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The Next-11 and the BRICs: Are They the Future Markets for Agrifood Trade?

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Abstract

In the mid-2000's, Goldman Sachs identified two groups of emerging economies known as the BRICs and the Next-11. Primarily selected on the basis of having large populations, these countries were heralded as the growth centres of the future with the potential to stimulate increased demand for a wide range of commodities, including food. This study uses an import demand model to estimate how income influences per capita expenditure on agrifood imports in 63 countries. The findings suggest that as groups the BRICs and N-11 do not differ from other low, middle, or high income countries with respect to their import behaviour. However, disaggregation of the two groups reveals significantly larger expenditure elasticities for China, India, South Korea and Vietnam. A forecasting exercise reveals the capacity of income and population growth in China, India, Indonesia, Russia, South Korea and Vietnam to substantially increase their expenditure on imported agrifood products.

Introduction

Between 1990 and 1999, the average real economic growth in emerging nations exceeded GDP growth in the G7 by only a percentage point. Hence, when Wilson and Purushothaman (2003), of Goldman Sachs, predicted that the combined economies of the BRICs[1] would exceed the size of the G6 in less than 40 years it was greeted with some skepticism.[2] However, between 2000 and 2010 the average real growth rate in emerging economies (6.2 percent) was nearly four times larger than in the G7 (1.6 percent). Table 1 documents the economic performance of the BRICs as compared to the G7 for 2000, 2010 and the IMF's projections for 2016 (IMF, 2010). In 2000, the BRIC's aggregate GDP was 12.2 percent of the G7; by 2010 it was more than a third; and by 2016 the IMF predicts that the BRIC's aggregate GDP will be more than one-half of that of the G7. From 8 percent of the world's economy in 2000, by 2016 the BRICs will account for 23 percent of the world's economic activity, while the G7's share of world GDP drops from 66 to 44 percent. Wilson and Purushothaman (2003) also predicted that by 2009 the annual increase in spending by the BRICs would be greater than in the G6. In this case their prediction appears very conservative because between 2009 and 2010 the increase in GDP in the G6 was US$1.1 trillion versus US$1.9 trillion in the BRICs, when measured using official exchange rates, and considerably higher at purchasing power exchange rates. It is now obvious that a major realignment of economic power will be a major story of the 21^{st} Century.

[1]The BRICs are: Brazil, Russia, India, China

[2]The G6 is a group of six wealthy, industrialized nations formed in 1975. Members include: France, Germany, Italy, Japan, United Kingdom and the United States. In 1976, Canada joined to form the G7. Between 2000 and 2009, on average, the cumulative GDP of the G7 (in real terms) represented roughly 60 percent of global GDP (IMF, 2010).

Table 1: BRIC, N-11 and G7 Country Summaries

Country	2000 Pop. (mil.)	2000 GDP (bil.)	2000 GDP per capita	2010 Pop. (mil.)	2010 GDP (bil.)	2010 GDP per capita	2016 Pop. (mil.)	2016 GDP (bil.)	2016 GDP per capita
G7									
Canada	31	$725.0	$23,653	34	$1,577.0	$46,303	36	$2,106.0	$58,674
France	59	$1,332.0	$22,550	63	$2,563.0	$40,704	65	$3,268.0	$50,497
Germany	82	$1,892.0	$23,051	82	$3,286.0	$40,274	81	$3,929.0	$48,731
Italy	57	$1,101.0	$19,334	60	$2,055.0	$34,059	62	$2,476.0	$40,100
Japan	127	$4,667.0	$36,800	128	$5,459.0	$42,783	127	$6,783.0	$53,615
U.K.	59	$1,481.0	$25,142	62	$2,250.0	$36,164	65	$3,224.0	$49,777
U.S.	282	$9,951.0	$35,252	310	$14,527.0	$46,860	328	$18,251.0	$55,622
Total/Avg.	**697**	**$21,149.0**	**$30,343**	**739**	**$31,717.0**	**$42,919**	**764**	**$40,037.0**	**$52,404**
BRICs									
Brazil	171	$642.0	$3,751	193	$2,090.0	$10,816	203	$3,373.0	$16,635
China	1,267	$1,198.0	$946	1,341	$5,878.0	$4,382	1,382	$11,780.0	$8,523
India	1,024	$476.0	$465	1,191	$1,632.0	$1,371	1,289	$3,027.0	$2,349
Russia	146	$260.0	$1,775	143	$1,480.0	$10,356	140	$3,088.0	$22,066
Total/Avg.	**2,608**	**$2,576.0**	**$988**	**2,868**	**$11,080.0**	**$3,863**	**3,014**	**$21,268.0**	**$7,056**
Next-11									
Bangladesh	141	$47.0	$334	164	$106.0	$642	179	$174.0	$973
Egypt	63	$99.0	$1,566	78	$218.0	$2,808	88	$342.0	$3,901
Indonesia	205	$166.0	$807	238	$707.0	$2,974	255	$1,382.0	$5,429
Iran	55	$85.0	$1,559	75	$407.0	$5,449	82	$630.0	$7702
S. Korea	47	$533.0	$11,317	49	$1,014.0	$20,756	50	$1,686.0	$33,948
Mexico	98	$672.0	$6,859	109	$1,034.0	$9,522	115	$1,505.0	$13,052
Nigeria	119	$46.0	$390	156	$203.0	$1,298	184	$359.0	$1,957
Pakistan	138	$74.0	$539	172	$177.0	$1,030	194	$303.0	$1,566
Philippines	77	$81.0	$1,053	94	$200.0	$2,123	106	$307.0	$2,907
Turkey	66	$266.0	$4,026	71	$735.0	$10,309	76	$1,133.0	$14,839
Vietnam	78	$31.0	$402	88	$104.0	$1,174	95	$210.0	$2,217
Total/Avg.	**1,087**	**$2,100.0**	**$2,626**	**1,294**	**$4,905.0**	**$5,280**	**1,424**	**$8,031.0**	**$8,045**
TOTALS	**4,392**	**$25,825.0**	**$5,880**	**4,901**	**$47,702.0**	**$9,734**	**5,202**	**$69,336.0**	**$13,329**
World	**6,115**	**$32,216.0**	**$5,268**	**6,909**	**$62,911.0**	**$9,106**	**7,302**	**$91,575.0**	**$12,541**

Source: IMF (2010). Actual data is used for 2010 where it is available, where it is not, IMF projections are used.

In 2007, Wilson and Stupnyska authored another Goldman Sachs report emphasizing the growth potential of an additional eleven emerging economies that they termed the next eleven (N-11).[3] Wilson and Stupnyska (2007) make several predictions regarding the growth potential of the group, noting that in general N-11 members have demonstrated a willingness to engage in more open trade by removing trade barriers and could grow to have a cumulative GDP two-thirds the size of the G7 by 2050. Table 1 shows that the N-11 currently have about 20 percent of the world's population, this is less than one-half of the population of the BRICs and about twice as many people as in the G7. The GDP of the N-11 is forecast to increase from seven percent of global economic activity to nine percent between 2010 and 2016. However, the N-11 is a diverse group of geographically dispersed countries. Some are close to large economic centres while others are more isolated. Two members of the N-11 have GDP's greater than US$1 trillion (South Korea, Mexico) while two are only a tenth as large (Bangladesh, Vietnam). In terms of GDP per capita South Korea ($20,756) stands out producing twice as much as the second most productive N-11 member Turkey ($10,309) in 2010. Currently, Iran faces stringent economic sanctions that will seriously hamper its economic growth potential.

The combination of higher economic and population growth in the N-11 and BRICs, coupled with a larger proportion of income spent on food in developing countries (Cranfield et al., 2002) could translate into significant increases in expenditure on agrifood. The anticipated increase in agrifood expenditures has the potential to increase agrifood imports as consumers begin to diversify their diets and/or if domestic food production rises slower than consumption – an important development for major agrifood exporters facing stagnant growth prospects in developed country markets. In short, there may be gains to be had by agrifood exporters targeting these developing markets as noted by Haq and Meilke (2009a).

