



# Estimating the effects of free trade agreements on international trade flows using matching econometrics

Scott L. Baier<sup>a,b</sup>, Jeffrey H. Bergstrand<sup>c,d,\*</sup>

<sup>a</sup> The John E. Walter Department of Economics, Clemson University, Clemson, SC 29634 USA

<sup>b</sup> Federal Reserve Bank of Atlanta, Atlanta, GA 30309 USA

<sup>c</sup> Department of Finance, Mendoza College of Business, and Kellogg Institute for International Studies, University of Notre Dame, Notre Dame, IN 46556 USA

<sup>d</sup> CESifo, Munich, Germany

## ARTICLE INFO

### Article history:

Received 5 December 2006

Received in revised form 16 July 2008

Accepted 9 September 2008

### Keywords:

International trade flows

Free trade agreements

Matching econometrics

Treatment effects

### JEL classification:

F10

F13

F15

## ABSTRACT

This paper provides the first cross-section estimates of long-run treatment effects of free trade agreements on members' bilateral international trade flows using (nonparametric) matching econometrics. Our nonparametric cross-section estimates of *ex post* long-run treatment effects are much more stable across years and have more economically plausible values than corresponding OLS cross-section estimates from typical gravity equations. We provide plausible estimates of the long-run effects of membership in the original European Economic Community (EEC) and the Central American Common Market (CACM) between 1960 and 2000 and the estimates confirm anecdotal reports of these agreements' effectiveness.

© 2008 Elsevier B.V. All rights reserved.

## 1. Introduction

For the past half century, quantitative evaluation of the effect of a trade policy change on the bilateral international trade of a pair of countries has been addressed traditionally in two ways, one *ex ante* and one *ex post*. *Ex ante* quantitative analysis of the effects of a policy change – such as formation of a free trade agreement (FTA) – on bilateral trade flows has been conducted using computable general equilibrium (CGE) models of trade, such as GTAP and the Michigan Model.<sup>1</sup> While pros and cons of these techniques have been discussed extensively, CGE models remain a standard tool to evaluate quantitatively *ex ante* trade effects of FTAs.

For decades, most *ex post* analyses of the (partial) effects of FTAs on trade flows have been conducted using “gravity equations,” a log-linear ordinary least squares (OLS) regression specification that typically is interpreted theoretically as the reduced-form from a formal general equilibrium model, cf., Anderson (1979), Bergstrand (1985), Anderson and van Wincoop (2003, 2004), Baier and Bergstrand (2001, 2002, 2007a,b), Eaton and Kortum (2002), Evenett and Keller (2002), Feenstra (2004), and Bergstrand et al. (2007). Up until a few years ago, empirical researchers typically employed cross-sectional data for a particular year or for multiple years and used the coefficient estimates associated with a dummy variable representing the presence or absence of an FTA to estimate the “average (partial) treatment effect” (ATE) of an FTA on members' bilateral trade, cf., Linnemann (1966), Aitken (1973), Sapir (1981, 2001), Baldwin (1994), Frankel (1997), and Schott (2005). However, such dummy variables' coefficient estimates often display extreme instability across years, and in many cases seemingly successful economic integration agreements – such as the European Union (formerly, European Economic Community) – have *negative* estimated treatment effects, cf., Frankel (1997). The “fragility” of these estimates has been documented using extreme-bounds analysis, cf., Ghosh and Yamarik (2004).<sup>2</sup>

\* Corresponding author. Department of Finance, Mendoza College of Business, and Kellogg Institute for International Studies, University of Notre Dame, Notre Dame, IN 46556 USA. Tel.: +1 574 631 6761; fax: +1 574 631 5255.

E-mail address: [Bergstrand.1@nd.edu](mailto:Bergstrand.1@nd.edu) (J.H. Bergstrand).

<sup>1</sup> In reality, there are numerous types of international economic integration agreements: free trade agreements, customs unions, common markets, and economic unions. For ease of reference, we use the term “free trade agreements” generically, as most economic integration agreements are FTAs or customs unions. The European Economic Community and Central American Common Market were customs unions initially.

