

Danish Firms and the Sources of Productivity Gains from International Integration

1. Purpose

The purpose of this project is to study the impact of globalization and increased international integration on firm-level productivity and wage inequality among Danish workers.

2. Background and motivation

A growing literature examines the linkage between international integration and productivity growth using firm level micro-data. These studies have documented a series of facts about productivity and exporting that are robust to the period and country examined. Exporters are larger, more productive and pay higher wages than non-exporters (Bernard et al 2007), and this is also confirmed for Danish firms (Munch and Skaksen 2006). From a policy perspective this creates an important source of gains from trade as trade liberalization results in a within-industry reallocation of resources away from inefficient firms and toward more efficient firms.

A weakness of this literature is that existing data sources make it difficult to determine precisely why exporters are larger and more productive. The canonical theoretical model used to interpret firm-level data (Melitz 2003) assumes that some firms enjoy higher labor productivity than other firms for exogenous reasons, and this causes them to be more successful in export markets. More general models of this process would be extremely helpful for understanding both the sources of firm heterogeneity and the attendant policy implications. However, most previous studies are limited by data constraints from examining in any more detail the source of productivity differences.

There has also been increased interest in understanding the impacts of globalization and outsourcing on wage inequality in the 21st century. It has been speculated that middle-class and professional jobs are at elevated risks of outsourcing and global competition (e.g. Blinder 2006, 2007). There is also evidence in the U.S. data that the wage growth at the middle of the income distribution is outpaced by the upper *and lower* tails during 1988~2004 (e.g. Autor, Katz and Kearny 2006), contrasting the changes in wage inequalities during the 1980's (e.g. Katz and Autor 1999). These issues have generated considerable interests in policy discussions (e.g. the 2004 U.S. presidential election). However, previous studies face data constraints in pinpointing the link between outsourcing and wage inequality: the trade literature has good trade data but limited employment data (e.g. Feenstra and Hanson 1996, 2003, Bergin, Feenstra and Hanson 2006) and the labor literature has good employment data but limited trade data (e.g. Abowd and Kramarz 1999).

3. Data

We have access to a unique longitudinal matched worker-firm dataset for the entire population of Danish workers and firms. Unlike previous studies we observe firm level

details on worker characteristics, imported and domestic inputs and their characteristics, and sales disaggregated by product classification, sales destination, and prices and quantity of export sales.

The data is based on the so-called FIDA database in Statistics Denmark, which links workers and firms. A novel feature is that for each firm we have merged records on international trade from The Danish External Trade Statistics (Udenrigshandelsstatistikken). This dataset records the detailed product classification of each shipment, the value and weight (in kilos) of the shipment, the month of the shipment, the destination or origin country, and the identity of the Danish firm engaging in the trade.

4. Research questions

We propose to use the data to shed light on precisely why some firms are more productive than others and the role that these differences play in exporting, as well as to study the impacts of outsourcing on wage inequality. Specifically, we can examine the following hypotheses.

1. The role of skilled labor. An alternative model of firm heterogeneity due to Yeaple (2005) suggests that firms are ex ante identical but choose different mixes of skilled and unskilled workers. This model offers a set of intriguing predictions that are fundamentally different from the Melitz (2003) model, including
 - a. Observed differences in firm productivity are not exogenous but are in fact due to cross-firm differences in the use of skilled workers.
 - b. Exporters choose endogenously to use a higher proportion of skilled workers than do non-exporters. This causes exporters to appear to be more productive than non-exporters even though the main reason for the differences lie with quality of inputs, rather than higher productivity.
 - c. Trade liberalization leads exporters to increase their use of skilled relative to unskilled workers, and this raises the wage premium paid to the highly educated.
2. The impacts of outsourcing on wage inequality. Yeaple (2005) predicts that trade liberalization, even that among identical countries (e.g. the European Union), increases the wage of the most skilled workers *and decreases* the wage of the medium skilled workers relative to the least skilled workers. With firm-level trade *and employment* data in the database we can investigate whether globalization “squeezes the middle class” and “polarizes” the (Danish) labor market.
3. The role of product quality. Traditional measures of firm productivity rely on calculations of value added per worker, where value added is measured as the product of price and quantity sold. Value added per worker can be high for a firm because it has high productivity and large quantity sold, or it can be high because better firms make better products and can sell them for higher prices. The difference between the two carries pronounced implications for how trade affects the within-country income distribution and skill premium (Flam and Helpman

1987); how the income distribution itself and trade costs affect patterns of trade (Choi, Hummels, and Xiang 2006; Hummels and Skiba 2004)

- a. Unlike previous studies we can measure the degree to which firm heterogeneity in measured productivity is due to heterogeneity in prices, quantities, or both.
- b. Similarly we can attribute exporter v. non-exporter differences in productivity to price and quantity dimensions.
- c. We use techniques developed in recent work by Hummels and Klenow (2005), and Choi, Hummels, and Xiang (2006) to extract quality information from product prices and quantities. This highlights the role of quality upgrading (as opposed to pure efficiency improvements) in securing market share for firms both in the domestic and foreign markets.
- d. In combination with the data on use of skilled labor, this will further allow us to understand the technology for producing higher quality goods within an industry. This has pronounced implications for understanding the ability or inability of developing nations to upgrade their product mix for sale in high income markets.

5. Policy relevance

From a policy perspective it is important to identify sources of productivity gains for Danish firms and how international integration affects wage inequality. Does firm-level productivity depend on economic integration and trade liberalization? Are certain skill groups in the labor market hurt by globalization? Does productivity depend on a sufficient supply of skilled workers? Is productivity tied to firms' ability to develop higher quality goods?

Trade, education and innovation policies play a central role in the recent report from the Globalization Council (see e.g. chapters 4, 5, 6, 9, 10 and 11 in Regeringen (2006)), but answers to the questions above should provide a better foundation for design of policies to improve firm-level productivity and achieve given political goals about the income distribution.

6. Project participants and their experience

The project will be carried out by

David Hummels, Associate Professor, Purdue University
Jakob R. Munch, Associate Professor, University of Copenhagen
Chong Xiang, Assistant Professor, Purdue University
NN, Research assistant, EPRU

David Hummels and Chong Xiang are leading experts in theoretical and empirical international trade (see attached CVs). Of particular relevance for the project is that they have developed methods to extract quality information from product prices and quantities (Hummels and Klenow 2005 and Choi, Hummels, and Xiang 2006) something which can

now be done at the firm level (as opposed to the country level in their previous work) using the Danish data. Jakob R. Munch has considerable experience in working with Danish register data. Thus together this group of researchers have the prerequisites to do original research on the link between firm-level trade and firm-level productivity.

7. Time plan and projected outcome

The scheduled duration of the project is 1½ years starting June 2007. The aim of the project is to publish one or more articles in leading journals.

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