[3] The Next-11 are: Bangladesh, Egypt, Indonesia, Iran, Mexico, Nigeria, Pakistan, Philippines, South Korea, Turkey and Vietnam

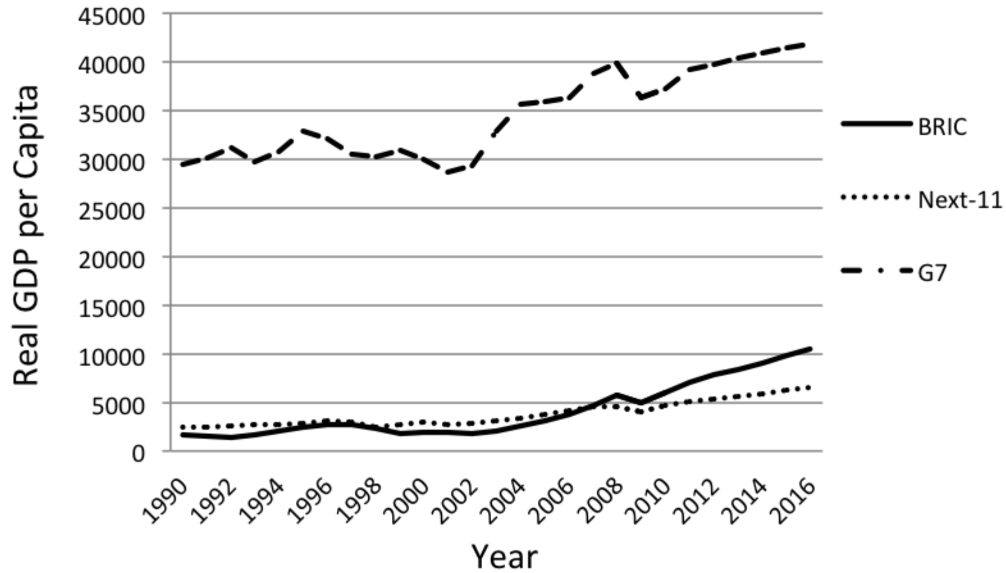

Figure 1: Actual and predicted GDP per capita of the BRIC's and Next-11, 1990-2016

Wilson and Stupnyska (2007) argue that with respect to the N-11:

> *Incremental new demand from the N-11 could conceivably overtake the G7 in around 25 years and be twice that of the G7 by 2050, so their growth contribution will rise faster.*

Examining how income growth influences the expenditure of the BRICs and the N-11 on agrifood imports can yield valuable insights into their potential as sources of import demand. This study will test the following hypotheses:

1. The expenditure elasticities for agrifood imports in the BRICs and N-11 (as a group) differ from other low, middle and high income countries.[4]

2. The expenditure elasticity for agrifood imports of the BRICs differs from the N-11.

[4]The term expenditure elasticity is used instead of income elasticity throughout the paper. The term income elasticity conventionally refers to the responsiveness of an increase in the quantity demanded relative to a change in income. However, the dependent variable in this study is the per capita value or expenditure on agrifood imports, therefore what is actually being measured is how the expenditure on agricultural or food imports changes with income growth. Coefficients on income variables are referred to as expenditure elasticity in order to avoid confusion with the formal definition.

3. The expenditure elasticities for agrifood imports differ across members of the BRICs and N-11.

The first hypothesis captures the average effect of income on import expenditure when BRIC and N-11 member countries are grouped, while the second tests whether the expenditure elasticities of the two groups are different. The final hypothesis disaggregates the BRICs and N-11 in order to test whether the expenditure elasticities of individual members differ.

This paper follows previous work by Haq and Meilke (2009a,b) in examining whether income growth has positively influenced expenditure on agrifood imports. However, we use aggregate agrifood trade data to explicitly compare the BRICs and N-11 as well as the individual country members. Following this we utilize the estimated expenditure elasticities to forecast the import potential of the BRICs and N-11 relative to the G7; illustrating the importance of emerging markets for major agrifood exporters.

The Import Demand Model

This study follows Haq and Meilke (2009a) in its use of Hallak's (2006) import demand model, which assumes a two stage budgeting procedure. The utility function is additively separable implying that the utility gained from the consumption of imported agrifood products is seperable from all other products (Hallak, 2006; Haq and Meilke, 2009a).

In the first stage, the representative consumer exogenously allocates their consumption budget between imported agrifood products and all other goods. In the second stage, the consumer then allocates the portion of their budget dedicated to imported agrifood products across various exporters in order to maximize their CES utility function with Dixit-Stiglitz preferences in year t (equation 1) (Hallak, 2006; Haq and Meilke, 2009a,b):

$$\underset{x}{\text{Max}} \qquad U_{it} = \sum_{j=1}^{J} (x_{ijt}^{\rho})^{\frac{1}{\rho}} \tag{1}$$

$$\text{s.t.} \qquad E_{it} = \sum_{j=1}^{J} x_{ijt} p_{ijt}$$

where x_{ijt} and p_{ijt} are the quantity demanded and the price in importing country i for agrifood from country j in time t. The utility function in equation 1 contains a substitution parameter (ρ), which accounts for the propensity to substitute between various exporters. The substitution parameter has a lower asymptote of zero in order to prevent the possibility that imports from different exporters are consumed in fixed proportions.[5] This is a realistic constraint, because an exporter's share of a country's imports typically varies from year to year. The upper bound of ρ is constrained to be less than one to ensure strict concavity of the utility function and to eliminate the possibility of linearity.[6]

Solving the constrained maximization problem gives the Marshallian demand function (Haq and Meilke, 2009a) where P_{ijt} represents an index of prices faced by importer i from exporters j where $j = 1 \dots J$.:

$$x_{ijt} = \frac{(p_{ijt})^{\frac{1}{(\rho-1)}}}{\sum_{j=1}^{J} P_{ijt}^{\frac{\rho}{(\rho-1)}}} E_{ijt} \tag{2}$$

From this demand function it is easy to generate a function (equation 3) that is specified in terms of the value of bilateral trade by multiplying equation 2 by the price of the good in

[5] As $\rho \to 0$ then the utility function begins to mimic a Leontief utility function, which would imply that imported agrifood products are perfect complements.

[6] Imposing strict concavity of the utility function implies it is also quasi-concave and therefore the indifference curves will be strictly convex to the origin. Strict convexity of the indifference curve means that the consumer prefers variety, i.e. they enjoy consuming imports from several exporters. This dismisses the notion of perfect substitutes which would suggest that the importing country imports food products from a single source.

the importing country (p_{ijt}) to get:

$$p_{ijt}x_{ijt} = \frac{p_{ijt}^{\frac{\rho}{(\rho-1)}}}{\sum_{j=1}^{J}(P_{ijt})^{\frac{\rho}{(\rho-1)}}}E_{it} \quad (3)$$

Equation 3 represents the expenditure on imports in country i from exporter j. It is implicitly assumed that the importer internalizes the transaction costs, and that the price of an imported good is a function of the exporter's price and the trade costs incurred when trading with a particular exporter, therefore let $p_{ijt} = p_{jt}t_{it}$ where t_{ij} represents an index of trade costs ($t_{ij} \in (1, \infty)$).[7] Next, for notational simplicity let the elasticity of substitution between agrifood exporters be a function of the substitution parameter represented by $\sigma = \frac{1}{1-\rho}$. Incorporating these changes into equation 3 and redefining the value of imports as $Imp_{ijt} = p_{ijt}x_{ijt}$ gives:

$$Imp_{ijt} = \frac{(p_{jt}t_{ijt})^{1-\sigma}}{\sum_{j=1}^{J}(P_{jt}T_{ijt})^{1-\sigma}}E_{it} \quad (4)$$

Here $P_{jt}T_{ijt}$ is an index of prices of all the prices faced by the importing country, which are a function of the price of the good in the exporting countries and the trade costs specific to each exporter for a given time period. Equation 4 represents the import demand function for imported agrifood products.

