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## THE UNEVEN ROLES OF FTAS: SELECTION EFFECT OR “LEARNING” EFFECT?

*Faqin Lin\**

**Abstract:** Previous studies on the role of FTAs in promoting members’ international trade have usually focused on FTA premium, ignoring the difference between selection effects – trade developments before the formation of FTAs – and “learning” effects – trade growth after the formation of FTAs. This paper considers this difference, using a large bilateral trade panel comprising data covering more than 50 years from 178 countries. South–South FTAs and North–South FTAs are most related to the selection effect while North–North FTAs have a significant “learning” effect.

**JEL Classifications:** F10, F13, F15

**Keywords:** Free trade agreements, selection effect, “learning” effect

### 1. INTRODUCTION

Since its introduction by Tinbergen (1962), the gravity model has become a standard approach to estimate the ex post role of FTAs in increasing members’ international trade. Although trade economists have found mixed results about specific FTAs,<sup>1</sup> the conclusion that such agreements strongly improve members’ international trade dominates the literature. More recently, a possible endogeneity problem of the FTA variable in gravity equations was considered by Baier and Bergstrand (2007, 2009) and they used different approaches including non-parametric matching econometrics to find significant premium effects of FTAs. However, previous studies usually focused on the FTA premium without considering the causes of such a premium, which might be either a selection effect, i.e. countries with more bilateral trade are more likely to form FTAs, or a “learning” effect, i.e. trade growth after the formation of FTAs. The two effects will have different significance from a policy perspective.

In this paper, I use a large bilateral trade panel comprising data covering more than 50 years from 178 countries to re-estimate the effects of FTAs. The data in this study cover the

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\* School of International Trade and Economics, Central University of Finance and Economics (CUFE), 39 South College Road, Haidian District, Beijing, P.R.China, 100081, E-mail: faqinlin@gmail.com.

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majority of global trade, with little data selection bias. Furthermore, I control for other variables that may have an impact on members' bilateral trade since omitted variable bias is the most important source of endogeneity (Baier and Bergstrand 2007). The results suggest that North–South and South–South FTAs are related mainly to the selection effect while North–North FTAs have a significant “learning” effect; North–North FTAs have a significant impact on members' trade growth whereas North–South and South–South FTAs do not. I conclude that after the formation of FTAs, North–North countries achieve deeper integration but for North–South and South–South countries, FTAs do not appear to promote bilateral trade.

The rest of the paper is structured as follows. I briefly discuss the gravity model, data and related control variables in section 2. Section 3 examines the results of FTA premium with cross-section data and section 4 discusses the results with the panel approach and first differencing. Section 5 addresses the selection effect test and “learning” effect test. Section 6 concludes.

## 2. GRAVITY MODEL AND DATA

### 2.1. Gravity Equation

The gravity equation is typically used to explain cross-sectional variation in country pairs' trade flows in terms of the countries' incomes, bilateral distance, and dummy variables for common languages, common land borders, the presence or absence of FTA/WTO, etc. Tinbergen (1962) was the first to estimate the ex post role of FTAs in increasing members' international trade with a gravity equation. For nearly half a century the gravity equation has been a standard approach for cross-country empirical analyses of free trade agreements on international trade flows. Here we use extended gravity equation to control for other possible factors to reconsider the uneven roles of FTAs.

$$\begin{aligned} \ln(X_{ij}) = & \beta_0 + \beta_1 FTA_{ij} + \beta_2 \ln D_{ij} + \beta_3 \ln(Y_i Y_j) + \beta_4 \ln \left( \frac{Y_i Y_j}{P_{opt} P_{opj}} \right) + \beta_5 Lang_{ij} + \beta_6 Border_{ij} \\ & + \beta_7 Landl_{ij} + \beta_8 Island_{ij} + \beta_9 \ln(Area_i Area_j) + \beta_{10} ComCol_{ij} + \beta_{11} CurCol_{ij} \\ & + \beta_{12} Colony_{ij} + \beta_{13} ComNat_{ij} + \beta_{14} CU_{ij} + \beta_{15} Bothin_{ij} + \beta_{16} Onein_{ij} \\ & + \beta_{17} GSP_{ij} + \varepsilon_{ij} \end{aligned} \quad (1)$$

Where  $i$  and  $j$  denote trading partners. The variables are defined in Table 1:

In the past 30 years, some trade economists have sought formal theoretical economic foundations for the gravity equation (Anderson 1979; Bergstrand 1985; Deardorff 1998; Baier and Bergstrand 2001; Eaton and Kortum 2002; Anderson and van Wincoop 2003). The striking characteristics of these studies about the theoretical foundations are the introduction of prices or particular forms of multilateral price indexes. Anderson and van Wincoop (2003) illustrate the omitted variables bias caused by ignoring prices in the cross-section gravity equation. They suggest theoretically that the gravity model should be written as:

