Financial Development and International Agricultural Trade: Is There a Connection?

By

Dwi Susanto and C. Parr Rosson

Department of Agricultural Economics, Texas A&M University

College Station, TX 77843

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Abstract

This study empirically investigates the possible link between financial development and international agricultural trade using binomial models of the gravity equations. Financial development is measured by a constructed financial reforms index. The results provide some evidence on the positive impacts of financial reform on agricultural exports. The results further indicate that countries with a greater degree of financial development as exhibited by advanced countries tend to have larger impacts on agricultural exports. Bilateral trade involving advanced countries has a larger magnitude of impacts of financial reforms on agricultural trade than those involving developing countries.

Key Words: agricultural trade, binomial model, financial reform, gravity model

Introduction

Classical trade theory suggests that differences across countries in technology and factor endowments are the sources of comparative advantage and thus trade patterns. Later, it is acknowledged that trade does take place between countries with similar technologies and similar factor proportions. That is, economies of scale can give rise to trade even in the absence of comparative advantage (Krugman, 1979, 1980; Dixit and Norman, 1980; Lancaster, 1980). Besides those traditional factors affecting comparative advantage, financial development has recently been argued as a potential source of a country's comparative advantage. This notion builds on the analysis of Kletzer and Bardhan (1987) and Baldwin (1989). Focusing on the role of financial institutions and markets in channeling external finance to industries, Kletzer and Bardhan suggest that countries with a relatively well-developed financial sector have a

comparative advantage in industries and sectors that rely more on external financing. The work of Baldwin is, on the other hand, based on the risk-diversification function of financial market and posits that economies with better developed financial markets are better able to diversify risk because they have better diversification possibilities. Consequently, they specialize in producing the risky good with relatively lower risk premiums. The general notion of the two studies is, therefore, that countries that are financially well developed should experience greater volumes of international trade. This has empirically been probed in studies such as Beck (2002, 2003), Svaleryd and Vlachos (2005), Hur et al (2006), and Manova (2008).

The argument of the link between financial development and trade is based on the liquidity constraints that most firms face. When a domestic financial institution is weak and inefficient, firms in export-oriented sectors are burdened by significant liquidity constraints that prevent a subset of productive firms to enter the foreign market (Chaney, 2005). In this instance, the main prediction is that financial underdevelopment hinders exports. On the other hand, if firms face less restrictive credit constraints as, for example, a result of financial sector reforms then investment can increase more in response to a lowering of variable export costs and all firms with productivity above a certain cut-of level become exporters (Melitz, 2003).

Prediction of theoretical papers (e.g. Kletzer and Bardhan, 1987; Baldwin, 1989) as well as empirical papers (e.g. Beck, 2002, 2003; Hur et al., 2006; Greenaway et al., 2007; Muûls, 2008; Manova, 2008; Berman and Héricourt, 2008) basically agree that financial development should promote production and trade in financially dependent industries by reducing the cost of external capital (Levine et al., 2000) or dampening the disconnection that may occur between productivity and export status as in Berman and Hericourt (2008). Financial development can be achieved through financial reforms, both deregulation and liberalization of the financial sector.

Financial liberalization eases credit constraints on firms in more intensive and modern firms, and switches resources from the inefficient to the efficient sector. Rajan and Zingales (1998) point out that firms that are more dependent on external finance are expected to grow faster when financial markets are deregulated.

Until the 1980s the financial sector was one of the sectors where state intervention was most visible both in developing and developed countries where banks were owned or controlled by the government and interest rates were subject to ceilings, allocation of credits was constrained, entry restrictions and barriers to foreign capital flows were imposed, among others (Abiad et al., 2010), thereby creating liquidity constraints to firms. Providing firms with better access to finance should have therefore promoted entries as a result of the better capacity to pay the fixed entry cost, as well as to an increase in the value of exports by incumbent firms. At the aggregated level, this should have led to a large increase in the number of bilateral trade relationships.

In this paper, we empirically investigate the possible link between financial development and trade flows in agricultural products. Specifically, we attempt to assess the extent to which financial development has contributed to bilateral agricultural trade flows. Given recent developments in trade theory, we argue that studying the link between finance and trade flows is important, especially given the reliance of many developing countries on production agriculture for significant shares of GDP and foreign exchange earnings. The importance of the argument is clearly stated in Beck (2003) in that if the level of financial development does have an effect on trade flows, this emphasizes the importance of the financial sector for economic development beyond its positive impact on economic growth and therefore increases the priority that financial reforms should have for policy makers (p.296). To our knowledge, there has not been a study

that specifically analyzes the link between financial development and agricultural trade flows. Previous studies focus on the manufacturing sector, a sector that is considered to have higher level of economies of scale than other sectors. Beck (2002), for example, stated that agricultural sector exhibits less scale economies than manufactured goods and therefore experiences lower trade shares and trade balances. It is therefore an interesting question of how sensitive agricultural trade may be to the level of financial development within a country.

The term of financial development used in this study is measured by the financial reform index (FinReform) developed by Abiad et al. (2010). The FinReform provides comprehensive information on financial reforms in that it recognizes the multifaceted nature of financial reform and records financial policy changes along many dimensions. The index includes both liberalization and deregulation of the financial sector and allows possible reversals. Therefore, it provides a good measure of financial development. The results of the analysis can help provide more tangible policy options that may deliver gains associated with financial reform and development.

To conduct the analysis, we use a gravity model of bilateral trade flows. The gravity model is adopted because it has been widely used to describe bilateral trade patterns and has given satisfactory performance (Deardorff, 2004; Disdier and Head, 2008). It also provides an analysis of geographic trade patterns as represented by the distance variable. Here, the financial reform index variable is integrated into the gravity model.

Related Literature Review on Trade and Financial Development

A number of theoretical papers related to finance-trade link have been proposed with the earliest versions are those by Kletzer and Bardhan (1987) and Baldwin (1989). Using the Heckscher-Ohlin framework, Kletzer and Bardhan compared two international trade models with

the same factor endowments but one sector in one of the models depends also on external finance for working capital. They show that the country with less credit market restrictions specializes in the sector that uses external finance and the country with the higher level of credit market restrictions specialize in the sector that does not require working capital or external finance. Their analysis concluded that a well developed financial sector can theoretically lead to a comparative advantage in industries that rely more on external financing and can explains the variance of the trade structure across countries. On the other hand, the work of Baldwin is based the risk-diversification function of a financial market consisting of two countries, two sectors, and one factor with the demand for one of the sector is subject to demand shocks and the other is not. He posits that economies with better developed financial markets are better able to diversify risk because they have better diversification possibilities. Consequently, they specialize in producing the risky good with relatively lower risk premiums.

Based on the conclusions of Kletzer and Bardhan (1987) and Baldwin (1989), Beck (2002) investigated and explored the possible relation between financial development and international trade by building both theoretical model and empirical model to test his hypothesis. The theoretical model with two sectors shows that the sector with high scale economies profits more from a higher level of financial development. Therefore, countries endowed with a well developed financial system tend to specialize in sectors with high scale economies because of comparative advantage. The empirical model that uses both cross-country and panel estimations in a sample of 65 countries gives support to the prediction of the theoretical model. In his second study, Beck (2003) verifies successfully the possible link between financial development and trade structure. That is, his empirical results provide robust evidence that countries with a higher level of financial development have higher export shares and trade balances in industries that

rely more on external finance. These two studies firmly show that an increase in the level of financial development has a positive impact on the value of exports, especially if industries report a higher level of external financial dependence.

Further empirical studies on the finance-trade link have emerged in both firm-level and country or sectoral level. Muul (2008) and Berman and Hericourt (2008) are among those who focus on firm-level data. Using dataset on export transactions at the firm level for the Belgian manufacturing sector, Muul analyzes the interaction between credit constraints and exporting behavior. He found that firms are more likely to be exporting if they enjoy higher productivity levels and lower credit constraints. He concludes that credit constraints really do matter for export patterns. Berman and Hericourt study show financial factor affect both firms' export decisions and the amount exported by firms. Using a large cross-country firm level database in developing and emerging economies, they found that financial constraints create a disconnection between firms' productivity and their export status. According to them, an increase in a country's financial development increases the number of exporters and on the exporters' selection process through dampening such disconnection. These 2 studies basically agree that financial development does really matter for export patterns with economies with higher level of financial developments should have greater comparative advantage.

Examples of empirical work that study at the sectoral level are given by Hur et al. (2006) and Manova (2008). Hur et al. investigate the impact of a country's financial development and its firms asset structure on the trade flow of different industries. Using data on 27 industries in 42 countries they found that economies with higher levels of financial development have higher export shares and trade balance in industries with more intangible assets. Manova (2008) developed a model with credit-constrained heterogeneous firms, countries at different levels of

financial development, and sectors of varying financial vulnerability. She shows that financially developed countries are more likely to export bilaterally and ship greater volumes when they become exporters. She empirically found robust, systematic variations in export participation, volumes, product variety, product turnover, and trade partners across countries at different levels of financial development and across sectors at different levels of financial vulnerability.

Empirical Specification

Our analysis is based on the gravity model of panel data for two reasons. First, the gravity model has been widely used to describe bilateral trade patterns and has exhibited satisfactory performance in representing trade flows (Deardorff, 2004; Disdier and Head, 2008) and has strong theoretical foundations as provided in papers such as Anderson (1979) and Anderson and van Wincoop (2003). Second, unlike the regular cross-section model, the gravity model with panel data provides an attractive way of dealing with unobserved heterogeneity as well as functional specifications (Baldwin, 1994; Matyas, 1997).

To empirically assess the impact of financial reforms on trade flows, we augment a variable called index of financial reforms (*FinReform*) that measures financial development or liberalization developed by Abiad *et al.* (2010) in the gravity model. There are two versions of *FinReform*: the non-normalized *FinReform* that ranges from 0 to 21 and the normalized *FinReform* whose values are from 0 to 1, where higher values of *FinReform* indicate higher liberalization in the financial sector. We would expect that countries with less developed financial development would experience less agricultural trade volume and vice versa. The model is written as

$$(1) \qquad \ln T_{ijt} = \alpha_i + \gamma_j + \nu_t + \mathbf{x}_{ijt}^{'}\boldsymbol{\beta} + \delta FinReform + u_{ijt},$$

Where $\ln T_{ijt}$ is the logarithmic value of agricultural exports and $\mathbf{x}_{ijt}^{'}$ is a $k\,x1$ row vector of explanatory variables normally included in the gravity model. All variables in $\mathbf{x}_{ijt}^{'}$ are stated in logarithm form except for the dummy variables. α_i, γ_j and ν_t are, respectively, exporter, importer, and time effects. In empirical work, a number of explanatory variables are included in the row vector $\mathbf{x}_{ijt}^{'}$ including gross domestic product (GDP), population, geographic distance, and time invariant variables such as language commonality, border measures, and trade blocs. Generally, any variable can be augmented into equation (3). Following Helpman (1987) and Baltagi *et al*. (2003), our empirical model includes three explanatory variables related to both gross domestic product and population: the sum of bilateral trading partner GDP as a measure of bilateral overall country size ($LGDP_{ijt}$), an index that measures relative country size ($LGDPI_{ijt}$), and the absolute difference in relative factor endowments between the two trading partners ($LGDPP_{ijt}$). As in the standard gravity model, geographical distance between trading partners ($LDIS_{ij}$) is included in the model to represent a proxy of trade costs. We also include language commonality to represent cultural familiarity and regional trade agreements (RTA) variables. To measure distance proximity, we also include a variable to reflect common borders between trading partners.

Including all variables, our empirical gravity equation can be expressed as follows:

$$\ln T_{ijt} = \alpha_i + \gamma_j + \nu_t + \beta_1 LGDP_{ijt} + \beta_2 LGDPI_{ijt} + \beta_3 LGDPP_{ijt} + \beta_4 LDIS_{ij} + \beta_5 FinReform_{it} + \beta_6 Language + \beta_7 Border + \beta_8 RTA + u_{ijt} \quad (2)$$

Where

$LGDP_{ijt} = Ln(GDP_{it} + GDP_{jt})$,

$$LGDPI_{ijt} = Ln\left[1-\left(\frac{GDP_{it}}{GDP_{it}+GDP_{jt}}\right)^2-\left(\frac{GDP_{jt}}{GDP_{it}+GDP_{jt}}\right)^2\right],$$

$$LGDPP_{ijt} = \left|Ln\left(\frac{GDP_{it}}{N_{it}}\right)-Ln\left(\frac{GDP_{jt}}{N_{jt}}\right)\right|.$$

Language is language commonality that takes a value of one if two trading partners share common language and zero otherwise. *Border* takes a value of one if two trading partners share common border and zero otherwise. *RTA* takes a value of one if a pair of countries takes part in the same RTA. *FinReform* is the normalized financial reform index as defined previously.

A Count Data Model for the Gravity Equations and Estimation Procedures

Despite its most commonly used economic tools to investigate bilateral trade flows, the logarithmic transformation of the gravity model (log-log model) as shown in (1) has faced increasing resistance. This is because there are some serious problems with this model specification. Santos Silva and Tenreyro (2006) underline two important points with regard to the log normal gravity model. First, by Jensen's inequality ($E[\ln EXP_{ijt}] \neq \ln E[EXP_{ijt}]$), they argue that the log linear model cannot be expected to provide unbiased estimates of mean effects when the errors are heteroscedastic. The second point emphasized by Santos Silva Tenreyo is the prevalence of zero trade flows. Obviously, the log linear model is not defined for observations with zero trade. They point out that zero trade flows are very common. Helpman et al. (2008) also reported that about half of the country-level trade flows have zero values. Our data set also show the prevalence of zero trade flows between trading partners.

Given the problems with the log linear specification, alternative methods have been proposed to handle the problems properly. The traditional methods are simply to ignore zero flows or to arbitrarily add a small constant factor between 0.01 and 1 to each observation with

zero trade. However, these procedures will generally lead to inconsistent estimators of the parameters of interest and bias the results (Silva and Tenreyro, 2006). The alternative method is to adopt the count data model (Santos Silva and Tenreyzo, 2006, 2009; Burger et al, 2009) because, unlike the log-normal specification, the count data model of the gravity equation does not face the problems outlined above since it generates estimates of T_{ijt} instead of $\ln T_{ijt}$, and thereby provides a natural way to deal with zero-valued trade flows.

The starting point in many count data analyses is the Poisson model. However, the Poisson regression has been criticized for having the restrictive property of equidispersion (equality between the variance and the mean). Greene (1994) pointed out that, in real-life applications, the conditional variance is often higher than the conditional mean (overdispersion), particularly because the presence of unobserved heterogeneity is not taken into account by the Poisson Model. Overdispersion normally results in inefficient estimation, exemplified by spuriously large z-values due to downward biased standard errors (Cameron & Trivedi, 1986). To overcome this problem, the negative binomial model has been developed for panel data. It allows for the second conditional moment to differ from the first and therefore can accommodate the problems of over and under dispersions, unobserved individual heterogeneity, and even non-Poissoness such as over abundance of zero values of the dependent variables (Greene, 1994). The adoption of the negative binomial model in this study is justified given that our data show considerable overdispersion and that empirical test suggests that the hypothesis of equidispersion is rejected.

The question of fixed versus random effects has been addressed extensively in the literature on panel data models. Greene (2003) states that it might be appropriate to model the individual specific constant terms as randomly distributed across cross-sectional units if the cross

sectional units were drawn from a large population. Similarly, Hilbe (2007) suggests that random effects estimators are more efficient that fixed effects estimators when the data come from within a larger population of observations, as well as there are more panels in the data. Moreover, Mundlak (1978) argues that we should always treat the individual effects as random because the fixed effects model is simply analyzed conditionally on the effects present in the observed sample. For these reasons, we adopt a random effects negative binomial model in this study. Our fit statistics also suggest that the random effects model is preferred over the fixed effects model and that the negative binomial model is more appropriate than the Poisson model.

Following (Hausman, Hall, and Griliches, 1984), the conditional expected value and variance of the random effects negative binomial are given as:

(3) $E(T_{ijt} \mid \mathbf{x}_{ijt}, \alpha_{ij}) = \alpha_{ij}\lambda_{ijt}$ and

(4) $V(T_{ijt} \mid \mathbf{x}_{ijt}, \alpha_{ij}) = \alpha_{ij}\lambda_{ijt}(1+\alpha_{ij})^{-1}$,

where $\lambda_{ijt} = Exp(\mathbf{x}_{ijt}^{'}\boldsymbol{\beta})$, with $\mathbf{x}_{ijt}$ being the exogenous covariates at time *t* and $(1+\alpha_{ijt})^{-1}$ is a beta distributed random variable with parameters (a,b). The joint density of trade flows is given by

(5) $$\Pr(T_{ij1},.....,T_{ijT}) = \left(\prod_{i=1}^{T}\frac{\Gamma(\lambda_{ijt}+T_{ijt}}{\Gamma(\lambda_{ijt})\Gamma(T_{ijt}+1)}\right)x\frac{\Gamma(a+b)\Gamma(a+\sum_{t}\lambda_{ijt})\Gamma(b+\sum_{t}T_{ijt})}{\Gamma(a)\Gamma(b)\Gamma(a+b+\sum_{t}\lambda_{ijt}+\sum_{t}T_{ijt})},$$

where $\Gamma(.)$ is the gamma function. Details on extension and derivation of the fixed effects and random effects of both Poisson and negative binomial models can be found in Hausman, Hall, and Griliches (1984) and Greene (2007). Note that equation (5) provides the basis for maximum likelihood estimation $a, b,$ and β; and the maximum likelihood estimation is implemented in the statistical software package STATA.

Data

To conduct analysis, we use bilateral export data on agricultural products for a set of 49 countries in the period 1989 and 2008. Instead of using annual data, we averaged trade flows for each of five years, giving 4 time series of 5-year average trade flows. Similarly, other non-dummy variables are treated the same. The bilateral trade data on agricultural products are obtained from UN COMTRADE database with SITC rev.1. The data are expressed in US dollars and deflated using the CPI. We use the SITC definition to construct agricultural products. According to SITC classification, agricultural products are those products in the categories SITC0 (food and live animals), SITC1 (beverages and tobacco), SITC2 (crude materials, inedible, except fuel), and SITC4 (animal and vegetable oils and fats). Excluding in the category are SITC27 (crude fertilizer and crude mineral) and SITC28 (metallic ferrous ores and metal scrap).

GDP and population used to construct the variables LGDP, LGDPPI, and LGDPP are from World Development Indicator (WDI) of the World Bank. GDP is in billion US dollars (real value) and population is in millions. The geographical distance is in miles and is calculated between the capitol cities of two trading partners using the World Atlas. We use OECD data on major regional trade agreements (RTAs) to determine whether pairs of countries take part in a particular RTA. We use CIA's World Factbook to assess whether two countries have at least the same official language in order to create the dummy variable Language.

Our financial development indicator is measured using a financial reform index developed by Abiad et al (2010). The index covers 91 countries representing different regions and levels of economic development. The index covers a period of 33 from 1973 to 2005. For the period of 2006 and 2008, we assume that there was no significant reform in the financial system,

therefore the index values of this period are the same as those in 2005. We average 5 year period of the index in conjunction with the other variables as stated previously.

The index is constructed based on seven different dimensions of financial sector policy: (1) credit controls and excessively high reserve requirements, (2) interest rate controls, (3) entry barriers, (4) state ownership in the banking sector, (5) financial account restrictions, (6) prudential regulations and supervision of the banking sector, and (7) securities market policy. Each dimension is coded from zero (fully repressed) to three (fully liberalized), giving a total value ranging from 0 to 21. The index is then normalized in the unit interval. Summary statistics of the financial reform index and other variables are given in Table 1.

[Place Table 1 Approximately Here]

Results and Discussion

Effects of Overall Financial Reforms

For comparison purposes, we provide the estimation results of the Poisson model of the gravity equation using maximum likelihood estimation as given in Colum 2 of Table 2. As shown, all parameter estimates in the Poisson model are statistically significant and have the expected signs, except the intercept term. The variable LDIST is negative indicating that the export volume decreases with geographic distance: an increase in distance by 1% leads to a decrease in exports volume by 1.1%. The positive signs of both LGDP and LGDPI show that bigger country size (overall and relative) has positive impacts on trade volume. The positive sign of LGDPP suggest that the model adheres to the Linder Hypothesis. The variables describing cultural and economic proximity of countries such as common language, common border, and having a free trade agreement all positively affect the volume of bilateral trade. Our variable of interest FinReform has positive sign suggesting that financial reform that occurred in exporting

countries has positive impacts on export volume. A one percentage change in an index of financial reform within exporting countries leads to an increase of 0.78% in export volume.

Although the Poisson estimation enables us to move away from the need for a logarithmic transformation of the gravity model and helps by taking away into account the possible bias created by the exclusion of zero trade flows, it is, however, very restrictive in its assumption that the conditional mean and variance are equal. This may be too strong and hence fail to account for the over-dispersion that characterizes many data sets (Cameron and Trivedi, 1986). In fact, our estimate of the over-dispersion parameter alpha shows a non-zero value, suggesting that the Poisson model is not appropriate. Furthermore, the likelihood ratio test of over-dispersion and, the goodness of fit statistics, as indicated by AIC and BIC statistics, appear to favor the negative binomial model over the Poisson model. Therefore, we conclude that the binomial model is preferred to the Poisson model in fitting our data set.

[Place Table 2 Approximately Here]

The estimation results of the negative binomial model are shown in column 3 of Table 2. Compared to the Poisson model, the effects of all included variables on the export volumes are of the same sign; except for the effect of contiguity dummy (BORDER) and the intercept term. Taking into account the over-dispersion using the binomial model, the magnitude of estimated parameters differ substantially. The choice of distribution that allows over-dispersion heavily affects regression outcomes. As shown in Table 2, all estimated variables for the negative binomial model are smaller in magnitude than those in the Poisson model. The elasticity of trade volume with respect to geographic distance is found to be -0.65 (compared to -1.1 in the Poisson model), meaning that export volume decreases by 0.65 percentage point as the distance increases

by 1 percentage point. This estimate is somewhat lower than the average estimate of distance decay of -0.91 as reported by Disdier and Head (2008) but it still falls in the empirical range.

The estimated parameter for overall country size variable falls from 1.48 to 0.93 and the relative country size goes down from 0.43 to 0.31. Similarly, the estimate of the relative factor endowment (LGDPP) is smaller in magnitude and has positive sign. The consistency in sign of the relative factor endowment suggests that our results are in favor of the classical H-O-S trade theory where trade raises with relative factor endowment differences. The estimated parameters of language commonality and regional trade agreements are 0.58 and 0.28, respectively. The negative sign of contiguity variable is very surprising. One possible explanation is that exporting countries may see the potential market of importing countries more than proximity.

Turning to our variable of interest, the results in column 3 show evidence for the importance of financial reform on bilateral trade flows. The estimated coefficient of *FinReform* is significantly positive at the 1% level with a magnitude of 0.66. A 10 percent higher level in financial reform index implies 6.6% larger agricultural exports. This result is consistent with the theoretical prediction given in Kletezer and Bardhan (2007) and Manova (2008) as well as empirical analysis given in Beck (2002, 2003) where countries with higher levels of financial development have tended to export more as their comparative advantage improves.

Although the estimation results confirm the positive effects of financial development on agricultural exports, they do not tell how the marginal effects differ between countries with different stages of development. This notion is important given that the effects of financial development on exports is closely related to the initial development of financial institutions (Berthou, 2009) and is highly conditional on a country's pre-existing circumstance such as economic, historic, cultural or geographic specificities (Apoteker and Crozet, 2003). To account

for possible different effects of a country's stage of economic development, we re-estimate the model by dividing exporting countries into advanced and developing countries.

Effects of Country Group

Data on FRI show the existence of clustering in financial liberalization process, particularly within advanced countries and developing countries. In most cases, advanced countries have tended to liberalize their financial sectors earlier than developing countries. As shown in Table 1, advanced countries have a higher average value of the financial reform index than developing countries and most advanced countries have reached full liberalization.

To analyze the possible effects of country groups, we divide the sample observations into advanced countries and developing countries and analyze the impacts of the financial reform index on agricultural exports between the two country groups. There are 6 possible combinations of exports flows. These are exports from advanced countries to all countries, advanced to advanced countries, advanced to developing countries, developing to all countries, developing to advanced countries, and developing to developing countries.

Table 3 contains the estimation results for the negative binomial model with trading partner groups, where cases 1 to 3 show the results of agricultural exports originating from advanced countries to all countries, advanced countries, and developing countries. While cases 4 to 6 give the results for agricultural exports originated from developing countries and shipped to all countries, advanced countries, and developing countries. As shown, the financial reform index has the greatest impacts on exports originated and destined to advanced countries (Case 2) followed by Case 1 for all countries. This effect is relatively low and not significant in Case 3 for developing country destinations. On the other, the effects of the financial reform index on developing countries are relatively low compared to advanced countries with the exception of

Case 5 where exports were shipped from developing countries to advanced countries. Clearly, the impacts of financial reforms on agricultural exports that occurred between advanced countries more than tripled those between developing countries (Case and Case 6).

Therefore, the results show some evidence that financial reform will have a larger effect when it is adopted by countries with a better developed financial system and supporting institutions, *i.e*. developed countries. The intuition is related to the theoretical framework of the financial and trade relationships described previously in that most firms with lower productivity levels, which are normally found in developing countries, require a higher level of financial development to start exporting. When financial institutions are poorly developed, financial development enables only a few firms to start exporting, which inevitably has only a small effect on aggregate exports. When financial institutions are better developed, financial reform enables more firms to start exporting, and has a larger effect on aggregate exports. Our results seem to support the above arguments.

[Place Table 3 Approximately Here]

Conclusions

This paper has empirically examined the possible link between a nation's financial reform and agricultural trade flows. We use a gravity specification with a variable representing financial reforms augmented into it. The investigation is conducted by analyzing the effects of financial reform on all countries included in the analysis and analyzing whether the initial level of financial development has different impacts on the flow of agricultural exports by developed and developing countries.

The results provide empirical evidence on the impacts of financial reform on agricultural trade flows. Overall, financial reforms have positive impacts on agricultural trade flows,

meaning that the higher level of financial development within a country, the greater the positive impact on agricultural exports. Using advanced and developing countries to differentiate the initial level of financial reform, the results indicate that countries with higher initial financial development as shown in advanced countries have higher marginal impacts on agricultural exports. Results indicate that bilateral agricultural trade involving advanced countries responds by a higher degree of magnitude to financial reform than developing countries.

The results of this study provide the first empirical examination of the literature on the possible link between international trade and financial development focusing on the agricultural sector. Specifically this study provides supporting evidence for the models on trade and financial reform as described earlier. Furthermore, the results have policy implications for policy reform in the financial sector. The linkage established by this study is of particular importance given the strong relationship between agricultural production and trade in most developing countries and provides a solid policy foundation for pursuing financial reform in those economies in order to stimulate agricultural trade and economic growth. A country with a low level of financial development that undertakes financial reform should benefit from doing so because agricultural exports would be expected to rise.

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Table 1. Summary statistics of variables used in estimations

Variable	Mean	SD	Min.	Max	N
Yearly average agric. exports (million)	123	680	0	26,859	14,112
Geographic distance (ln)	8.26	0.86	3.78	9.42	14,112
LGDP	5.91	1.34	2.00	9.69	14,112
LGDPI	-1.66	1.08	-7.16	-0.69	14,112
LGDPP	1.62	1.18	0.00	5.09	14,112
Common language dummy	0.16	0.36	0	1	14,112
Contiguity dummy	0.05	0.22	0	1	14,112
Regional trade agreement dummy	0.13	0.33	0	1	14,112
Financial reform index (exporter)					
Total	0.61	0.28	0.00	1.00	14,112
Advanced country	0.78	0.22	0.12	1.00	6,048
Developing country	0.48	0.26	0.00	0.95	8,064

Source: Calculated

Table 2. Random Effects Models of the Gravity Models

Variable	Poisson	Negative Binomial
INTERCEPT	0.3002 (0.3555)	-0.6282 (0.2961)**
LGDP	1.4826 (0.0174)***	0.9293 (0.0227)***
LGDPI	0.4301 (0.0158)***	0.3109 (0.0239)***
LGDPP	0.2856 (0.0142)***	0.0332 (0.0171)*
LDIST	-1.1046 (0.0353)***	-0.6479 (0.0277)***
BORDER	0.5489 (0.1166)***	-0.3179 (0.0827)***
LANGUAGE	0.5826 (0.0718)***	0.4378 (0.0513)***
RTA	0.2822 (0.0086)***	0.2431 (0.0311)***
FinReform	0.7752 (0.0204)***	0.6646 (0.0897)***
Alpha	1.1655 (0.0344)***	-
a	-	0.9789 (0.0336)
b	-	2.5405 (0.1505)
Observations	9,408	9,408
Fit Statistics		
Neg. LL	64,554	32,944
AIC	129,230	66,012
BIC	129,666	66,455

Notes: ***, **, and * are significant at the 1%, 5%, and 10% levels, respectively.

Table 3. Random Effects Models of the Negative Binomial: Country Groups

Variable	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6
INTERCEPT	1.727**	2.156	2.596	-3.109***	1.358	-5.637**
	(0.809)	(1.823)	(1.926)	(0.934)	(1.559)	(1.191)
LGDP	0.862***	0.625***	0.786***	1.389***	0.720***	1.307***
	(0.123)	(0.173)	(0.214)	(0.154)	(0.271)	(0.225)
LGDPI	0.205***	0.144	0.199	0.450***	0.279*	0.375***
	(0.069)	(0.091)	(0.126)	(0.084)	(0.151)	(0.127)
LGDPP	0.123*	0.119	-0.367***	0.035	-0.015	0.206*
	(0.064)	(0.091)	(0.119)	(0.036)	(0.055)	(0.122)
LDIST	-0.537***	-0.615***	-0.575***	-0.698***	-0.775***	-0.495***
	(0.053)	(0.074)	(0.088)	(0.050)	(0.067)	(0.089)
BORDER	-0.147	-0.112	0.494*	-0.246	-0.519***	0.449
	(0.120)	(0.130)	(0.270)	(0.139)	(0.165)	(0.288)
LANGUAGE	0.290***	0.444***	0.230*	0.582***	0.633***	0.314**
	(0.084)	(0.107)	(0.127)	(0.082)	(0.131)	(0.125)
RTA	0.276***	0.278***	0.158**	0.128**	0.243*	0.240***
	(0.037)	(0.045)	(0.077)	(0.061)	(0.131)	(0.075)
FinReform	0.620***	0.867***	0.196	0.221*	0.518**	0.249*
	(0.142)	(0.169)	(0.269)	(0.125)	(0.233)	(0.144)
a	1.157	1.780	1.364	1.076	1.145	1.259
	(0.064)	(0.194)	(0.097)	(0.051)	(0.075)	(0.093)
b	4.145	16.34	2.712	1.966	1.694	3.071
	(0.387)	(2.858)	(0.291)	(0.152)	(0.187)	(0.359)
Observations	4,032	1,680	2,352	5,376	3,028	2,348
Fit Statistics						
Neg. LL	17,231	9,166	7,883	15,034	6,810	8,105
AIC	34,627	18,441	15,889	30,246	13,758	16,333
BIC	35,143	18,734	16,241	30,833	14,173	16,685

Notes: ***, **, and * are significant at the 1%, 5%, and 10% levels, respectively.