The Empirical Model

The empirical model does not explicitly include the price terms shown in equation 4. Instead fixed effects are used to account for the price terms identified in the conceptual model (equation 4) (Anderson and van Wincoop, 2003). Due to the lack of price data, this is the best (and a very common) alternative used in estimating import demand and gravity models

[7]Note that t_{ijt} must be greater than 1, otherwise it would imply there there are no transaction costs of engaging in international trade, which would in turn suggest that the country is trading with itself.

(Anderson and van Wincoop, 2003; Jayasunghe, Beghin, and Moschini, 2010; Matyas, 1997).

Again following standard convention, each specification of the empirical model contains several variables to proxy trade costs: distance ($Dist_{ij}$), an exchange rate variable ($Exchange_{ijt}$), and dummy variables indicating adjacency (Adj_{ij}), a shared official language ($Lang_{ij}$), a common colonizer ($Colony_{ij}$) and if a preferential trade agreement (PTA_{ijt}) exists between a country pair.[8] This study follows Grant and Lambert (2008) by including lags of the PTA variables to account for the implementation period dictated under a given PTA. In theory, as a particular agreement matures trade creation should occur due to the improved market access granted to trading partners from the gradual reduction in barriers to trade. We also include a variable for the exchange rate between a country pair as it affects the relative cost of trading with a given exporter. It is the ratio of the importer's currency to the exporter's; measuring how per capita expenditure on agrifood imports will change as the value of the importer's currency increases relative to the exporter's, with this definition we expect the sign of the exchange rate variable to be positive. The variables used to proxy trade costs are consistent with conventional specifications in the literature on trade potential using import demand and gravity models. Equation 5 is the log–linear function used to represent trade costs (t_{ijt}) in equation 4:

$$\begin{aligned} ln(t_{ijt}) = {} & \alpha_1 ln(Dist_{ij}) + \alpha_2 Adj_{ij} + \alpha_3 Lang_{ij} + \alpha_4 Colony_{ij} \\ & + \alpha_5 ln(Exchange_{ijt}) + \alpha_6 PTA_{ijt} + \alpha_7 PTA_{ijt-4} + \alpha_8 PTA_{ijt-8} \end{aligned} \tag{5}$$

Two specifications were used to test the hypotheses presented earlier. The first specification is obtained by taking the natural logarithm of the variables in equation 4, then substituting in equation 5 for $\ln(t_{ijt})$ and adding a stochastic error term (Haq and Meilke,

[8]Table 7 lists all of the variables in the empirical model along with brief descriptions.

2009a,b) to get:

$$\begin{aligned} ln(Imp_{ijt}) = \beta_0 + \psi_i + \psi_j + \psi_t + \beta_1 N\text{-}11_{it} + \beta_2 BRIC_{it} + \beta_3 LI_{it} + \beta_4 MI_{it} \\ + \beta_5 HI_{it} + \beta_6 lnDist_{ij} + \beta_7 Adj_{ij} + \beta_8 Lang_{ij} + \beta_9 Colony_{ij} \\ + \beta_{10} ln(Exchange_{ijt}) + \beta_{11} PTA_{ijt} + \beta_{12} PTA_{ijt-4} + \beta_{13} PTA_{ijt-8} + \mu_{ijt} \end{aligned} \quad (6)$$

To estimate the expenditure elasticities for imported agrifood products for a given country group, the natural logarithm of income (proxied by GDP per capita) is interacted with a dummy variable equal to one if the importing nation belongs to a given group and zero otherwise. Dummy variables are generated for five mutually exclusive groups: the BRICs, the N-11, and low (LI), middle (MI) and high income (HI) countries; where if an importer is a member of the BRICs or N-11 then they are excluded from the other income groups.[9] This specification allows us to explicitly examine whether the expenditure elasticity of the BRICs and/or N-11 differs from the elasticity of other low, middle or high income countries.

The second model specification disaggregates the BRICs and N-11 by member country, and interacts a dummy variable identifying each individual member with the natural

[9]Non-N-11 and non-BRIC countries included in the sample are classified according to the World Banks income groups. The composition of each income group may vary annually as some countries may experience enough per capita income growth (loss) to warrant a graduation (demotion) to another group – e.g. if in year t a country has a GDP per capita of less than \$996 they would be considered a low-income country, if economic growth results in a GDP per capita of \$1,005 in year t+1 they are now classified as a middle-income country.

logarithm of income:

$$
\begin{aligned}
ln(Imp_{ijt}) = {} & \beta_0 + \psi_i + \psi_j + \psi_t + \beta_1 Bra_t + \beta_2 Rus_t + \beta_3 Ind_t + \beta_4 Chn_t \\
& + \beta_5 Bang_t + \beta_6 Egy_t + \beta_7 Indo_t + \beta_8 Iran_t + \beta_9 Mex_t + \beta_{10} Nig_t \\
& + \beta_{11} Pak_t + \beta_{12} Phi_t + \beta_{13} Kor_t + \beta_{14} Tur_t + \beta_{15} Vnm_t + \beta_3 LI_{it} \qquad (7) \\
& + \beta_4 MI_{it} + \beta 5 HI_{it} + \beta_6 ln(Dist_{ij}) + \beta_7 Adj_{ij} + \beta_8 Lang_{ij} + \beta_9 Colony_{ij} \\
& + \beta_{10} ln(Exchange_{ijt}) + \beta_{11} PTA_{ijt} + \beta_{12} PTA_{ijt-4} + \beta_{13} PTA_{ijt-8} + \mu_{ijt}
\end{aligned}
$$

This allows for the estimation of country-specific expenditure elasticities which may reveal country heterogeneity among BRIC and N-11 members.

Zero Trade Flows

When analyzing trade potential, the presence of zero trade flows presents a significant dilemma (Haq, Meilke, and Cranfield, 2012; Madden, 2006).[10] While various studies have used different remedies (e.g., Leung and Yu (1996); Madden (2006); Puhani (2000)), we follow Haq, Meilke, and Cranfield (2012) and Jayasunghe, Beghin, and Moschini (2010) in using the Heckman selection model to account for the potential selection bias introduced as a result of zero trade flows. Each specification is also estimated using subsample OLS to provide a comparison with the unbiased parameter estimates obtained with Heckman's (1979) estimation procedure. In order to explicitly test for the presence of sample selection bias, both a conventional t-test on the coefficients of the inverse mills ratio and an empirical mean square error (EMSE) test (Toro-Vizcarrondo and Wallace, 1968) are employed.

There are two estimators commonly applied to the Heckman Selection Model, we follow Puhani (2000) and Dow and Norton (2003), and use the (full–information) maximum likeli-

[10] The need for trade economists to address zero trade flows stems from the use of the log-linear functional form, as mathematically you cannot take the logarithm of a nonpositive number.

hood estimator as it is more efficient, relative to the two-step estimator originally suggested by Heckman (1979).

Due to the inclusion of the inverse mills ratio in the Heckman estimation procedure the coefficients are not the marginal effects; the marginal effects (elasticities) are contingent on the assumptions made regarding the nature of the zero trade flows, namely, whether they represent "actual" or "potential" outcomes (Dow and Norton, 2003; Hoffman and Kassouf, 2005; Madden, 2006). Actual outcomes arise when the value of imports are equal to zero because a country did not import from another – i.e. a corner solution. In contrast, potential outcomes occur when zero trade flows represent missing data. When calculating marginal effects, potential outcomes must be treated differently than actual outcomes due to the presence of missing data, which results in sample selection bias.