**Table 1**  
**Definitions of Variables**

<i>Variables</i>	<i>Definitions</i>
X	Average value of real bilateral trade between <i>i</i> and <i>j</i>
FTA	Binary variable which is unity if <i>i</i> and <i>j</i> both belong to the same regional trade agreement
D	Distance between <i>i</i> and <i>j</i>
Y	Real GDP
Pop	Population
Lang	Dummy variable which is unity if <i>i</i> and <i>j</i> have a common language and zero otherwise
Border	Binary variable which is unity if <i>i</i> and <i>j</i> share a land border
Landl	The number of landlocked countries in the country pair (0, 1, or 2)
Island	The number of island nations in the pair (0, 1, or 2)
Area	The area of the country (in square kilometres)
ComCol	Binary variable which is unity if <i>i</i> and <i>j</i> were ever colonies after 1945 with the same colonizer
CurCol	Binary variable which is unity if <i>i</i> is a colony of <i>j</i> at time <i>t</i> or vice versa
Colony	Binary variable which is unity if <i>i</i> ever colonized <i>j</i> or vice versa
ComNat	Binary variable which is unity if <i>i</i> and <i>j</i> remained part of the same nation during the sample
CU	Binary variable which is unity if <i>i</i> and <i>j</i> use the same currency at time <i>t</i>
Bothin	Binary variable which is unity if both <i>i</i> and <i>j</i> are GATT/WTO members
Onein	Binary variable which is unity if either <i>i</i> or <i>j</i> is a GATT/WTO member
GSP	Binary variable which is unity if <i>i</i> was a GSP (generalized system of preferences) beneficiary of <i>j</i> or vice versa
$\varepsilon_{ij}$	Represents the omitted other influences on bilateral trade, assumed to be white noise process

$$\begin{aligned}
\ln(X_{ij}/Y_i Y_j) = & \beta_0 + \beta_1 FTA_{ij} + \beta_2 \ln D_{ij} + \beta_5 Lang_{ij} + \beta_6 Border_{ij} + \beta_7 Landl_{ij} + \beta_8 Island_{ij} \\
& + \beta_9 \ln(Area_i Area_j) + \beta_{10} ComCol_{ij} + \beta_{11} CurCol_{ij} + \beta_{12} Colony_{ij} + \beta_{13} ComNat_{ij} \\
& + \beta_{14} CU_{ij} + \beta_{15} Bothin_{ij} + \beta_{16} Onein_{ij} + \beta_{17} GSP_{ij} - \ln P_i^{1-\sigma} - \ln P_j^{1-\sigma} + \varepsilon_{ij}
\end{aligned} \quad (2)$$

where  $P_i^{1-\sigma}$  and  $P_j^{1-\sigma}$  are denoted as “multilateral (price) resistance terms”. Anderson and van Wincoop then estimate this system using a customized non-linear least squares program, treating all  $P_i^{1-\sigma}$  variables ( $i = 1 \dots N$  countries) as endogenous<sup>2</sup>. However, an alternative and computationally easier way with country-specific fixed effects for estimating the multilateral price terms  $P_i^{1-\sigma}$  and  $P_j^{1-\sigma}$  was referred to by Anderson and van Wincoop (2003) as well as Feenstra (2004). This method will also generate unbiased coefficient estimates of the  $\beta$  vector. Thus, we can write the theoretically motivated cross-section model as:

$$\begin{aligned}
\ln(X_{ij}/Y_i Y_j) = & \beta_0 + \beta_1 FTA_{ij} + \beta_2 \ln D_{ij} + \beta_5 Lang_{ij} + \beta_6 Border_{ij} + \beta_7 Landl_{ij} + \beta_8 Island_{ij} \\
& + \beta_9 \ln(Area_i Area_j) + \beta_{10} ComCol_{ij} + \beta_{11} CurCol_{ij} + \beta_{12} Colony_{ij} + \beta_{13} ComNat_{ij} \\
& + \beta_{14} CU_{ij} + \beta_{15} Bothin_{ij} + \beta_{16} Onein_{ij} + \beta_{17} GSP_{ij} + \delta_1^i D_1^i + \delta_2^j D_2^j + \varepsilon_{ij}
\end{aligned} \quad (3)$$

where  $D_1^i$  is a dummy which is unity if the exporting country is *i* and  $D_2^j$  is a dummy which is unity if the importing country is *j*. For the two sets of country-specific fixed effects, one for exporters and one for importers, one set of dummies is enough (Rose 2004). For this reason, in this paper, with bilateral trade I use the first country fixed effects to control the price effects.

Furthermore, I also use specification (1) with country fixed effects to estimate the average treatment effect of FTAs, and call specifications (2) and (3) a unity income elasticity equation.

## 2.2 Data

The data come from Rose's homepage<sup>3</sup> and trade data come from the "Direction of Trade" (DoT) CD-ROM dataset developed by the IMF. The data cover bilateral trade between 178 IMF trading partners between 1948 and 1999 but with gaps (Rose 2004). FOB exports and CIF imports are recorded in US dollars.

Rose has deflated trade by the US CPI. Population and real GDP data (in constant US dollars) have been obtained from the Penn World Table, the World Bank's World Development Indicators, and the IMF's International Financial Statistics. Rose exploits the CIA's World Factbook for a number of country-specific variables including: latitude and longitude, land area, land-locked and island status, physically contiguous neighbours, language, colonizers, and dates of independence. I use these to create controls. Rose also adds information on whether the pair of countries was involved in a currency union. FTA dummies are from the WTO, and WTO dummies were created by Rose.

Using North to denote high income countries and South to denote non-high income countries, I employ the World Bank's definition of "High Income" countries to disaggregate the data into three, North–North, North–South and South–South FTAs. In 1999, there are 223 FTAs of country pairs in our dataset, 94 are North–North FTAs, 31 are North–South FTAs and the other 98 are South–South FTAs.

## 3. CROSS-SECTION ESTIMATES

I first show the average treatment effect estimates of the FTA premium using a cross-section theory-motivated gravity equation with multiple years (1960, 1970, 1980, 1990 and 1999). Table 2 provides the results for these years estimated with specification (1) and country fixed effects. Table 3 gives the coefficients estimated with specification (3) with unity income elasticity.

**Table 2**  
**FTA Premium: Cross-Section Results with Specification (1)**

	<i>Global</i>	<i>(North–North)</i>	<i>(North–South)</i>	<i>(South–South)</i>
	0.0535 (0.148)	–0.0722 (0.200)		
N/R <sup>2</sup>	2625/0.715	323/0.873		
1970	2.014*** (0.516)	0.313 (0.197)		3.306*** (0.333)
N/R <sup>2</sup>	4737/0.727	405/0.895		2027/0.546
1980	1.337*** (0.244)	–0.290 (0.179)	2.504*** (0.276)	2.080*** (0.292)
N/R <sup>2</sup>	5895/0.705	453/0.865	2764/0.757	2678/0.531
1990	1.330*** (0.218)	0.168 (0.161)	2.629*** (0.417)	2.579*** (0.358)
N/R <sup>2</sup>	6620/0.704	453/0.889	3004/0.752	3163/0.583
1999	0.790*** (0.112)	0.454*** (0.108)	2.064*** (0.326)	1.324*** (0.180)
N/R <sup>2</sup>	7268/0.801	405/0.932	3273/0.826	3590/0.685

*Note:* Robust standard errors in parentheses. \*\*\* p<0.01

**Table 3**  
**FTA Premium: Cross-section Results with Specification (3)**

	<i>Global</i>	<i>(North–North)</i>	<i>(North–South)</i>	<i>(South–South)</i>
1960	–0.685*** (0.154)	–0.349* (0.205)		
N/R <sup>2</sup>	2625/0.550	323/0.613		
1970	1.876*** (0.531)	0.194 (0.172)		3.166*** (0.328)
N/R <sup>2</sup>	4737/0.482	405/0.572		2027/0.512
1980	1.252*** (0.241)	–0.269* (0.160)	2.660*** (0.278)	2.000*** (0.298)
N/R <sup>2</sup>	5895/0.452	453/0.499	2764/0.344	2678/0.478
1990	1.468*** (0.202)	0.0384 (0.140)	2.709*** (0.408)	2.640*** (0.378)
N/R <sup>2</sup>	6620/0.391	453/0.495	3004/0.328	3163/0.371
1999	0.748*** (0.114)	0.317*** (0.107)	2.068*** (0.326)	1.300*** (0.184)
N/R <sup>2</sup>	7268/0.527	405/0.680	3273/0.433	3590/0.584

Note: Robust standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

From the tables we can see that some coefficients are not stable from year to year, especially the coefficients of the *FTA* variable for North–North bilateral trade, which means that the cross-section estimates are not reliable owing to omitted variables bias even though I try to control the possible effects (Baier and Bergstrand 2007). As well, a point was made by Novy (2008) and Stack (2009) that gravity relations might change over time. However, for North–South and South–South bilateral trade, most of the FTA estimates are positive and significantly different from zero. To test the robustness of the findings and to address the bias by using a cross-section equation (Baldwin and Taglioni 2006), I now use the panel data to test the treatment effect of FTAs in different trade groups.

#### 4. FTA TREATMENT EFFECTS WITH PANEL DATA

Fixed-effects and first differencing approaches with panel data are effective ways to control for time-invariant effects (Wooldridge 2002). With panel data, the gravity model is as follows:

$$\begin{aligned}
 \ln(X_{ijt}) = & \beta_0 + \beta_1 FTA_{ijt} + \beta_2 \ln D_{ijt} + \beta_3 \ln(Y_i Y_j)_t + \beta_4 \ln \left( \frac{Y_i Y_j}{P_{opi} P_{opj}} \right)_t + \beta_5 Lang_{ijt} \\
 & + \beta_6 Border_{ijt} + \beta_7 Landl_{ijt} + \beta_8 Island_{ijt} + \beta_9 \ln(Area_i Area_j)_t + \beta_{10} ComCol_{ijt} \\
 & + \beta_{11} CurCol_{ijt} + \beta_{12} Colony_{ijt} + \beta_{13} ComNat_{ijt} + \beta_{14} CU_{ijt} + \beta_{15} Bothin_{ijt} + \beta_{16} Onein_{ijt} \\
 & + \beta_{17} GSP_{ijt} - \ln P_i^{1-\sigma} - \ln P_j^{1-\sigma} + \sum \lambda_i Timedummy_t + \varepsilon_{ijt}
 \end{aligned} \tag{4}$$

Furthermore, with unity elasticity of income suggests estimating:

$$\begin{aligned}
 \ln(X_{ij} / Y_i Y_j)_t = & \beta_0 + \beta_1 FTA_{ijt} + \beta_2 \ln D_{ijt} + \beta_5 Lang_{ijt} + \beta_6 Border_{ijt} + \beta_7 Landl_{ijt} + \beta_8 Island_{ijt} \\
 & + \beta_9 \ln(Area_i Area_j)_t + \beta_{10} ComCol_{ijt} + \beta_{11} CurCol_{ijt} + \beta_{12} Colony_{ijt} + \beta_{13} ComNat_{ijt} \\
 & + \beta_{14} CU_{ijt} + \beta_{15} Bothin_{ijt} + \beta_{16} Onein_{ijt} + \beta_{17} GSP_{ijt} - \ln P_i^{1-\sigma} - \ln P_j^{1-\sigma} \\
 & + \sum \lambda_i Timedummy_t + \varepsilon_{ijt}
 \end{aligned} \tag{5}$$

As the dataset covers the bilateral trade of 178 countries covering more than 50 years, there are extensive panel data but with gaps. There are four ways to estimate the treatment effects of FTAs: pooled OLS, fixed effects, random effects and first differencing. However, for unbalanced panel data, the random effects approach requires much stronger assumptions compared with fixed effects (Woodridge 2002). Therefore, I use pooled OLS, fixed effects and first differencing to test the average treatment effects of FTAs. Section 4.1 reports the pooled OLS and fixed effects regressions, and Section 4.2 the first differencing method.

#### 4.1. Pooled OLS and Fixed Effects

Table 4 provides the results of treatment effects of FTAs with various specifications by the pooled OLS method. We can see that most of the FTA coefficients are significantly positive, which means that FTAs have a significant premium, i.e. countries with FTAs have more bilateral trade than countries without FTAs. However, the FTA premium is uneven across different trade groups. For North–South and South–South trade, FTAs have a much higher premium. The FTA coefficients for North–South FTAs are 10 times larger than for North–North FTAs, and the coefficients for South–South FTAs are even larger. However, as OLS cannot completely control the time-invariant effects I use a fixed effects approach to rerun the regressions.

**Table 4**  
**FTA Coefficients Estimated Using the Pooled OLS Method**

	<i>Global</i>	<i>(North–North)</i>	<i>(North–South)</i>	<i>(South–South)</i>
OLS with Country Effects				
	0.972*** (0.0334)	0.119*** (0.0230)	1.482*** (0.0994)	1.802*** (0.0535)
N/R <sup>2</sup>	234597/0.651	19800/0.853	112759/0.711	102038/0.467
OLS with Country and Time Effects				
	1.291*** (0.0337)	0.196*** (0.0220)	1.758*** (0.0991)	2.012*** (0.0519)
N/R <sup>2</sup>	234597/0.681	19800/0.863	112759/0.737	102038/0.515
OLS with Unity Income Elasticity and Country and Time Effects				
	1.327*** (0.0333)	0.128*** (0.0221)	1.923*** (0.0987)	2.003*** (0.0520)
N/R <sup>2</sup>	234597/0.429	19800/0.503	112759/0.372	102038/0.435

*Note:* Robust standard errors in parentheses. \*\*\* p < 0.01

Table 5 shows the results of a fixed effects approach. We can see that most FTA coefficients are positive and significant, which confirms the existence of an FTA premium. While the uneven roles of FTAs between different trade groups still exist, the coefficients of North–South FTAs lose their significance and so we can expect that for North–South FTAs, the premium is not robust with the pooled OLS approach. South–South FTAs still have larger FTA coefficients than North–North bilateral trade although these are largely decreased compared with pooled OLS estimates, which are about twice that of North–North FTAs. Therefore, it can be concluded that the North–South FTA premium is not robust and that South–South FTAs have a much larger premium than North–North FTAs.

**Table 5**  
FTA Coefficients Estimated Using Fixed Effects

	Global	(North–North)	(North–South)	(South–South)
Fixed Effects with Time Effects				
	0.764*** (0.0732)	0.571*** (0.0671)	–0.105 (0.193)	1.077*** (0.150)
N/R <sup>2</sup>	234597/0.124	19800/0.636	112759/0.203	102038/0.071
Country Pair	12150	555	4575	7020
Fixed Effects with Unity Income Elasticity and Time Effects				
	0.852*** (0.0720)	0.662*** (0.0679)	–0.119 (0.191)	1.116*** (0.146)
N/R <sup>2</sup>	234597/0.119	19800/0.253	112759/0.189	102038/0.117
Country Pair	12150	555	4575	7020

