Journal of International Economics 96 (2015) 18–36

Contents lists available at ScienceDirect

Journal of International Economics

journal homepage: www.elsevier.com/locate/jie

Firm heterogeneity and costly trade: A new estimation strategy and policy experiments

Ivan Cherkashin [a,1], Svetlana Demidova [b,2], Hiau Looi Kee [c,3], Kala Krishna [d,e,4]

[a] Research School of Economics, College of Business and Economics, Australian National University, ACT 0020, Australia
[b] Department of Economics, McMaster University, Hamilton, ON L8S 4M4, Canada
[c] Development Research Group — Trade, The World Bank, 1818 H ST NW (MSN MC3-303), Washington, DC 20433, United States
[d] Department of Economics, Pennsylvania State University, University Park, PA 16802, United States
[e] NBER, United States

ARTICLE INFO

Article history:
Received 21 August 2013
Received in revised form 10 December 2014
Accepted 11 December 2014
Available online 13 January 2015

JEL classification:
F12
F14
F17

Keywords:
Rules of origin
Firm heterogeneity
Demand shocks
Policy experiments

ABSTRACT

We build a tractable partial equilibrium model in the spirit of Melitz (2003) to help understand the role of trade preferences given to developing countries, as well as the efficacy of various subsidy policies. The model allows for firm level heterogeneity in both demand and productivity and lets the mass of firms that enter be endogenous.
Trade preferences given by one country have positive spillovers on exports to others in this model. Preferences given by the EU to Bangladesh in an industry raise profits, resulting in entry, and some of these firms also export to the US. In contrast, simple competitive models would predict a fall in exports to the US. Such spillovers are shown to be large when exports are not constrained by quotas, suggesting that unilateral preferences given to developing countries might be more efficacious than expected in promoting their exports.
The parameters of the model are estimated using cross sectional customs data on Bangladeshi exports of apparel to the US and EU. Counterfactual experiments regarding the effects of reducing costs, both fixed and marginal, or of trade preferences (with distortionary Rules of Origin) offered by an importing country are performed. The counterfactuals show that reducing fixed costs at various levels has very different effects and suggest that such reductions are more effective in promoting exports when applied at later stages when firms are more committed to production. A subsidy of 1.5 million dollars to industry entry costs raises exports by only 40 cents for every dollar spent, but when applied to fixed costs of production, it raises exports by $25 per dollar spent.

1. Introduction

When the US granted duty-free and quota-free access to Madagascar, under the African Growth and Opportunity Act of 2000, exports from Madagascar exploded, from $170 million in 2000 to $500 million in 2004. Over the same period, Madagascar's exports to the rest of the world also increased, from $750 million to $875 million. Similarly, based on Comtrade export data, when the EU granted duty-free and quota-free access to Bangladesh under the Everything But Arms Initiative in 2001, knitwear exports from Bangladesh to the EU more than doubled, rising from $823 million to $2,351 million between 2000 to 2004. During the same period of time, knitwear exports from Bangladesh to the US increased from $316 million to $465 million.[5] Exports to countries other than the US and EU rose from $60 million to $190 million.[6] To the surprise of many, such generous trade preferences resulted not in trade diversion from the rest of the world to the preference granting markets, but in trade creation — tempered by the presence of quotas.

The model we develop and estimate in this paper predicts exactly these changes. Trade preferences given by one country have positive spillovers on exports to others in the presence of free entry. For example, preferences given by the EU make the industry more attractive, induce entry, and some of these entering firms export to the US so that exports to both countries rise. We use customs data from Bangladesh to estimate a heterogeneous firm model based on the flagship model

E-mail addresses: ivan.cherkashin@anu.edu.au (I. Cherkashin), demidov@mcmaster.ca (S. Demidova), hlkee@worldbank.org (H.L. Kee), kmk4@psu.edu (K. Krishna).
[1] Tel.: +61 2 612 55637.
[2] Tel.: +1 905 525 9140x26095; fax: +1 905 521 8232.
[3] Tel.: +1 202 473 4155; fax: +1 202 522 1159.
[4] Tel.: +1 814 865 1106; fax: +1 814 863 4775.

[5] This small increase is not unexpected, given that the presence of quotas on most of these items in the US constrained export growth there.
[6] If we base the numbers on *import* data reported by Comtrade, we get a similar pattern though the numbers are somewhat different. In the EU, knitwear imports from Bangladesh more than doubled, from $1.3 billion in 2000 to $3 billion in 2004. At the same time the US imports from Bangladesh increased by $30 million, and imports from Bangladesh to all countries other than the US and EU rose by $287 million.

http://dx.doi.org/10.1016/j.jinteco.2014.12.007
0022-1996/

of Melitz (2003), but structured to be suitable for trade policy applications. Our work takes a heterogeneous firm model literally, and confronts it with micro data and actual trade policies, to estimate all of its structural parameters, including the various levels of fixed costs. These fixed costs are at the core of the model and serve as hurdles that productive/fortunate firms choose to jump over, while those that are less so do not. Our paper then uses the estimated model to evaluate the effects of the different kinds of trade polices used in practice. Finally, we compare fixed cost subsidies of various kinds in terms of their effectiveness in promoting exports.

In our model, there are two sources of firm heterogeneity: firm specific productivity as in Melitz (2003), and firm and market specific demand shocks, which is motivated by the findings in Demidova et al. (2012). They use a firm level data set on Bangladeshi garment producers and show that firms roughly follow the productivity hierarchy predicted in Melitz (2003), namely, that firms export to all markets that are easier than the toughest one they export to, and more productive firms export to tougher markets. However, there are a number of violators. While these violators are small in terms of their numbers, they are large in terms of their output. This fact can be rationalized by introducing firm and market specific demand shocks. Such shocks allow us to explain why, given its productivity, a firm may be very successful in one market but not the other.[7] We chose not to use the approach of Arkolakis (2010), who argues that firms have a choice of penetration costs that increase with the number of consumers firms want to access and decrease with the market size, which allows small exporters to exist — something that would be ruled out by large fixed costs of entry. However, even with his approach, but without the presence of firm and market specific demand shocks, there would be a very strong positive correlation in the size of the firm's market shares across export destinations, something we do not see in our data. To explain the data we need firm and market specific demand shocks, as postulated here. Such demand shocks do much of the work in fitting the data, which is also consistent with the work of Roberts et al. (2012) and Eaton et al. (2011a,).

In addition to two dimensional heterogeneity, we also incorporate, albeit simply, various real world trade policies; tariffs, preferences, rules of origin, and quotas into our model. We focus only on the partial equilibrium interaction between Bangladeshi firms and take the prices and actions of other firms operating in the EU and US as fixed.

A closely related paper in the literature is the work of Eaton et al. (2011a) (EKK from here on). EKK use customs-level data to understand the patterns of French firms' exports. Their focus is on constructing the simplest model that fits most of the facts, rather than on trade policy. They also add a reduced form version of Arkolakis's (2010) market access costs to explain the presence of many small firms with a limited attachment to the market, as well as firm and market specific demand shocks. We see their work as very complementary to ours. They look at the "big picture" and try to match the patterns in firm-level exports by all French firms, in all industries, to all countries. As a result, their model is unsuited to zooming in on a particular industry and incorporating the relevant trade policy details as our model is designed to do. Moreover, and perhaps more critically, their model, like that of Chaney (2008), assumes that the mass of potential entrants is fixed. In contrast, we treat the mass of entrants as endogenous. Since we show that this entry margin does most of the heavy lifting in the adjustments that occur in response to policy, such difference in our assumptions is worth emphasizing. Our paper is also related to Bernard et al. (2011), which also features market demand shocks in order to determine the export behavior of multi-product firms.

Our model has two policy-relevant predictions. First, it suggests that a small country can increase its exports quite considerably if granted easily accessed preferences, and through cost-reducing policies. We explicitly show how to incorporate these preferences and the costs, both fixed and variable, associated with obtaining them into a structural model that is suitable for estimation and policy analysis. Conversely, factors that raise export costs, like corruption or bad infrastructure, can really take a toll on exports. Second, the model suggests that preferences to developing countries can have a catalytic effect. In our model, preferences given by one developed country can significantly raise the exports to the other market rather than diverting trade away from other markets as predicted in standard competitive settings. This occurs because preferences raise the expected return to entry in the industry. Once a firm has entered the industry, it may end up exporting to markets other than those where it was given preferences if it gets an adequate demand shock. Our low estimate of elasticity of substitution between products means that entering firms make room for themselves in product space, so that greater entry does not quickly drive down profits, which magnifies the entry effect of preferences. The effects of such policies are, of course, blunted by the presence of quotas in other markets.

In our estimation, we simulate our model and then match the generated distributions to those in the data.[8] In this paper, we use only cross sectional price and quantity information and are able to generate bootstrap standard errors for our estimates. The advantage of this approach is that such cross sectional data is commonly available, which makes our procedure widely applicable in contrast to the structural dynamic approach taken in recent work, such as Das et al. (2007) and Aw et al. (2011), which is limited to where data is available over a period of time.

Finally, some caveats. Our model, which we believe captures the essential aspects in question, as usual, has a number of limitations. We make a number of modeling assumptions like constant marginal costs, restricting ourself to a static model, etc., which simplifies things considerably. These assumptions let us separate what happens in the two markets at any point in time. If, for example, marginal costs were not constant, as would be the case with capacity constraints, pricing in one market would depend on demand shocks in the other, resulting in our model being mis-specified and our estimates being biased. However, if capacity constraints were binding, the correlation of sales of firms that serve both the US and EU markets (AUS firms) should be negative. For the 155 AUS firms in our data, this correlation is $+0.32$ (and significant at the 5% level), consistent with no binding capacity constraints.[9]

Our structural approach interprets the data through the lens of a heterogenous firm model. Such models have been widely used in recent work. The literature has focused on whether fixed cost changes or marginal cost changes drive increases in trade into the export market.[10]

[7] Eaton et al. (2011a) also postulate the existence of firm and market specific demand shocks. Kee and Krishna (2008) look at the patterns in the violations and what might explain them. Armenter and Koren (2014) assume heterogeneity on the fixed cost side. They show that matching the share of exporters in a standard Melitz model to the data results in having exports per firm far larger than in the data. Fixed costs heterogeneity helps to reduce this mismatch and explain hierarchy violations.

[8] Demidova et al. (2012) take advantage of a natural experiment in trade policy that provides clean predictions regarding how firms should sort themselves across markets in this augmented Melitz model. They then show that these predictions are consistent with the data.

[9] This could be because firms in apparel can subcontract out and thereby relax capacity constraints at low cost. The absence of such evidence of capacity constraints helps to motivate our assumption of constant marginal costs.

[10] The importance of marginal trade costs, such as tariffs, in explaining the expansion of the extensive margin of trade can be found in Yi (2003), who focuses on multi-stage production, and Kehoe and Ruhl (2013) and Debaere and Mostashari (2010), who focus on the new goods margin. di Giovanni and Levchenko (2013) argue that reductions in marginal costs would have a far larger impact than reductions in fixed costs in a world with significant fractions of very large firms, i.e., where the size distribution of firms has fat tails as in the U.S. data. In such settings, small firms contribute little to trade and reductions in fixed costs, which affect the entry of small firms, do little to increase trade. Lincoln and McCallum (2011) look at the U.S. census data and find that in the US, both the number of firms and their average size grew from 1987 to 2006, consistent with a fall in marginal costs driving entry and larger size. However, they attribute this to rising incomes in export markets rather than to a fall in fixed or marginal cost. On the other hand, by focusing on cross sectional data of a wide range of developed and developing countries, Helpman et al. (2008) show that fixed costs of trade could determine the extensive margin of trade through the selection of firms into the export market.