UN Comtrade, the data source for the value of agrifood imports only publishes positive trade flow data (United Nations, 2010). Any zeros in the sample are therefore latent observations representing absent trade flows, and it is unclear whether they represent actual or potential outcomes. We calculate the marginal effects for both actual (conditional marginal effects) and potential (unconditional marginal effects) outcomes from the Heckman model. Doing so avoids having to make additional and unnecessary assumptions about the ambiguous nature of trade flows recorded as zero.

Data

The sample used in this study contains 24,800 bilateral trade flows from 20 major agrifood exporters to 63 importers over a period of 20 years (1990-2009). The exporters were the 20 largest agrifood exporters in 2008, and on average accounted for 74.5 percent of world agrifood exports over the sample period. Importers were included based on the following criteria:

1. they were a member of the BRICs, N-11 or one of the 20 major exporters; or
2. they imported more than US$ 5 million in agrifood; or
3. Canada generally exported more than one million in agrifood to the country in each of the 20 years.[11]

This resulted in the selection of 63 importers accounting for, on average, 90.5 percent of agrifood imports annually over the sample period.[12] The nominal US dollar annual value of agrifood imports for each country-pair and year are taken from UN Comtrade (United Nations, 2010), deflated using the US GDP deflator and divided by population.[13] The US GDP deflator (base year=2005), population, GDP and per capita GDP were obtained from the International Monetary Fund's World Macroeconomic Outlook Database (2010). The arithmetic weighted average distance between trade partners, and dummy variables identifying shared colonizers, adjacency and shared official languages are taken from CEPII (2011).[14] The PTA dummy variable is constructed from a list of regional trade agreements on the WTO's website (World Trade Organization, 2011). Due to the ambiguous coverage of

[11]The third selection criteria was included because of the author's plan to examine Canadian export performance in future research. Since this criterion resulted in Canada's exports to some countries of less than one million dollars being deleted, exports from all other exporters of less than one million dollars were set to zero. This affected 1,736 out of 24,320 observations. Since this truncation point is somewhat arbitrary, sensitivity analysis was performed to see if the degree of truncation alters the direction, magnitude, and/or significance of the parameter estimates. The sensitivity analysis indicated that the truncation point does not change the parameter estimates in any economically meaningful way.

[12]The 63 importers include (and their income ranking as of 2010): three low-income countries – Bangladesh, Ghana, Haiti; eleven low-middle income countries China, Ecuador, Egypt, Guatemala, India, Indonesia, Nigeria, Pakistan, Philippines, Thailand, and Vietnam; 19 upper-middle income – Algeria, Argentina, Brazil, Chile, Columbia, Dominican Republic, Iran, Jamaica, Malaysia, Mexico, Morocco, Panama, Peru, Russia, South Africa, Turkey, Uruguay, and Venezuela; and 33 high-income countries – Australia, Austria, The Bahamas, Barbados, Belgium-Luxembourg, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Iceland, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Poland, Portugal, Saudi Arabia, South Korea, Singapore, Spain, Sweden, Switzerland, United Arab Emirates, United Kingdom, and the United States.

[13]Bilateral agrifood imports are defined according to the World Integrated Trade Solutions product classification of food at the SITC revision 3 codes, which includes: 0 – food and live animals; 1 – beverages and tobacco; 22 – Oilseeds/Oil fruits; and 4 – Animal/vegetable oils/fat/wax.

[14]The arithmetic average calculates the internal distance between the largest cities of a given country weighting them by their share of the country's population, and then uses this constructed point to estimate the distance with the weighted point of each trading partner (CEPII, 2011).

most partial scope agreements and economic integration agreements, the PTA dummy only accounts for preferential trade agreements and customs unions.

Results

Results are presented for two specifications of the empirical model: specification one (equation 6) where members of the BRICs and N-11 are grouped; and specification two (equation 7) where the members of the BRICs and N-11 are considered individually. Wald tests on both model specifications reject the null hypothesis that the joint effect of the exporter, importer, and year fixed effects are equal to zero. Next, likelihood ratio tests were performed on both empirical specifications, revealing that the fit of the models are significantly improved through the inclusion of fixed effects. These tests confirm that exclusion of the fixed effects would result in a misspecification of the model and correspondingly omitted variable bias.

A Breusch-Pagan test, and Wooldridge's test for serial correlation in panel data (Wooldridge, 2002) revealed that both autocorrelation and heteroskedasticity are present, hence robust standard errors are used.

Differences between estimates of the conditional and unconditional marginal effects are minor implying that the economic interpretation of the results are not sensitive to which marginal effect is assumed to be appropriate. Furthermore, subsample OLS produces coefficient estimates close to both the conditional and unconditional marginal effects, which suggests that sample selection bias is not severe. Two statistical tests confirm this conclusion. First, a t-test on the coefficient on the inverse mills ratio (IMR) (i.e., the natural log of σ and ρ in tables 2 and 4) are inconclusive as only the natural logarithm of sigma appears to be statistically significant in both specifications. Next, an empirical mean square error test (EMSE) was performed using both the conditional and unconditional marginal effects as the consistent estimator. Results from the EMSE test for the first specification were inconclusive, and highly sensitive to which estimator was assumed to be consistent. However, the EMSE from the second specification provided some evidence that the Heckman selection model is the preferred estimator. Thus, while sample selection bias does not appear to be serious, the remaining discussion focuses on the Heckman selection model, in light of the EMSE results for the second specification (table 8 and 9).

As Hoffman and Kassouf (2005) emphasize a distinction should be made regarding the interpretation of the conditional and unconditional marginal effects. Namely, unconditional marginal effects will typically be larger than the conditional marginal effects due to the fact that the unconditional effects capture both the increase in the percentage of agrifood expenditure, as well as the increase in the probability of the country, or country group, importing agrifood products. In contrast, the conditional marginal effect does not take into account the increased probability of a country pair engaging in trade (Hoffman and Kassouf, 2005). For simplicity, the remaining discussion of the findings will focus on the unconditional marginal effects as it better accounts for trade potential.

Specification 1: BRICs and N-11 Members Grouped

The first two hypotheses test whether the expenditure elasticities for the N-11 and BRICs differ from each other, or other low, middle and high income countries. In order to distinguish between importing groups, dummy variables indicating each importer group are interacted with the income variable to capture how the effect of income on agrifood imports changes across different importer groups.

In table 2, all of the unconditional marginal effects possess the expected signs and are statistically significant at the one percent level, with the exception of the coefficient on the exchange rate variable. Increases in per capita expenditure on agrifood imports from the establishment of a PTA appears to occur at an increasing rate: from around 21 percent at implementation; to roughly another 17 percent after four years; to an additional 33 percent improvement after eight years (table 2).[15] These results indicate that on average, eight years after implementation PTAs cumulatively increase the per capita expenditure on food imports by roughly 70 percent. This systematic accrual of the gains from trade is consistent with the original justification for the inclusion of the lagged PTA variables, namely that trade creation gradually increases as barriers to trade are reduced and as the implementation period progresses. While this supports the findings of Grant and Lambert (2008), their study found PTAs to have a substantially larger effect on agricultural trade flows (125 percent increase in trade after twelve years). However, the scope and coverage of PTAs are not uniform. Liberalization under some agreements may be back-end loaded meaning that the majority of their reforms occur towards the end of the implementation period, which could explain why sequential increases in the value of imports get larger as the agreement matures. In contrast, if the reforms are front-end loaded then the majority of the trade liberalization occurs closer to implementation and the gains are more immediate. Our results suggest that for the PTAs examined, the reduction of trade barriers for agrifood products is back-end loaded, and the difference in findings compared to Grant and Lambert (2008) may have arisen from differences in which PTAs are included in the sample.

All of the expenditure elasticities in table 2 are positive indicating that as income grows per capita expenditure on imports increases. Since all of the coefficients are less than one, it appears that per capita expenditure on imported food products increases less than proportionally with income growth, suggesting that Anderson and van Wincoop's (2003) theoretical assumption of homothetic preferences does not hold for the groups studied, a notion previously advocated by Dalgin, Mitra, and Trindade (2004).

[15]Due to the use of the log linear functional form all coefficients for dummy variables are interpreted as $= (e^{\beta} - 1) \times 100$.

Table 2: Estimation Results – BRICs and N-11 Members Grouped

(Specification 1)

	Heckman	Marginal Effects		Subsample
		Conditional	Unconditional	OLS
BRIC	0.859***	0.806***	0.859***	0.862***
	(0.0692)	(0.0650)	(0.0692)	(0.0694)
Next-11	0.735***	0.689***	0.735***	0.739***
	(0.0891)	(0.0837)	(0.0891)	(0.0894)
Low Income	0.599***	0.562***	0.599***	0.601***
	(0.0559)	(0.0525)	(0.0559)	(0.0561)
Middle Income	0.631***	0.592***	0.631***	0.635***
	(0.0498)	(0.0467)	(0.0498)	(0.0499)
High Income	0.633***	0.594***	0.633***	0.636***
	(0.0492)	(0.0462)	(0.0492)	(0.0494)
lnDistance	-0.960***	-0.928***	-0.961***	-0.961***
	(0.0140)	(0.0135)	(0.0140)	(0.0140)
lnexchange	-0.00199	-0.000300	-0.00189	-0.00164
	(0.00580)	(0.00545)	(0.00580)	(0.00582)
Adjacent	0.383***	0.362***	0.384***	0.383***
	(0.0392)	(0.0379)	(0.0392)	(0.0393)
Language	0.353***	0.367***	0.355***	0.355***
	(0.0267)	(0.0252)	(0.0267)	(0.0267)
Colony	0.261***	0.268***	0.263***	0.262***
	(0.0348)	(0.0330)	(0.0348)	(0.0349)
PTA_t	0.193***	0.185***	0.193***	0.193***
	(0.0354)	(0.0335)	(0.0354)	(0.0355)
PTA_{t-4}	0.159***	0.150***	0.159***	0.159***
	(0.0449)	(0.0432)	(0.0449)	(0.0450)
PTA_{t-8}	0.282***	0.283***	0.283***	0.280***
	(0.0381)	(0.0381)	(0.0382)	(0.0382)
Constant	4.445***			4.417***
	(0.410)			(0.411)
IMR	athrho	-0.0198	lnsigma	-0.0844***
	(ρ)	(0.0195)	($\ln\sigma$)	(0.00585)
Adjusted R^2				0.827
Log-likelihood	-31490.5			-25640.6
F-test				1011.7
Chi^2	107491.9			
Observations	24800	24800	24800	19214

Marginal effects; Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3: Wald Test for Equality of Group Expenditure Elasticities (Specification 1)		
	N-11	BRIC
BRIC	1.346 (0.246)	–
Next-11	–	1.346 (0.246)
Low–income	2.030 (0.154)	10.17*** (0.00143)
Middle–Income	1.265 (0.261)	8.636*** (0.00330)
High–Income	1.235 (0.266)	8.602*** (0.00336)
Joint Equality	10.65** (0.0308)	

Unconditional Marginal effects; Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

A Wald test for joint equality of the expenditure elasticities for all five country groups indicates that all expenditure coefficients are not equal, suggesting that the average effect of income on per capita agrifood imports varies between groups (table 3).

Casual observation of table 2 suggests that the average expenditure elasticity for the BRICs (0.86) and N-11 (0.73) are somewhat larger then their counterparts in the different income rankings, although this is only statistically confirmed for the BRICs. Table 3 shows the complete results from Wald tests for equality of the expenditure elasticities, revealing that only the BRIC's marginal effects differ from those of the major income groups, with no statistical difference between the expenditure elasticity for the N-11 and the latter groups, implying that, as a group, the N-11 is not unique in terms of it's expenditure elasticities for agrifood imports.

In table 2, the N-11s expenditure elasticity (0.73) is lower than the BRICs' (0.86), but the difference is not large enough to have much economic significance. The Wald test for equality between the unconditional marginal effects of the two groups confirms that no statistical difference is present (table 3, rows 1 and 2). In other words, our second hypothesis cannot be rejected, and on average, the effect of income on agrifood imports does not differ between the BRICs and N-11.

Aggregation of BRIC and N-11 members into their respective groups limits the depth of the analysis. These elasticities represent average group effects, which can mask substantial differences in expenditure elasticities at the individual country level. It is possible that income growth for specific members of the N-11 and BRICs has resulted in substantial increases in expenditures, while for others income growth may have had a more negligible effect. Specification two differentiates between the individual members of the N-11 and BRICs to see if expenditure elasticities differ across members of the two groups.

Specification 2: Individual BRIC and N-11 Members

The third hypothesis asks whether expenditure elasticities for agrifood imports vary across the members of the BRICs and N-11. The previous hypotheses (and specification) treated them as a group, and therefore implicitly assumed that income growth has a homogenous effect on expenditures in each member country. This specification differentiates each member, permitting the examination of whether expenditure elasticities vary across countries. An initial Wald test for joint equality reveals the income coefficients are statistically different, supporting the notion of heterogenous income effects both within and across the BRICs and Next-11.

In table 4, every BRIC member has a statistically significant and positive expenditure elasticity. Income appears to have the largest effect for India, which has an marginal effect larger than unity, suggesting that if expenditure increases by 1 percent, then per capita expenditure on agrifood imports will increase by roughly 1.25 percent. Income in China appears to have a near proportional effect on imported food expenditure, increasing by

0.9 percent for every one percent increase in income, while the expenditure elasticities for Russia and Brazil are around 0.7, slightly lower than the BRIC average in table 2 (table 4). Furthermore, Wald tests demonstrate that Brazil and Russia are not statistically different from the middle income group, while China and India differ from the average elasticity faced by the middle and low income groups to which they belong (table 5). This echoes Haq and Meilke's (2009a) findings for China but fails to confirm the same claim about Russia. We find that Russia does not differ from other middle income countries. However, Haq and Meilke (2009a) excluded data for 1991–1995 for Russia, and we include it. The Russian Federation came into existence late in 1991. Thus, inclusion of data for 1991–1995 may be the source of the difference in our findings and Haq and Meilke (2009a), as adaptation to or the establishment of, the economic institutions governing market based trading may have limited the degree to which Russians purchased imported food products earlier in the period.

The results in table 4 indicate that the income elasticities for the N-11 are varied ranging from 0.38 on the low end for Nigeria to 2.28 for South Korea on the high end.[16] The expenditure elasticitities for all of the N-11 are statistically significant except for Bangladesh and the Philippines. A Wald test for joint equality of all the N-11's expenditure coefficients is rejected at the one percent level, indicating that the expenditure elasticities of N-11 members are not identical. This reinforces earlier comments stressing the likelihood that not all members of the N-11 will have large expenditure elasticities.

[16] In this discussion we have ignored the negative income elasticity for Iran (-1.4) which is undoubtedly influenced by economic sanctions

Table 4: Estimation Results – Individual BRIC and N-11 Members (Specification 2)

	Heckman	Marginal Effects		Subsample
		Conditional	Unconditional	OLS
Brazil	0.736***	0.691***	0.736***	0.738***
	(0.202)	(0.189)	(0.202)	(0.202)
Russia	0.765***	0.718***	0.765***	0.769***
	(0.0902)	(0.0847)	(0.0902)	(0.0905)
India	1.244***	1.167***	1.244***	1.248***
	(0.258)	(0.242)	(0.258)	(0.259)
China	0.905***	0.849***	0.905***	0.907***
	(0.113)	(0.106)	(0.113)	(0.113)
Bangladesh	1.326	1.244	1.326	1.366
	(1.172)	(1.099)	(1.172)	(1.172)
Egypt	0.876*	0.821*	0.876*	0.881*
	(0.377)	(0.354)	(0.377)	(0.379)
Indonesia	0.853***	0.800***	0.853***	0.855***
	(0.194)	(0.182)	(0.194)	(0.194)
Iran	-1.436*	-1.346*	-1.436*	-1.425*
	(0.642)	(0.602)	(0.642)	(0.644)
Mexico	0.629*	0.590*	0.629*	0.630*
	(0.267)	(0.251)	(0.267)	(0.268)
Nigeria	0.377*	0.354*	0.377*	0.383*
	(0.177)	(0.166)	(0.177)	(0.177)
Pakistan	0.939*	0.880*	0.939*	0.946*
	(0.458)	(0.430)	(0.458)	(0.459)
Philippines	0.465	0.436	0.465	0.469
	(0.273)	(0.256)	(0.273)	(0.274)
Korea	2.282***	2.140***	2.282***	2.316***
	(0.281)	(0.264)	(0.281)	(0.283)
Turkey	0.763***	0.716***	0.763***	0.765***
	(0.190)	(0.178)	(0.190)	(0.191)
Vietnam	1.813***	1.700***	1.813***	1.817***
	(0.207)	(0.194)	(0.207)	(0.208)

Table 4 – continued from previous page

	Heckman	Marginal Effects Conditional	Marginal Effects Unconditional	Subsample OLS
Low Income	0.616***	0.577***	0.616***	0.618***
	(0.0560)	(0.0526)	(0.0560)	(0.0562)
Middle Income	0.649***	0.608***	0.649***	0.652***
	(0.0498)	(0.0468)	(0.0498)	(0.0500)
High Income	0.651***	0.610***	0.651***	0.654***
	(0.0493)	(0.0463)	(0.0493)	(0.0495)
lnDistance	-0.960***	-0.928***	-0.962***	-0.961***
	(0.0140)	(0.0135)	(0.0140)	(0.0140)
lnExchange	-0.000511	0.00107	-0.000412	-0.000168
	(0.00581)	(0.00546)	(0.00581)	(0.00583)
Adjacent	0.384***	0.362***	0.384***	0.383***
	(0.0391)	(0.0378)	(0.0391)	(0.0392)
Language	0.353***	0.367***	0.355***	0.355***
	(0.0267)	(0.0252)	(0.0267)	(0.0267)
Colony	0.262***	0.269***	0.264***	0.263***
	(0.0348)	(0.0330)	(0.0349)	(0.0350)
PTA_t	0.193***	0.185***	0.193***	0.193***
	(0.0355)	(0.0336)	(0.0355)	(0.0356)
PTA_{t-4}	0.164***	0.155***	0.164***	0.164***
	(0.0452)	(0.0434)	(0.0451)	(0.0453)
PTA_{t-8}	0.277***	0.279***	0.279***	0.276***
	(0.0385)	(0.0383)	(0.0386)	(0.0386)
Constant	4.309***			4.280***
	(0.411)			(0.412)
IMR	athrho	-0.0194	lnsigma	-0.0862***
	(ρ)	(0.0199)	($\ln\sigma$)	(0.00583)
Adjusted R^2				0.827
log-likelihood	-31457.2			-25607.3
F-test				915.9
Chi^2	108610.6			
Observations	24800	24800	24800	19214

Marginal effects; Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The N-11 members: Egypt (0.88), Indonesia (0.85), Pakistan (0.94), Nigeria (0.38) and Turkey (0.76) have expenditure elasticities of varying magnitudes and significance. Wald tests for equality reveal that their income coefficients are not statistically different from other low and middle income coutnries (table 5). Therefore, it cannot be concluded that the effect of income growth on per capita expenditure on imported agrifood products in these N-11 members is different from other emerging nations.

Among the N-11, the results clearly identify South Korea (2.28) and Vietnam (1.8) as countries where income notably influences per capita expenditure on agrifood imports. In particular South Korea and Vietnam both exhibit expenditure elasticities greater than one implying that per capita expenditure on food imports increases at a faster rate than income growth – e.g. if income grows by 10 percent, expenditure on agrifood imports increases by roughly 23 percent in South Korea and approximately 18 percent in Vietnam. This is likely attributable to several fundamental factors driving demand.

South Korea faces topographical and political constraints on agriculture; it is geographically characterized as largely mountainous, a problem which is further exacerbated by archaic agricultural policies which constrain farm size (Economist Intelligence Unit, 2008a). Furthermore, South Korea's emphasis on it's manufacturing sector and it's role as a transportation hub, has led to it's population becoming increasingly urbanized (Economist Intelligence Unit, 2008a, 2010). Thus, due to the high cost of domestic production, South Korea has become a large net importer of food – \$20 US billion in 2010 (USDA-Economic Research Service, 2011) in spite of high applied MFN tariffs averaging 48.6 percent (World Trade Organization, 2010).

Vietnam's large expenditure elasticity likely stems from consumer's emerging preference for meat (a higher value good) (Economist Intelligence Unit, 2008b), and its increased efforts to engage in international markets including its ascension to the WTO in Janurary 2007. Wilson and Stupnyska (2007) also note the potential for Vietnam to experience large increases

Table 5: Wald Test for the Equality of Expenditure Elasticities – Individual BRIC and N-11 Members (Specification 2)

	Low Income	Middle Income	High Income
Brazil	0.34	0.18	0.17
	(0.5577)	(0.6684)	(0.6758)
Russia	2.20	1.43	1.38
	(0.1377)	(0.2322)	(0.2393)
India	5.87**	5.32**	5.29**
	(0.0154)	(0.0211)	(0.0215)
China	5.76**	4.73**	4.67**
	(0.0164)	(0.0297)	(0.0307)
Bangladesh	0.37	0.34	0.33
	(0.5436)	(0.5625)	(0.5637)
Egypt	0.47	0.36	0.35
	(0.493)	(0.5489)	(0.5526)
Indonesia	1.45	1.09	1.07
	(0.2288)	(0.2965)	(0.3011)
Iran	10.18***	10.52***	10.55***
	(0.0014)	(0.0012)	(0.0012)
Mexico	0.00	0.01	0.01
	(0.9598)	(0.9417)	(0.9353)
Nigeria	1.72	2.27	2.31
	(0.1903)	(0.1316)	(0.1282)
Pakistan	0.50	0.40	0.40
	(0.4801)	(0.5257)	(0.5287)
Philippines	0.31	0.46	0.47
	(0.58)	(0.4976)	(0.4923)
South Korea	34.8***	33.75***	33.71***
	(0.0000)	(0.0000)	(0.0000)
Turkey	0.58	0.35	0.34
	(0.4468)	(0.5521)	(0.5592)
Vietnam	32.77***	31.47***	31.41***
	(0.0000)	(0.0000)	(0.0000)

Unconditional Marginal effects; Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

in income, which may translate into increased expenditure on imported food products as Vietnam is still a lower-middle income country with food representing a significant portion of consumer's budgetary outlays.

The coefficients on the PTA variables remain consistent with the findings from the previous specification, as the gains from the existence of a PTA are increasing with time and the cumulative gain after eight years is approximately 71 percent (depending on which estimates are used). Finally, the remaining variables that proxy trade costs remain consistent with expectations, and are again statistically significant with the exception of the exchange rate variable.

Forecasts

In the previous section we estimated the import demand elasticities for the members of the BRICs and the N-11. However, the estimated income elasticities only tell a part of the story with respect to market potential. In this section, we estimate the absolute growth in agrifood import demand in the members of the BRICs, the N-11 and the G7 between 2010 and 2016. This process has four components.