Note: Robust standard errors in parentheses. \*\*\* p<0.01

#### 4.2. First Differencing

If we use the first differencing method, the corresponding equations to specifications (4) and (5) should be as follows:

$$\begin{aligned} \Delta \ln(X_{ij,t-(t-1)}) = & \beta_1 \Delta FTA_{ij,t-(t-1)} + \beta_2 \Delta \ln(Y_i Y_j)_{t-(t-1)} + \beta_3 \Delta \ln \left( \frac{Y_i Y_j}{P_{opi} P_{opj}} \right)_{t-(t-1)} + \beta_{11} \Delta CurCol_{ij,t-(t-1)} \\ & + \beta_{14} \Delta CU_{ij,t-(t-1)} + \beta_{15} \Delta Bothin_{ij,t-(t-1)} + \beta_{16} \Delta Onein_{ij,t-(t-1)} + \beta_{17} \Delta GSP_{ij,t-(t-1)} \\ & + \sum \lambda_i Timedummy_{t+1} + v_{ij,t-(t-1)} \end{aligned} \quad (6)$$

$$\begin{aligned} \Delta \ln(X_{ij} / Y_i Y_j)_{t-(t-1)} = & \beta_1 \Delta FTA_{ij,t-(t-1)} + \beta_{11} \Delta CurCol_{ij,t-(t-1)} + \beta_{14} \Delta CU_{ij,t-(t-1)} \\ & + \beta_{15} \Delta Bothin_{ij,t-(t-1)} + \beta_{16} \Delta Onein_{ij,t-(t-1)} + \beta_{17} \Delta GSP_{ij,t-(t-1)} \\ & + \sum \lambda_i Timedummy_{t+1} + v_{ij,t-(t-1)} \end{aligned} \quad (7)$$

where  $v_{ij,t-(t-1)} = \varepsilon_{ij,t} - \varepsilon_{ij,t-1}$ . The fixed effect and first differencing methods are both effective ways to control the endogeneity problems caused by omitted time-invariant variables. In contrast to previous studies with intervals of the time period, in this paper I employ the data of every year from 1948 to 1999, so the economic meaning of the estimated coefficients with first differencing will be different from the fixed effects. Fixed effect coefficients of FTAs can be regarded as the FTA premium of bilateral trade, that is, countries with FTAs have more bilateral trade flows than those without FTAs. However, first differencing coefficients can be treated as the role of FTAs in promoting trade growth after their formation.

Table 6 reports the results using the first differencing method. Most of the coefficients estimated are not statistically significant. North–North FTAs have a strong effect in promoting trade growth after the FTA is formed. Although South–South FTAs have a much higher FTA premium, they do little to promote trade growth after the formation of the FTA. Similar to the export and productivity literature, their premium may be caused by a selection effect (larger bilateral trade partners form FTAs) but the “learning effect” (after FTA formation) is not



**Table 6**  
**FTA Coefficients Estimated Using First Differencing**

	<i>Global</i>	<i>(North–North)</i>	<i>(North–South)</i>	<i>(South–South)</i>
First Differencing with Time Effects				
	0.0352 (0.0507)	0.0888*** (0.0206)	–0.271 (0.182)	0.106 (0.0931)
N/R <sup>2</sup>	222447/0.011	19245/0.043	108184/0.012	95018/0.013
First Differencing with Unity Income Elasticity and Time Effects				
	0.0790 (0.0581)	0.0995*** (0.0204)	–0.277 (0.190)	0.155 (0.104)
N/R <sup>2</sup>	222447/0.008	19245/0.116	108184/0.009	95018/0.018

Note: Robust standard errors in parentheses. \*\*\* p<0.01

significant. For North–North FTAs, although there is only a minor FTA premium but a significant “learning effect”, after the FTA trade growth is significant. In the next section I test the hypothesis.

## 5. SELECTION EFFECT OR “LEARNING” EFFECT

In this section, I use standard econometrics to test the mechanism of the FTA premium: selection effect or “learning” effect? To test the selection effect and “learning” effect, I choose 1960, 1970, 1980, 1990 and 1999 as the time periods to study. Section 5.1 looks at the selection effect and section 5.2 discusses the “learning” effect.

### 5.1. Selection Effect Test

First, I test the selection effect. As with the self-selection effect in export and productivity shown in the firm-level literature, I use the above mentioned hypothesis – namely, that the more developed is bilateral trade, the easier it is to form an FTA –to investigate the pre-FTA differences in trade volume between countries with FTAs and countries without FTAs. If countries with greater trade volume find it easier to form FTAs, we should expect to find significant differences in trade volume between countries with future FTAs and countries that never form FTAs several years before the formation of FTAs. To test whether countries that now have FTAs had more developed bilateral trade before entering these agreements than countries that have not entered FTAs I select all countries that did not begin a FTA between years  $t - j$  and  $t - 1$  and estimate the average difference in bilateral trade volume in year  $t - j$  between those countries that formed the FTAs in year  $t$  and those that did not, controlling for other factors in year  $t - j$ . More formally, we estimate the gravity model:

$$\begin{aligned}
 \ln(X_{ij,t-n}) = & \beta_0 + \beta_1 FTA_{ij,t} + \beta_2 \ln D_{ij,t-n} + \beta_3 \ln(Y_i Y_j)_{t-n} + \beta_4 \ln \left( \frac{Y_i Y_j}{P_{opi} P_{opj}} \right)_{t-n} \\
 & + \beta_5 Lang_{ij,t-n} + \beta_6 Border_{ij,t-n} + \beta_7 Landl_{ij,t-n} + \beta_8 Island_{ij,t-n} + \beta_9 \ln(Area_i Area_j)_{t-n} \\
 & + \beta_{10} ComCol_{ij,t-n} + \beta_{11} CurCol_{ij,t-n} + \beta_{12} Colony_{ij,t-n} + \beta_{13} ComNat_{ij,t-n} + \beta_{14} CU_{ij,t-n} \\
 & + \beta_{15} Bothin_{ij,t-n} + \beta_{16} Onein_{ij,t-n} + \beta_{17} GSP_{ij,t-n} + \varepsilon_{ijt}
 \end{aligned} \tag{9}$$

Specifically, I first let  $t = 1999$ ,  $n = 1, 2, 3, 4$ , and keep countries that did not have FTAs from 1960 to 1990. Thus, the pre-entry premium that can be computed from the estimated coefficient  $\beta_1$ , shows the average percentile difference between 1999's FTA countries and 1999's non-FTA countries in 1960, 1970 and 1980, controlling for the characteristics some years before. Because the number of FTAs increased rapidly after 1999,<sup>5</sup> I ignore the pre-entry premium in the nearest year prior to 1999, which is 1990 in the case of biased estimates. Similarly, I also let  $t = 1990$ ,  $n = 1, 2, 3$  and keep countries that did not have FTAs from 1960 to 1980. I then compute the pre-FTA premium between 1990's FTA countries and 1990's non-FTA countries in 1960, 1970 and 1980, controlling for the characteristics some years before; and let  $t = 1980$ ,  $n = 1, 2$  and keep countries that did not have FTAs from 1960 to 1970. I then compute the pre-FTA premium between 1980's FTA countries and 1980's non-FTA countries in 1960 and 1970, controlling for the characteristics some years before. Because most FTAs were formed after 1970, especially North–South FTAs and South–South FTAs, and some North–North FTAs were formed before 1960, there is little variation from 1960 to 1970<sup>6</sup>, and thus I do not estimate the pre-FTA premium between 1970's FTA countries and 1970's non-FTA countries in 1960.

Table 7 shows the results of the selection effect. From the coefficients of  $\beta_1$ , we can see that most of the estimates about North–South and South–South FTAs are significant and there are large positive values but that there are also significant and large negative values for North–North FTAs. That is, the selection effects for North–South and South–South FTAs are much more significant than for North–North FTAs and there seems little relation between the selection effects and North–North FTAs.

However, we find that for North–North FTAs formed in 1999, there is some selection effect in 1980 (significant at 10% level) and the possible reason is that in the 1970s and 1980s, most of the global trade was bilateral trade between North countries. Some of the North countries had already formed FTAs (like the EU) and made great progress in bilateral trade. This success encouraged other North countries to form FTAs in the 1980s and 1990s (like the US–Canada FTA), so there is some selection effect but over all the selection effect is not very strong across North–North FTAs.

The selection effects are the most significant for South–South FTAs; bilateral trade in 1970 for South–South FTAs formed in 1980 was 229.2% higher than in South–South bilateral trade in countries without FTAs throughout the period, controlling for other possible effects. Thus, we can conclude that the premium of South–South FTAs is caused by the selection effect; North–South FTAs also display this selection effect, but the premium has little relation with the selection effect in North–North FTAs.

## **5.2. “Learning” Effect Test**

Now we turn to the “learning” effect – trade growth after the formation of FTAs. The “learning” effect is much more important from the policy perspective, and the policy implication is quite different from the selection effect. To do the formal estimate, I choose countries that form FTAs at year  $t$  and those that never form FTAs to estimate how FTAs increase bilateral trade after the formation of FTAs compared with those that never form FTAs. I do not include countries with FTAs over the entire sample period 1960–1999 but use countries that begin the FTA

**Table 7**  
**Selection Effect**

<i>Bilateral Trade</i>	<i>FTA(1999)</i>	<i>FTA(1990)</i>	<i>FTA(1980)</i>
North-North			
1960	-0.0382	-0.345*	-0.683***
1970	-0.0274	-0.641***	-0.790***
1980	0.329*	-0.602***	
North-South			
1960	0.250	1.842***	1.348***
1970	0.821	2.215***	1.750**
1980	-0.573	2.704***	
South-South			
1960	0.832*	2.076***	1.285***
1970	0.509*		2.292***
1980	0.919***		

Note: \* p<0.1, \*\* p<0.05, \*\*\* p<0.01

process after 1960. Because most FTAs formed after 1970, I do not estimate the promoting effect of 1970 FTAs but let  $t$  be the years 1980, 1990, 1999, and  $t + n < 1999$ .

Formally, I run the following regression to estimate the “learning” effect of FTAs’ roles in promoting international trade growth after the formation of FTAs compared with those countries without FTAs.

$$\begin{aligned}
\ln(X_{ij,t+n}) - \ln(X_{ij,t-1}) = & \beta_0 + \beta_1 FTA_{ij,t} + \beta_2 \ln D_{ij,t-1} + \beta_3 \ln(Y_i Y_j)_{t-1} + \beta_4 \ln \left( \frac{Y_i Y_j}{P_{opi} P_{opj}} \right)_{t-1} \\
& + \beta_5 Lang_{ij,t-1} + \beta_6 Border_{ij,t-1} + \beta_7 Landl_{ij,t-1} + \beta_8 Island_{ij,t-1} + \beta_9 \ln(Area_i Area_j)_{t-1} \\
& + \beta_{10} ComCol_{ij,t-1} + \beta_{11} CurCol_{ij,t-1} + \beta_{12} Colony_{ij,t-1} + \beta_{13} ComNat_{ij,t-1} + \beta_{14} CU_{ij,t-1} \\
& + \beta_{15} Bothin_{ij,t-1} + \beta_{16} Onein_{ij,t-1} + \beta_{17} GSP_{ij,t-1} + \varepsilon_{ij,t+n}
\end{aligned} \tag{10}$$

The “learning” or promoting effect can be estimated by the coefficient  $\beta_1$ . This coefficient shows the promoting effect of trade growth at various years compared to the year before the FTA’s formation indicating percentile difference. Table 8 reports the results of  $\beta_1$ . From the estimated coefficients, we can clearly see that the “learning” effect is significant for North-North FTAs, but not for North-South and South-South FTAs. For North-North FTAs formed in 1980, the trade growth between 1970 and 1980 is on average 93.5% faster than in those countries without FTAs throughout the period, controlling for other possible effects. Thus, we can conclude that the “learning” effect of North-North FTAs is the main cause of North-North FTAs’ premium, but for North-South and South-South FTAs, the FTA premium has little relation with the “learning” effect.

From the above analyses, we can see that both the selection effect and the “learning” effect are strongly uneven across different trade groups. There is an uneven premium of different FTAs in selection 3 and selection 4, with the South-South FTAs having a much more significant premium than North-North FTAs, which shows the mechanism more clearly. The premium of North-North FTAs is mainly caused by “learning” effects while South-South FTA premiums

**Table 8**  
**“Learning” Effect**

<i>FTAs</i>		<i>North–North FTAs</i>	
FTA (1980)	0.389**	0.782***	0.935***
FTA (1990)		0.666***	0.561***
FTA (1999)			–0.0463
		<i>North–South FTAs</i>	
FTA (1980)	0.572	0.550	1.131
FTA (1990)		0.128	0.0557
FTA (1999)			0.231
		<i>South–South FTAs</i>	
FTA (1980)	0.832*	0.0514	0.688
FTA (1990)			
FTA (1999)			0.245

*Note:* \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ . The trade growth is as follows: for FTA (1980), the trade growth is between 1980 and 1970, 1990 and 1970, 1999 and 1970; for FTA (1990), the trade growth is between 1990 and 1980, 1999 and 1980; for FTA (1999), the trade growth is between 1990 and 1999.

are much more related to selection effects. For North–South FTAs, some level of selection effect dominates the insignificant “learning” effect and causes the premium of North–South FTAs not to be robust. Thus, North–North FTAs have “real” roles in promoting members’ bilateral trade. However, if we care only about the traditional FTA premium, we will be misled on the roles of FTAs, which is extremely important for policy makers. It seems that for South–South and North–South FTAs, trade development has a significant influence on the choice of formation. While FTAs usually do not increase bilateral trade once they are formed, North–North FTAs achieved deep integration after their formation and greatly increased bilateral trade.

### 5.3. Further Discussion

From the above analyses, the author finds that the North–North FTAs demonstrated a significant “learning” effect, i.e. they strongly increase the level of bilateral trade after the formation of FTAs, while for North–South FTAs and South–South FTAs, the “learning” effect is rather weak and their agreements are due mostly to selecting countries which have a significant trade relationship tending to sign FTAs. The remaining question is that there may be some other reasons behind the results found in this paper. In the period between the Second World War and the 1980s, global trade was dominated by developed countries, particularly intra-industry trade in intermediate goods. In addition to international trade links, North countries have strong links through a range of economic activities, for example, through the bilateral investment agreements. Such cross-border investments will also facilitate bilateral trade, so the omission of such investment variables may exaggerate the impact of the “learning” effects between North countries, but probably will not change the results. In other words, it may be the fixed effects of developed countries that help the North–North FTAs to display the significant “learning” effects, though we control the fixed effects in the analyses, we may miss some variability over time, such as that resulting from the bilateral investment agreements. This is the task for the future to study the impacts of bilateral investment agreements on international trade, especially for North countries.<sup>7</sup>

## 6. CONCLUSION

The roles of FTAs can be analysed by both the selection effect and the “learning” effect, however, previous studies were concerned only with the FTA premium. The more developed bilateral trade is between two countries, the easier it is to form FTAs. This is the selection effect. The “learning” effect, which is borrowed from export and productivity in the firm-level literature, shows that bilateral trade growth is faster for those countries that formed FTAs compared with those countries that did not.

I use a large bilateral trade panel comprising data covering more than 50 years from 178 countries to reconsider the roles of FTAs based on the above two effects. The data cover most global trade, so there is little selection problem. As I also control other variables that may have an impact on bilateral trade, there should be little omitted variable bias. An extensive investigation reveals some new findings. Although South–South FTAs had a much higher FTA premium than North–North FTAs, South–South FTAs dominated in the selection effect and North–North FTAs dominated in the “learning effect”. The North–South FTA premium was offset by a significant selection effect and an insignificant “learning” effect.

It can be inferred that after FTA formation, North–North countries achieve deep integration but North–South and South–South countries do not display any significant development in bilateral trade growth. This finding suggests that the function of FTAs related to South developing countries should be reconsidered.

## NOTES

1. For example, Brada and Mendez (1985) found significant effects of the European Community on trade flows among members, while Frankel, Stein and Wei (1995) found the effects were insignificant.
2. The equation needs equilibrium condition constraints, and in these conditions the multilateral price terms become endogenous.
3. The website is <http://faculty.haas.berkeley.edu/arose/>.
4. The first FTA was initiated in 1958 by France, Netherlands, Belgium, Luxemburg, Italy and Germany according to the Treaties of Rome, and the author began the study from 1960.
5. In our sample, in 1999 the number of FTAs (RTAs) is 223, and according to WTO statistics, close to 400 RTAs are scheduled to be implemented by 2010. See the website: [http://www.wto.org/english/tratop\\_e/region\\_e/region\\_e.htm](http://www.wto.org/english/tratop_e/region_e/region_e.htm).
6. In our dataset, the number of FTAs was only 15 in 1970, and in 1999 it was 223. North–North FTAs were first formed in 1958, and between 1958 and 1970 no further North–North FTAs were formed; the number of North–North FTAs in 1999 was 94.
7. Here the author discusses the possible impacts about bilateral investment agreements on international trade and the author does not collect such data to do all the regressions again. The reason is that the data set is very large; over 175 countries across more than 50 years, to collect the bilateral investment agreements for each country pair in each year needs a huge time and the author leaves it to the future work.

## REFERENCES

- Anderson, J. E., (1979), “A Theoretical Foundation for the Gravity Equation”, *American Economic Review*, 69: 106–116.
- Anderson, J. E., van Wincoop, E., (2003), “Gravity with Gravitas: A Solution to the Border Puzzle”, *American Economic Review*, 93:170–192.

- Baier, S. L. and Bergstrand, J. H., (2001), “The Growth of World Trade: Tariffs, Transport Costs and Income Similarity”, *Journal of International Economics*, 53: 1–27.
- Baier, S. L. and Bergstrand, J. H., (2007), “Do Free Trade Agreements Actually Increase Members’ International Trade?”, *Journal of International Economics*, 71:72–95.
- Baier, S. L. and Bergstrand, J. H., (2009), “Estimating the Effects of Free Trade Agreements on International Trade Flows Using Matching Econometrics”, *Journal of International Economics*, 77: 63–76.
- Baldwin, R. and Taglioni, D., (2006), “Gravity for Dummies and Dummies for Gravity Equations”, (Working Papers12516). Cambridge, MA: National Bureau of Economic Research.
- Bergstrand, J. H., (1985), “The Gravity Equation in International Trade: Some Microeconomic Foundations and Empirical Evidence”, *Review of Economics and Statistics*, 67: 474–481.
- Brada, J. C. and Mendez, J. A., (1985), “Economic Integration among Developed, Developing and Centrally Planned Economies: A Comparative Analysis”, *Review of Economics and Statistics*, 67: 549–56.
- Deardorff, A. V., (1998), “Determinants of Bilateral Trade: Does Gravity Work in a Neo-classical World ?”, In Frankel, J. A. (ed), *The Regionalization of the World Economy*, Chicago: The University of Chicago Press.
- Eaton, J. and Kortum, S., (2002), “Technology, Geography, and Trade”, *Econometrica*, 70: 1741–1779.
- Feenstra, R. C., (2004), *Advanced International Trade: Theory and Evidence*. Princeton, NJ: Princeton University Press.
- Frankel, J. A. Stein, E. and Wei, S. J. (1995), “Trading Blocs and the Americas: The Natural, the Unnatural, and the Super-natural”, *Journal of Development Economics*, 47: 61–95.
- Novy, D., (2008), “Gravity Redux: Measuring Trade Costs with Panel Data”, (Warwick. Economic Research Papers No. 861).UK: University of Warwick.
- Rose, A. K., (2004), “Do We Really Know That the WTO Increases Trade?”, *American Economic Review*, 94: 98–114.
- Rose, A. K., (2004), “Response to Subramanian and Wei”, Resource document. See Rose’s homepage <http://faculty.haas.berkeley.edu/arose/>.
- Stack, M., (2009), “Regional Integration and Trade: Controlling for Varying Degrees of Heterogeneity in the Gravity Model”, *The World Economy*, 32: 772–789.
- Tinbergen, J., (1962), *Shaping the World Economy*. New York: The Twentieth Century Fund.
- Wooldridge, J. M., (2002), *Econometric Analysis of Cross-section and Panel Data*. Cambridge, MA: MIT Press.