<sup>2</sup> Widely varying estimates have also been found in empirical analyses of the effects of currency unions on trade, cf., Alesina et al. (2002, Table 8).

Yet, a fundamental question that remains to be addressed as the world continues to pursue economic integration agreements is simply this: What is the *ex post* long-run effect of a particular economic integration agreement between a pair of countries on the level of trade between those members? This is the central question addressed here.<sup>3</sup>

This paper is the first to evaluate *cross-sectionally* the (*ex post*) long-run treatment effects of FTAs on trade flow volumes using nonparametric estimation.<sup>4</sup> Several reasons exist to employ a matching estimator as a nonparametric benchmark for the empirical analysis of FTA treatment effects. First, while the log-linear gravity equation has worked well for decades to explain fundamental determinants of bilateral trade flows (such as GDPs and bilateral distance), the effects of FTAs on trade flows may be related to the levels of trade flows and other covariates (i.e., nonlinearities may exist), cf., Brada and Mendez (1985), Frankel (1997), Baier and Bergstrand (2002), Anderson and van Wincoop (2003), Santos Silva and Tenreyro (2006), Bergstrand et al. (2007), and Henderson and Millimet (2008). Matching provides an alternative approach to log-linear gravity equations to estimate treatment effects without knowing a precise functional relationship. Since it is not yet clear that there is any *well-accepted* methodology for estimating *ex post* the effects of an FTA on trade between a country pair in a given year, it is important to consider alternative methodologies, which may or may not confirm previous estimates using gravity equations, such as those in Baier and Bergstrand (2007a), Baier et al. (2007), and Baier et al. (2008). Second, matching estimators allow ready estimation of average treatment effects when FTA treatments are subject to self-selection and the relationships between FTA treatments and other trade-flow covariates are nonlinear. As Baier and Bergstrand (2004a) show, selection into FTAs is not random. In fact, country pairs that select into FTAs tend to share similar economic characteristics that gravity equations use to explain their trade flows. The combination of non-random selection into FTAs and omitted non-linearities can bias OLS estimates of FTA treatment effects, cf., Persson (2001) for similar concerns in estimating the effects on trade of currency unions. Matching econometrics provide a simple method to form treatment and control groups by selecting on observable covariates and comparing observations drawn from the “same” distribution. For each country pair with an FTA, we construct a control group of country pairs with nearly identical economic characteristics but having no FTA; the average difference in trade flows between the pairs with FTAs and their control groups provides an estimate of “treatment.” Third, if the relationships between the FTA treatments and other trade-flow determinants are nonlinear, then the OLS average treatment effect (ATE) on a randomly selected pair will differ from the average treatment effect on the *treated* (ATT), and the latter may be of relevance for the policymaker.

We focus on two sets of potential contributions, one methodological and the other empirical. Methodologically, matching econometrics have been employed in economics predominantly in the labor economics literature, in particular in the evaluation of either job training or benefits programs in large cross-sections of individuals.

<sup>3</sup> Evidence for long-run effects of other trade policies and their importance has been addressed in the literature, cf., Trefler (1993). Moreover, Anderson and van Wincoop (2003) and Bergstrand et al. (2007) remind us that there are both long-run partial- and general-equilibrium effects. In this paper, we focus only on the long-run partial (or “treatment”) effects. However, the partial effects estimated here could be combined with a nonlinear system of structural equations to generate general-equilibrium comparative statics, as done in the two papers just noted.

<sup>4</sup> We know of one other study that has used matching estimation for FTA effects on trade flows, cf., Egger et al. (2008). However, that study focused on the effects of FTAs on intra-industry trade-share indexes, rather than trade volumes, and focused on *short-run* changes requiring a panel to do difference-in-differences estimation. As a tangent, that study did provide panel estimates of short-run (2-year) new FTA effects on trade flows using difference-in-differences matching. In international trade, a few nonparametric studies have addressed the long-run effects of *currency unions* on trade flow volumes using propensity-score estimates in cross-section, cf., Persson (2001), Kenen (2002), and Chintrakarn (2008), but not long-run effects of FTAs.

