

Research proposal: Education and Skills in the Global Economy: Evidence Using
Linked Danish and Norwegian Matched Employer-Employee Data

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We propose to build the first comprehensive dataset on cross-border transactions between individual firms by linking matched employer-employee data for Denmark with the similar data for Norway. The unique dataset enables us to observe which firms are trading with each other, and to draw out the impacts of offshoring on Norwegian and Danish labor markets. In particular, we are interested in understanding how the value of education is affected in the global economy.

Objective: Globalization and trade have important implications for the demand for skills in domestic labor markets. For example, using input-output tables Malchow-Møller et al. (2011) construct a so-called Danish current account for qualifications. They find a rising net import of labor embodied in international trade. This net import of labor is pronounced for low-skilled labor, while Denmark's imports and exports of high-skilled labor are roughly in balance. Such studies have to rely on strong assumptions about the factor content of imports due to the lack of knowledge about how the imported goods are produced. Also, they do not account for how the imported labor is utilized as inputs in domestic firms. Hummels et al. (2013) use Danish matched-worker firm data to assess how offshoring (imported intermediate inputs) affects labor demand and wages within firms. Still, this study cannot account for the skill or task content in the imported intermediate inputs as this information is missing.

We propose to build the first comprehensive dataset on cross-border transactions between individual firms by linking matched employer-employee data for Denmark with the similar data for Norway. Specifically, we do so by examining records in the Norwegian trade data with similar records in the Danish trade data. After establishing the link, we would like to examine which firms are trading with each other, and draw out the impacts of offshoring from Denmark to Norway (or vice versa) on both the Danish and Norwegian labor markets. We believe this project has the potential to significantly improve our understanding of trade and labor markets, and in particular, the values of college degrees in the offshoring global economy. Our project will in all likelihood generate at least one publication in a top economics journal and dissemination in various media outlets for a broader audience.

Methodology: To establish the link between firm d and n , we use Norwegian and Danish daily (or transaction level) firm-level trade data. For example, if firm d exports product k at time t to Norway (as recorded in the Danish trade data), we can search the Norwegian trade data for a similar transaction of imports from Denmark to firm n of product k at time t . After the link has been performed, individual transactions are summed up to annual trade values (per firm-product), which is the aggregation level that we have used in numerous previous research projects. Statistics Denmark and Statistics Norway have confirmed the feasibility of the data exchange.

Data: We intend to collect data on the universe of Norwegian (NO) and Danish (DK) firms, and the linkages between them, for the period 1995-2011. These are interesting countries to study because Norway and Denmark are important trade partners for each other.¹ In the data, we observe 1) the DK (NO)

¹ Offshoring is often associated with North-South trade, but Hummels et al. (2013) show that 85 percent of Danish offshoring is imports of intermediate inputs from European countries.

suppliers/customers of NO (DK) firms and the trade flows between them², 2) information about capital stock, investment and R&D activity, 3) exports and imports to/from third countries, and 4) detailed information about the workforce, such as wages, education, occupation and tenure, for all firms in both countries. Specifically, we observe the years of education and highest obtained degree for every NO and DK worker (e.g. NUS 455103 “Electrical installation and maintenance, upper secondary level 3 (Vg3)”, and NUS 361101 “maternity and paediatric nursing, upper secondary, basic education”).³

Contribution to the literature: Firm-to-firm transactions are a defining feature of the modern global economy, and its importance has attracted the interests of policymakers and academics alike. E.g. the WTO coined the phrase ‘Made in the World’, as the name for an initiative to examine the consequences of globalized production for international trade policy. However, economic research on firm-to-firm transactions, and their implications for labor markets, is mainly based on the data showing only *one side* of the transactions (e.g. Feenstra and Hanson 1999, Hummels, Ishii and Yi, 2001, and Hummels et al. 2013). In comparison, we have detailed information on *both sides* of firm-to-firm transactions, and our linked data is the first and only one of its kind in the literature. Eaton et al. (2012) observe firm identities, and only firm identities, on both sides of U.S. and Columbian trade (e.g. they do not have any additional information for a U.S. firm exporting to Columbia). Blum, Claro and Horstmann (2009) match Columbian importers with Chilean exporters and observe only the identities and rest-of-world trade values for the matched firms. Bernard, Moxnes and Ulltveit-Moe (2013) analyze buyer-seller relationships at the micro-level, but have no information about the buyers in the market, except the value of their transactions. Therefore we believe that with our linked data we are capable of asking fundamental questions about inter-firm trading and supplier relationships and their labor-market implications, whose answers will generate large impacts in the literature. Below we summarize one major research question and its contributions.

