter in the world.

This growth has fundamental implications for the world economy, not least in its impact on developed economies' patterns of production and the rewards to different factors of production. Chinese exports bring about different competitive pressures to countries of different income levels. If Chinese exports embody high levels of technology and skill, developed

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countries will lose market share in these products, and the same effect holds for less developed countries if China's exports remain highly labour-intensive.[1] Given the increasingly large share of China in world trade, concerns arise as to how Chinese exports impact on factor markets in its trading partners. In particular, it is widely believed that competition from China's exports will affect the wage of the labour force engaged in production in other countries.[2]

The size of the impact of Chinese exports on the world economy depends, to a large extent, on the answer to two questions. First, how much *domestic value-added* is there in China's exports to the world? Second, how *technologically sophisticated* and *skill-intensive* are China's exports? This study provides answers to both these questions using new, detailed, and comprehensive data on Chinese manufacturing firms and the products they export.

A number of studies have already made important contributions in answering the above questions. With respect to the assessment of domestic value-added in Chinese exports, Dean et al. (2011), for example, apply the method of Hummels et al. (2001) to Chinese input–output (I/O) tables and customs trade records. However, a problem with Hummels et al. (2001) (HIY, hereafter) approach is that it assumes the imported inputs are used evenly in production for domestic sales and in production for exports. This assumption is unrealistic in the case of China given that processing exports are so important in some Chinese industries. The use of imported materials is far more intensive in production for processing exports than in production for ordinary exports or domestic sales. As a result, simply applying the HIY approach would underestimate the degree of vertical specialisation. Chen et al. (2004) and Koopman et al. (2012) modify the HIY approach by splitting the standard I/O tales into separate tables for processing trade and other production. Their results show a higher degree of vertical specialisation, confirming the necessity of adjusting for processing trade in estimation. However, due to the limitation of I/O tables, their estimates are only at the sectoral-level and are only available for certain years.

There is also existing evidence as to the skill-and technology-intensity of Chinese exports. Mostly notably, product-level studies of Rodrik (2006) and Schott (2008) suggest that the structure of the Chinese export bundle is increasingly similar to that of high-income countries. However, their results rely on the assumption that a similar product produced in different countries uses the same production process. In practice, even if China's export structure in terms of export sales resembles that of the United States (US), the genuine domestic value-added embedded in Chinese exports can be very different from the US, because Chinese exports of some high-final-value products can contain a large proportion of imported intermediates.[3]

Distinct from the above studies, our study uses micro-level data. Our data comprise an annual census of all large-and medium-sized manufacturing firms in China over the period 2000–2007, and a monthly transaction-level database of all merchandise passing through Chinese customs from January 2003 to December 2006. We are able to link the data sets together to get a linked firm-transaction-level data set, the first of its kind on Chinese firms. These rich data enable us to document a series of new facts about the Chinese export boom. By doing this, our study contributes both to the growing literature which describes the Chinese export boom and to the literature on measuring value-added creation in the global value chain.

Because we observe exports and imports by firms, we are able to provide a new direct measure of the value-added in Chinese exports by examining the proportion of export value which comes from imported intermediates. We show that the foreign content of Chinese exports is high (nearly 50% on average) but falling over the sample period. This high foreign content is driven in large part by the very high foreign content of the electronics industry, which accounts for a particularly large share of all Chinese exports. We are able to show which kinds of firms account for this high level of foreign content.

Our data also allow us to examine the characteristics of firms which contributed to the growth in exports, because we have measures of firms' technology and human capital inputs. We have information on the skill composition of the workforce, R&D expenditure and the development of new products. The results show that less skill-and technology-intensive industries export a larger fraction of their output.

The remainder of the paper is structured as follows. In Section 2 we describe the sources and characteristics of the data to be used in this study. Section 3 reviews the existing literature on measuring domestic value-added in detail, and proposes a new, micro-level approach of measurement method that takes into account the special features of the Chinese case, thanks to our firm-transaction data. We report our estimates across industries, across time, and across different types of firm. In Section 4 we assess the "sophistication" of Chinese exports by measuring the skill-and technology-intensity of the individual firms which export, followed by a decomposition exercise showing how the overall skill-and technology-intensity change came about. Section 5 summarises and concludes.

## 2. Data

This study draws on two main sources of micro-data, firm-level and transaction-level. The firm-level data comes from the Chinese Annual Survey of Industrial Firms (CASIF) from the National Bureau of Statistics of China (NBSC). The transaction-level data comes from the database of the Chinese Customs Trade Statistics (CCTS) which is compiled and maintained by the General Administration of Customs of China.

[1] For the latter impact, see, among others, the papers by Lall and Albaladejo (2004) and the collection of studies in Lederman et al. (2009) for their analyses of the impact of China's substantial export growth on other developing countries.

[2] See, for example, Krugman (1995), Freeman (1995), Wood (1995), and Sachs and Shatz (1996).

[3] More thorough reviews of the above two strands of literature are presented in the discussions on methodology in Sections 3 and 4.