The key consideration for matching econometrics is the formulation of a credible counterfactual, cf., Diamond (2006a,b). First, international trade provides an excellent context (outside of labor economics) for evaluating treatment effects because the theoretical foundations for the gravity equation in international trade offer a convincing method for constructing a credible counterfactual. Well-established theoretical foundations for the gravity equation provide an excellent framework for selecting “control groups” (i.e., matched pairs without FTAs). Second, we are able to match treatments with their nearest neighbor controls and ensure that there are no statistically significant observable differences between the treatment and control groups for *all* conditioning characteristics common to the two groups. Successful identification of the control group requires acknowledging empirically the multilateral (price) resistance terms influencing trade identified in Anderson and van Wincoop (2003). By employing a simple Taylor-series expansion of the theoretically motivated Anderson–van Wincoop multilateral resistance terms, we are able to construct theoretically appropriate bilateral *and* multilateral “trade cost” covariates for selection. The theory and structure of the gravity model of trade is very useful to help determine the “selection on observables.”<sup>5</sup>

Empirically, we provide the first cross-sectional nonparametric matching estimates of long-run FTA treatment effects on levels of the volume of trade. First, we find across many settings and years that the matching estimates of treatment effects are much more stable and economically plausible than average treatment effect (ATE) estimates using typical cross-section OLS (or OLS with country fixed effects) gravity equations. The three main findings are: our ATT estimates indicate that FTAs increased members' trade by an economically and statistically significant amount in each of the nine years of our sample; the average treatment effects on the treated (ATTs) are lower than the ATEs for a randomly selected country pair; and the ATTs have less variance across years than ATEs calculated using matching techniques or using OLS. Second, we use matching econometrics to assess the effects of two historically prominent economic integration agreements on trade in a given year; specific treaties help to ensure an important assumption in matching estimation is met. Using nine cross-sections of annual trade flows from 1960 to 2000 (every 5 years), we find interesting results for two (still active) regional economic integration agreements that were formed between 1957 and 1960. First, the average treatment effect for a typical pair of members (ATT) of the *original* European Economic Community (EEC) was positive and economically significant from 1960 to 1970; by 1970, the EEC's Treaty of Rome had more than *doubled* on average the six members' bilateral trade. However, the enlargements of the Community in the early 1970s, the EC–EFTA free trade agreements, and the economic liberalization of Central and Eastern European countries and their subsequent FTAs with EC and EFTA members in the early 1990s reduced the original six members' bilateral trade significantly (i.e., trade diversion).<sup>6</sup> Second, we find that the treatment effect for a typical pair of countries in the original Central American Common Market (CACM) was positive and rose monotonically until 1970. However, in the early 1970s and early 1980s, the treatment effect was considerably lower, rebounding in the 1990s. These estimates support anecdotal evidence that the CACM flourished in the 1960s, but as some member countries faced considerable political instability and cross-border armed conflicts beginning in 1969 and then again in 1979, CACM became less effective between 1970 and 1990, reinvigorated by the nations' presidents in the 1990s.

<sup>5</sup> Note that instrumental variables (IV) is not appropriate for addressing the bias raised by selection on observables. IV can address potentially the issue of selection bias on unobservables, cf., Baier and Bergstrand (2002). However, two points are worth noting. First, many have argued that the selection bias on observables may well dominate that on unobservables. Second, it is difficult to find instruments for FTAs that are not also correlated with trade flows, making IV techniques' usefulness limited, cf., Baier and Bergstrand (2007a), discussed more later.

<sup>6</sup> The EEC began to be called the EC (European Community) in the 1970s. EFTA denotes the European Free Trade Association), which was formed in 1960.

متن کامل مقاله

دریافت فوری ←

**ISI**Articles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات