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Economic integration agreements and the margins of international trade

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ABSTRACT

One of the main policy sources of trade–cost changes is the formation of an economic integration agreement (EIA), which potentially affects an importing country's welfare. This paper: (i) provides the first evidence using gravity equations of *both* intensive and extensive (goods) margins being affected by EIAs employing a panel data set with a large number of country pairs, product categories, and EIAs from 1962 to 2000; (ii) provides the first evidence of the differential (partial) effects of various "types" of EIAs on these intensive and extensive margins of trade; and (iii) finds a novel differential "timing" of the two margins' (partial) effects with intensive-margin effects occurring sooner than extensive-margin effects, consistent with recent theoretical predictions. The results are robust to correcting for potential sample-selection, firm-heterogeneity, and reverse causality biases.

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1. Introduction

The gravity equation has long dominated the international trade literature as the main econometric approach toward estimating ex post the "partial" (or direct) effects of economic integration agreements and other natural and policy-based bilateral trade costs on aggregate bilateral trade flows.[1] Economic integration agreements (EIAs) refer broadly to preferential trade agreements, free trade agreements, customs unions, common markets, and economic unions.[2] Recently, Baier and Bergstrand (2007) demonstrated that estimation (ex post) of the (partial) effects of EIAs suffered from endogeneity bias, mainly due to self-selection of country-pairs' governments into agreements. They showed that – after accounting for such bias using panel techniques – EIAs had much larger effects on trade flows than revealed in the earlier gravity equation literature and these estimates were more precise. Anderson and Yotov (2011) confirmed these findings using panel data also. Such results followed in the footsteps of empirical trade studies such as Trefler (1993) and Lee and Swagel (1997) that showed that previous estimates of trade-policy liberalizations on imports were underestimated considerably due to endogeneity bias.

While such positive estimates for EIA dummy variables were interpreted in the context of either Armington or Krugman models as EIAs increasing trade volumes of existing homogeneous firms (i.e., the "intensive margin"), consideration of zeros in bilateral trade, fixed export costs, and firm heterogeneity have led researchers more recently to examine various "extensive margins" of trade. Such extensive margins fall under three general categories: country, goods (or products), and firm. The existence of zeros in aggregate bilateral trade flows among many country pairs has led some researchers to explore the probability that a pair of countries trades at all; to the extent that an EIA affects this probability, this changes the *country* extensive margin of trade and potentially economic welfare.

A second margin is known as the "goods" margin of trade. Hummels and Klenow (2005), or HK, introduced this notion by examining zeros in bilateral trade flows at *highly disaggregated product-category levels*. The motivation for HK was to explore in a cross section of a large number of products and among a large number of U.S. trading partners a fundamental question: Do large economies export more because they export

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[1] Partial (or direct) effects refer to the absence of general-equilibrium (or indirect) effects; see Anderson and van Wincoop (2003) and Baier and Bergstrand (2009) on partial versus general equilibrium trade effects of trade–cost changes. "Aggregate" refers to all "goods" (or industries or product categories).

[2] In this study, we use the term "preferential trade agreement" to denote one with only partial liberalization (not free trade).

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larger quantities of a given good (i.e., intensive goods margin) *or* a wider set of goods (extensive goods margin)?[3] They found in their cross section that about 60% of larger exports of large economies was attributable to the extensive goods margin; specifically, as the exporter country's economic size grew, it exported a larger number of product categories (or "goods") to more markets. However, HK did not investigate the relationship between trade liberalizations and the intensive and extensive goods margins of trade. The purpose of this paper is to address this shortcoming.

In this paper, we explore the impact of EIAs on aggregate trade flows, intensive (goods) margins, and extensive (goods) margins for a large number of goods, country pairs, and years.[4] This is important for at least three reasons. First, the relative impacts on intensive versus extensive margins of trade liberalizations may matter for estimating the welfare gains from trade. Traditionally, the welfare gains from trade liberalizations in models such as Armington and Krugman arise due to terms-of-trade changes; this is summarized succinctly in Arkolakis et al. (2012). In Eaton and Kortum (2002), trade liberalizations increase welfare due to an increase in economic efficiency a la the Dornbusch–Fisher–Samuelson model. In the Melitz (2003) model, trade liberalizations lead to gains due to firm heterogeneity and resulting increases in aggregate productivity. Second, while Arkolakis et al. (2012) recently argued that the welfare gains are iso-morphic across many modern quantitative trade models, they note that the gains can vary across models allowing heterogenous firms depending upon the type of Melitz model; hence, the distinction between intensive margin effects and extensive margin effects is important for ultimately quantifying with more precision the "gains from trade."[5] Third, the HK analysis limited itself to a cross section. In a panel, however, intensive margin and extensive margin effects of EIAs may have differential "timings." For instance, Arkolakis et al. (2012) recently introduced staggered "Calvo pricing" into their Ricardian model of trade and showed that the intensive margin likely reacts sooner to trade liberalizations than does the extensive margin. Moreover, since the two margins have different "trade elasticities," the quantitative path of the welfare gains is time sensitive.

Our paper extends the literature by offering three potential empirical contributions. First, we extend the Baier and Bergstrand (2007) panel econometric methodology for the (partial) effects of EIAs on aggregate trade flows using a gravity equation to examine in a setting with a large number of country pairs the effects of virtually all EIAs on the extensive and intensive goods margins, using the HK trade–margin–decomposition methodology. In the context of an econometric analysis, we are the first to find economically and statistically significant EIA effects on both the intensive *and* extensive (goods) margins in the context of a large number of country pairs, EIAs, and years.

Second, we examine the effects of various *types* of EIAs – one-way preferential trade agreements (OWPTAs), two-way preferential trade agreements (TWPTAs), free trade agreements (FTAs), and a variable for customs unions, common markets and economic unions (CUCMECUs) – on trade flows, extensive margins, and intensive margins.[6] While two recent studies have adapted the Baier–Bergstrand methodology for estimating the effect of differing "types" of EIAs on bilateral aggregate trade flows, *no* econometric study has examined the effect of various types of EIAs on the (goods) extensive and intensive margins of trade using a large number of country pairs and EIAs.[7] Neither Helpman et al. (2008) nor Egger et al. (2011) distinguished among various types of EIAs in their analyses of country intensive and extensive margins. We find not only that deeper EIAs have larger trade effects than FTAs, and the latter have larger effects than (partial) two-way and one-way PTAs, but we distinguish between these various trade effects at the extensive and intensive margins using a panel of (disaggregate) bilateral trade flows from 1962 to 2000 covering 98% of world exports.

Third, Bernard et al. (2009) is likely the only empirical study to date to explore the "timing" of extensive and intensive margin responses to shocks. Using cross-sectional variation to examine long-run aspects, Bernard et al. (2009) find that variation in trade flows across country pairs is explained largely by the extensive margin, using firm-level data (the "firm" margin); this result is consistent with HK using their "goods" margin. But using *time-series* variation, Bernard et al. (2009) find that a larger proportion of trade variation can be explained by the intensive margin at short (five-year) time intervals. They show that, following the Asian financial crisis of 1997, virtually all of the variation in trade flows within 2–3 years could be explained by the *intensive* margin. This finding is consistent with two recent theoretical studies arguing that the low trade-cost elasticity found in macroeconomic analyses of business cycles should be associated with the intensive margin of trade compared with the relatively higher trade-cost elasticity found in international trade, which reflects the intensive and extensive margin effects.[8] In this paper, we allow for differential "timing" of EIA effects using panel data. We find the first comprehensive empirical evidence that the shorter-term effects of EIAs on trade flows are more at the (goods) intensive margin and longer-term effects are more at the extensive margin (the latter entailing either fixed export costs or staggered "Calvo pricing" by consumers), consistent with intuition and results in Bernard et al. (2009). Moreover, our results shed empirical light on theoretical conjectures for the *relative* quantitative effects on intensive and extensive margins of variable trade cost changes in a Melitz-type model. Finally, we show our results are robust to potential country-selection, firm-heterogeneity, and reverse causality biases.

The remainder of this paper is as follows. Section 2 discusses our methodology, based on the HK linear trade–margins–decomposition method and the Baier and Bergstrand (2007) approach for estimating partial effects of EIAs on trade flows in gravity frameworks. Section 3 discusses data and measurement issues. Section 4 provides the main empirical results and findings from three sensitivity analyses. Section 5 concludes.

2. Methodology

Only three empirical studies have explored the effects of trade liberalizations – and, in particular, EIAs – on the intensive and extensive goods margins of trade using the HK methodology. The earliest study using the HK decomposition to explore this issue is Hillberry and McDaniel (2002), focusing solely on the North American Free Trade Agreement (NAFTA). Although they do not attempt to establish causal effects from NAFTA to trade increases, they provide a decomposition of post-NAFTA trade among the three partners into goods intensive and extensive margins using 4-digit Standard International Trade Classification (SITC) data. They find evidence of both margins changing between 1993 and 2001. Kehoe and Ruhl (2009) examined NAFTA, the earlier Canada–U.S. FTA trade liberalization, and some structural

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[3] Each "good" was a 6-digit SITC category. They also explored the effects of country size and per capita GDP on the quality of goods exported, as well as the two margins.

[4] Because firm-level data is not available for a large number of country-pairs for a large number of years, we are constrained to investigating EIAs impacts on products defined at the 4-digit SITC category level, as in Hillberry and McDaniel (2002), Kehoe and Ruhl (2009), and Foster et al. (2011) discussed below.

[5] For instance, welfare estimates could be sensitive to the presence or absence of intermediates or multiple sectors. See also Melitz and Redding (2013) and Feenstra and Weinstein (2013).

[6] The HK methodology is based on Feenstra (1994). Due to few observations on common markets and economic unions, we combine these two types of "deeper" EIAs with customs unions to form the variable CUCMECU, representing "deep" EIAs.

[7] The two studies that extended the Baier–Bergstrand framework to differing types of EIAs are Magee (2008) and Roy (2010); both found that customs unions had larger aggregate trade flow effects than FTAs. However, neither study examined extensive versus intensive margin issues.

[8] Ruhl (2008) explains the delayed effect of the extensive-margin effects to fixed export costs on the supply side, while Arkolakis et al. (2011) explain the delayed effect of the extensive-margin effects to "Calvo pricing" by consumers on the demand side.

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