Task trade. When we observe, e.g., Norwegian firm *n* exporting product *k* to Danish firm *d*, we measure task trade between *n* and *d*, embodied in product *k*; i.e. firm *d* has offshored the tasks of making input *k* to firm *n*. To begin, we seek to establish a series of stylized facts. As compared with firm *d*, does firm *n*, the undertaker of firm *d*’s offshored tasks, employ a larger fraction of college-educated workers? And what degrees do firm *n*’s workforce have (as compared with firm *d*), engineering, natural science, or arts and humanities? What occupational tasks are performed by workers in firm *n* as measured occupational characteristics (see e.g. Hummels et al. 2013). Are there other systematic differences between the labor-force-composition of firms

² Since Denmark is a member of the EU and Norway is not, the trade flows between the two countries are recorded precisely by the customs authorities. In contrast, intra-EU trade flows are less precisely recorded and the coverage rate is less than complete.

³ <http://www3.ssb.no/stabas/ClassificationFrames.asp?ID=430501&Language=en>

n and d? In addition, how does the R&D of firm d interact with the labor-force composition of firm n?

These exercises we propose have not been done by any other study because our linked data is the only one of its kind in the literature. In the literature there has been much generic discussions about task trade (e.g. Grossman and Rossi-Hansberg 2007), and much theorizing about task trade (e.g. Feenstra and Hanson 1996, 1997, Grossman and Rossi-Hansberg 2008), but not much is known about the empirical facts for task trade because existing data are unable to link the firms at both ends of task trade. E.g. Hummels et al. (2013) observe the buyers of task trade (offshoring Danish firms) but not the sellers, and do not use the individual workers' data on the types of college degrees. As a result, it is unclear whether the tasks offshored are more unskilled-labor intensive than those that stay, as in Feenstra and Hanson (1997), or whether they are just as unskilled-labor intensive, as in Grossman and Rossi-Hansberg (2008). This difference matters for the predictions and policy implications of the model (e.g. Feenstra 2010). It is even more unclear what kinds of occupations are more susceptible to offshoring (e.g. Blinder 2006). We can establish stylized facts about task trade and potentially answer these questions. We can also contribute to the literature on how offshoring affects choices of technology (e.g. Acemoglu et al. 2012) by examining how the R&D of firm d interacts with the skilled/labor-force composition of firm n.

Policy Implications: Over the past decade, US college tuition has grown twice as fast as inflation, leaving students with heavy debt loads, and governments throughout Europe are looking to staunch the flow of budgetary red ink by boosting tuition. In addition, most advanced countries have experienced job polarization in their labor markets, such that middle income occupations are shrinking, while top and bottom income occupations are expanding (e.g. Goos et al. 2009). This has contributed to the perception that today's college degrees may simply lead to jobs "that don't exist or don't pay middle-class wages" (Krugman 2011). There is also *suggestive* evidence that rising offshoring *may* lead firms to value STEM skills (Science, Technology, Engineering, and Math) less than communication, language, and social science skills (Hummels et al. 2013). In the globalizing world economy, which college degrees are valuable? And which college degrees are valuable for Denmark? Answers to these questions will feed into the current debate in Denmark about restructuring of the system of further education. For example, the Danish government has recently formed a committee that will propose initiatives to improve the quality and relevance of further educations in Denmark ("Udvalg for kvalitet og relevans i de videregående uddannelser"). Our work will inform policymakers about how demand, and ultimately wages, for different types of skills change in response to globalization and deeper international production networks. As such, our work can help shape policies that target adversely affected educational groups or policies that shape the long-run supply of skills. We believe our unique linked dataset will help shed light on these open questions.

Project participants and their experience: The project will be carried out by

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Jakob R. Munch and Chong Xiang have considerable experience working with Danish register data, while Andreas Moxnes has considerable experience working with similar Norwegian register data.

Time plan: The scheduled duration of the project is two years starting January 2014.

References:

- Acemoglu, Daron, Gino Gancia and Fabrizio Zilibotti. 2012. "Offshoring and Directed Technical Change", NBER working paper 18595.
- Bernard, Andrew B., Moxnes, Andreas, and Ulltveit-Moe, KH. 2013. "Two-Sided Heterogeneity and Trade." Working paper.
- Blinder, A.S. (2007), How Many U.S. Jobs Might Be Offshorable?, CEPS Working Paper No. 142.
- Blum, Bernardo S., Sebastian Claro and Ignatius J. Horstmann. 2009. "Intermediation and the Nature of Trade Costs: Theory and Evidence", mimeo.
- Eaton, Jonathan, Marcela Eslava, David Jinkins, C. J. Krizan and James Tybout. 2012. "A Search and Learning Model of Export Dynamics", mimeo.
- Feenstra, R.C., 2010. "Offshoring in the Global Economy: Microeconomic Structure and Macroeconomic Implications", MIT Press, Cambridge, Massachusetts.
- Feenstra, Robert C. and Gordon H. Hanson. 1996. "Foreign Investment, Outsourcing and Relative Wages", in R.C. Feenstra, G.M. Grossman and D.A. Irwin, eds., *The Political Economy of Trade Policy: Papers in Honor of Jagdish Bhagwati*, Cambridge, MA: MIT Press, pp. 89-227.
- Feenstra, R.C. and Gordon H. Hanson. 1997. "Foreign Direct Investment and Wage Inequality: Evidence from Mexico's Maquiladoras." *Journal of International Economics*, 42, pp. 371-93.
- Feenstra, R.C. and Gordon H. Hanson. 1999. "The Impact of Outsourcing and High-Technology Capital on Wages: Estimates for the United States." *Quarterly Journal of Economics*, 114, pp. 907-40.
- Goos, M., A. Manning and A. Salomons. 2009. "Job Polarization in Europe", *American Economic Review Papers and Proceedings* 99, pp. 58-63.
- Grossman, Gene and Esteban Rossi-Hansberg, 2007. "The Rise of Offshoring: It's Not Wine for Cloth Anymore", *The New Economic Geography: Effects and Policy Implications*, Federal Reserve Bank of Kansas City, Jackson Hole Symposium.
- Grossman, Gene and Esteban Rossi-Hansberg, 2008. "Trading Tasks: A Simple Theory of Offshoring", *American Economic Review*, 98, pp. 1978-1997.
- Hummels, David; Ishii, Jun; Yi, Kei-Mu; 2001. "The Nature and Growth of Vertical Specialization in World Trade", *Journal of International Economics*, June 2001, v. 54, iss. 1, pp. 75-96.

- Hummels, David, Rasmus Jørgensen, Jakob R. Munch, and Chong Xiang. 2013. "The Wage Effects of Offshoring: Evidence from Danish Matched Worker-Firm Data". Forthcoming, *American Economic Review*.
- Irrarrazabal, Alfonso; Moxnes, Andreas; Ulltveit-Moe, Karen Helene; forthcoming 2013. "Heterogeneous firms or heterogeneous workers? Implications for exporter premia and the gains from trade", *Review of Economics and Statistics*.
- Krugman, Paul, 2011, "Degrees and Dollars", The New York Times, March 6, 2011.
- Malchow-Møller, Nikolaj, Jakob Munch and Jan Rose Skaksen, 2011, *Danmarks Kvalifikationsbalance*, Gyldendal, København.