First, the unconditional import demand elasticities reproduced in table 6 tell us how fast agrifood imports will increase as per capita GDP rises. South Korea (2.3) and Vietnam (1.8) have the largest expenditure elasticities for agrifood imports followed by Bangladesh (1.3)[17] and India (1.2). However, these are the only countries studied that have elastic import demand elasticities. In contrast, the average import demand elasticity estimated for developed countries is 0.65.

Second, table 6 shows the 2010 US dollar value of agrifood imports for the members of the G7, BRICs and N-11. In 2010, imports by the G7 ($414.5 billion) dwarfed those

[17]While Bangladesh exhibits a noteworthy expenditure elasticity, in table 4 it's coefficient was statistically insignificant therefore the precision of the estimate is questionable.

Table 6: BRIC, G7 and N-11 Agrifood Import Forecasts

	Import Elasticity	2010 Imports (bil.)	2010 to 2016: Pop. Growth (percent)	2010 to 2016: Income* Growth (percent)	Additional agrifood imports resulting from: Pop. Growth (bil.)	Additional agrifood imports resulting from: GDP Growth (bil.)	Additional agrifood imports resulting from: Pop. + GDP Growth (bil.)	Share of Total Growth (percent)	Est. 2016 Imports (bil.)
G7									
Canada	0.65	$28.1	6	18	$1.7	$3.3	$5.0	0.9	$33.1
France	0.65	$51.0	3	16	$1.6	$5.2	$6.8	0.9	$57.8
Germany	0.65	$75.6	-1	13	-$0.9	$6.3	$5.4	-0.5	$81.0
Italy	0.65	$44.3	3	10	$1.5	$2.8	$4.3	0.8	$48.6
Japan	0.65	$64.0	-1	17	-$0.5	$7.0	$6.5	-0.3	$70.5
U.K.	0.65	$54.2	5	28	$2.6	$10.0	$12.6	1.5	$66.8
U.S.	0.65	$97.3	6	11	$5.6	$6.8	$12.4	3.2	$109.7
G7 Total	**0.65**	**$414.5**	**3**	**14**	**$14.0**	**$37.5**	**$51.5**	**8.1**	**$466.0**
BRICs									
Brazil	0.74	$8.4	5	43	$0.4	$2.7	$3.1	0.3	$11.5
China	0.91	$59.6	3	81	$1.8	$43.9	$45.7	1.0	$105.3
India	1.24	$12.3	8	60	$1.0	$9.2	$10.2	0.6	$22.5
Russia	0.77	$32.5	-2	99	-$0.7	$24.6	$23.9	-0.4	$56.4
BRICs Total	**0.89**	**$112.8**	**5**	**70**	**$5.7**	**$70.6**	**$76.3**	**3.3**	**$189.1**
Next-11									
Bangladesh	1.33	$3.9	9	41	$0.4	$2.1	$2.5	0.2	$6.4
Egypt	0.88	$10.1	13	30	$1.3	$2.6	$3.9	0.7	$14.0
Indonesia	0.85	$11.5	7	70	$0.8	$6.9	$7.7	0.5	$19.2
Iran	-1.43	$8.3	9	32	$0.8	-$3.8	-$3.0	0.4	$5.3
S. Korea	2.28	$19.2	2	53	$0.4	$23.0	$23.4	0.2	$42.6
Mexico	0.63	$19.5	6	28	$1.1	$3.4	$4.5	0.6	$24.0
Nigeria	0.38	$4.5	18	41	$0.8	$0.7	$1.5	0.5	$6.0
Pakistan	0.94	$4.9	13	42	$0.6	$1.9	$2.6	0.4	$7.5
Philippines	0.47	$6.4	13	28	$0.8	$0.8	$1.6	0.5	$8.0
Turkey	0.76	$7.4	7	34	$0.5	$1.9	$2.5	0.3	$9.9
Vietnam	1.81	$5.5	8	76	$0.4	$7.6	$8.0	0.3	$13.5
N-11 Total	**0.92**	**$101.0**	**10**	**39**	**$10.2**	**$36.1**	**$46.2**	**5.8**	**$147.4**
Total		**$628.5**			**$29.9**	**$147.2**	**$178.1**	**17.2**	**$802.6**

*Note: Income is proxied by real per capita GDP.
**Source: IMF (2010). Actual data is used for 2010 where it is available, where it is not, IMF projections are used.
***Aggregate elasticities are weighted by the countries' share of agrifood imports.

of the BRICs ($112.8 billion) and the N-11 ($101 billion). Among the BRICs and N-11, only China ($59.6 billion), Russia ($32.5 billion), Mexico ($19.5 billion), South Korea ($19.2 billion) and India ($12.3 billion) imported more than $12 billion in agrifood products, in 2010; but $12 billion is less than one-half of the imports of the smallest G7 member Canada ($28.1 billion). The value of the United States' agrifood imports ($97.3 billion) alone were nearly as much as the BRICs or N-11 combined.

Third, population growth will play an important role in driving future agrifood imports. The IMF forecasts population growth between 2010 and 2016 to average three percent in the G7, five percent in the BRICs and ten percent in the N-11. The most rapidly growing countries, in terms of population, are all in the N-11: Nigeria (18 percent), Pakistan (13 percent), Egypt (13 percent) and the Philippines (13 percent). India (8 percent) has the fastest growing population in the BRICs.

Fourth, real income growth is a key element in determining how quickly agrifood imports will grow. The IMF forecasts real per capita GDP to grow by 70 percent between 2010 and 2016 in the BRICs, 39 percent in the N-11 and 14 percent in the G7. The largest forecast increases in real per capita GDP are for Russia (99 percent), China (81 percent), Vietnam (76 percent) and Indonesia (70 percent).

Multiplying the 2010 value of agrifood imports by population growth shows by how much agrifood imports will rise as a result of population growth (column 6 in table 6).[18] In 2016, agrifood imports are projected to be $14 billion larger than in 2010 in the G7, $5.7 billion larger in the BRICs and $10.2 billion larger in the N-11 (table 2). Although population growth in the G7 is relatively low the quantity of agrifood imported is so large that population growth results in a nontrivial increase in imports, 2.5 times more than in the BRICs and 1.4 times more than in the N-11.

[18] Our empirical model estimates per capita demand, consequently total demand is homogeneous of degree one in population.

The seventh column of table 6 shows the impact of real income growth on agrifood imports. Somewhat surprisingly, the aggregate growth in agrifood imports between 2010 and 2016, resulting from real income growth, is similar in the G7 ($37.5 billion) and the N-11 ($36.1 billion) but considerably larger in the BRICs ($70.6 billion), in fact growth in China ($43.9 billion) alone is larger than in the G7 or N-11. The eighth column of table 6 shows the combined effects of population and income growth on agrifood imports. Again counter intuitively population growth accounts for a larger fraction of the total growth in imports in the G7 (27.2 percent) than in the BRICs (7.5 percent) or N-11 (22.1 percent). Total agrifood imports in the BRICs and N-11 are forecast to rise by 67.6 and 45.7 percent, respectively, in six years while in the G7 they increase by 12.4 percent from their 2010 value. As a fraction of the total growth in agrifood imports between 2010 and 2016 China accounts for 26.3 percent, Russia 13.7 percent, South Korea 13.5 percent, the United Kingdom (UK) 7.3 percent and the United States (US) 7.1 percent.

The information in table 6 shows that six developing countries stand out as major growth markets for agrifood imports in the near future: India ($10.2 billion), Indonesia ($7.7 billion), South Korea ($23.4 billion), Vietnam ($8.0 billion), China ($45.7 billion) and Russia ($23.9 billion). Six members of the N-11 (Bangladesh, Iran, Nigeria, Pakistan, Philippines, Turkey) appear to be so small and/or at such early stages of development that near term increases in agrifood imports will likely be minor. Developed countries will continue to expand their use of imported agrifood products and given their size they cannot be forgotten; in the United States, United Kingdom, Japan, and France the increase in agrifood imports is forecast to range from $6.5 to $12.6 billion. In the BRIC and N-11 members not yet mentioned (Brazil, Egypt, Mexico) the growth in agrifood imports is forecast to range from $3.1 to $4.5 billion. If the projections shown in table 6 pan out by 2016, China and the United States will be importing in excess of $100 billion in agrifood imports and import levels in Russia and South Korea will be similar to the G7 countries.

Conclusions

This paper assesses whether income growth in two groups of emerging economies, the BRICs and N-11, has translated into increased expenditure on imported agrifood products. The results suggest that as groups, the N-11 and BRICs are not unique in terms of their agrifood import demand elasticities. However, when the members of these groups are disaggregated, China, India, South Korea, and Vietnam are found to have large expenditure elasticities, which are statistically different from other countries in the income groups to which they belong. While other members of the BRICs and N-11 also have positive and statistically significant expenditure elasticities, Wald tests reveal no statistical difference between their elasticities and those of other countries at similar income levels.

Zero trade flows are accounted for through the use of the Heckman Selection model, from which both conditional and unconditional marginal effects are derived. In order to contrast the findings from the latter estimation technique, subsample OLS is also used; where zero trade flows are dropped from the sample and an OLS regression is performed. Surprisingly, there is no variation in the direction or significance of any of the coefficients across estimation methods, although there are subtle differences in the estimated coefficients, but none large enough to change in the economic interpretation. Results from a conventional t-test on the coefficients of the inverse mills ratio and an empirical mean square error test (Toro-Vizcarrondo and Wallace, 1968) are inconclusive, sensitive to the specification under consideration and which estimator is assumed consistent, and thus failed to confirm that sample selection bias is present. This is likely due to the use of aggregate trade data, and relatively few zero trade flows.

A simple forecasting exercise is employed to approximate the capacity of the BRIC and N-11 members to increase the value of their agrifood imports by 2016. Findings suggest that by 2016 China will be the largest agrifood import market ($105.3 billion), followed by Russia

($56.4 billion), South Korea($42.6 billion), Mexico ($24.0 billion), India ($22.5 billion) and Indonesia ($19.2 billion). As a result G7 agrifood imports which were about two-thirds of the G7 plus BRIC and N-11 imports in 2010 are forecast to decline to less than 60 percent by 2016.

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Table 7: Variable Descriptions

Variable	Description
Imp_{ijt}	The dependent variable – the real per capita value of agrifood imports in country i from exporter j in year t.
$BRIC_{it}$	The natural logarithm of the real per capita GDP interacted with a dummy variable equal to one if the importing nation is a member of the BRICs, and zero otherwise.
$N\text{-}11_{it}$	The natural logarithm of the real per capita GDP interacted with a dummy variable equal to one if the importing nation is a member of the N-11, and zero otherwise.
LI_{it}	The natural logarithm of the real per capita GDP interacted with a dummy variable equal to one if the importing nation is defined as a low income nation (a per capita GDP of less than $996), excluding N-11 and BRIC member countries, and zero otherwise.
MI_{it}	The natural logarithm of the real per capita GDP interacted with a dummy variable equal to one if the importing nation is defined as a middle income nation (a per capita GDP between $997 and $12,195), excluding N-11 and BRIC member countries, and zero otherwise.
HI_{it}	The natural logarithm of the real per capita GDP interacted with a dummy variable equal to one if the importing nation is defined as a middle income nation (a per capita GDP greater than $12,195), excluding N-11 and BRIC member countries, and zero otherwise.
Bra_t	The natural logarithm of the real per capita GDP interacted with a dummy variable equal to one if the importing nation is Brazil and zero otherwise.
Rus_t	The natural logarithm of the real per capita GDP interacted with a dummy variable equal to one if the importing nation is Russia and zero otherwise.
Ind_t	The natural logarithm of the real per capita GDP interacted with a dummy variable equal to one if the importing nation is India and zero otherwise..
Chn_t	The natural logarithm of the real per capita GDP interacted with a dummy variable equal to one if the importing nation is China and zero otherwise..

$Bang_t$	The natural logarithm of the real per capita GDP interacted with a dummy variable equal to one if the importing nation is Bangladesh and zero otherwise.
Egy_t	The natural logarithm of the real per capita GDP interacted with a dummy variable equal to one if the importing nation is Egypt and zero otherwise.
$Indo_t$	The natural logarithm of the real per capita GDP interacted with a dummy variable equal to one if the importing nation is Indonesia and zero otherwise.
$Iran_t$	The natural logarithm of the real per capita GDP interacted with a dummy variable equal to one if the importing nation is Iran and zero otherwise.
Mex_t	The natural logarithm of the real per capita GDP interacted with a dummy variable equal to one if the importing nation is Mexico and zero otherwise.
Nig_t	The natural logarithm of the real per capita GDP interacted with a dummy variable equal to one if the importing nation is Nigeria and zero otherwise.
Pak_t	The natural logarithm of the real per capita GDP interacted with a dummy variable equal to one if the importing nation is Pakistan and zero otherwise.
Phi_t	The natural logarithm of the real per capita GDP interacted with a dummy variable equal to one if the importing nation is Philippines and zero otherwise..
Kor_t	The natural logarithm of the real per capita GDP interacted with a dummy variable equal to one if the importing nation is South Korea and zero otherwise.
Tur_t	The natural logarithm of the real per capita GDP interacted with a dummy variable equal to one if the importing nation is Turkey and zero otherwise.
Vnm_t	The natural logarithm of the real per capita GDP interacted with a dummy variable equal to one if the importing nation is Vietnam and zero otherwise.
$Dist_{ij}$	The distance between exporter j and importer i.
Adj_{ij}	A dummy variable equal to one if importer i and exporter j share a common border, zero otherwise.

$Lang_{ij}$	A dummy variable equal to one if importer i and exporter j share an official language(s), zero otherwise.
$Colony_{ij}$	A dummy variable equal to one if importer i and exporter j share a similar colonizer, zero otherwise.
$Exchange_{ijt}$	The exchange rate between trading partners i and j in time t. It is the ratio of the value of the importers currency relative to the exporters.
PTA_{ijt}	A dummy variable equal to one if exporter j and importer i have a preferential trade agreement, or customs union in a given year, zero otherwise.

Table 8: EMSE Test - Specification 2 - Conditional Marginal Effects

	Heckman as Consistent			**OLS as Consistent**		
	Unconditional Marginal Effects	OLS	Appropriate Estimator	OLS	Unconditional Marginal Effects	Appropriate Estimator
Brazil	.03583686	.0432389	Heckman	.04099436	.0380814	Heckman
Russia	.00716725	.01082091	Heckman	.00818685	.00980132	OLS
India	.05850041	.07347898	Heckman	.0668292	.06515019	Heckman
China	.01124107	.01621026	Heckman	.01284743	.0146039	OLS
Bangladesh	1.2085128	1.3877567	Heckman	1.3728825	1.223387	Heckman
Egypt	.12534983	.14691143	Heckman	.14331829	.12894297	Heckman
Indonesia	.03302068	.0407839	Heckman	.0377493	.03605528	Heckman
Iran	.36293435	.42121689	Heckman	.41501451	.36913673	Heckman
Mexico	.06290113	.07358872	Heckman	.07196159	.06452826	Heckman
Nigeria	.02747846	.03231323	Heckman	.03147235	.02831934	Heckman
Pakistan	.18479299	.21528557	Heckman	.21100957	.18906898	Heckman
Philippines	.06557858	.07610552	Heckman	.07502049	.06666361	Heckman
Korea	.06958106	.1111111	Heckman	.08010443	.10058773	OLS
Turkey	.03185341	.03887635	Heckman	.03646483	.03426493	Heckman
Vietnam	.03774034	.05673609	Heckman	.04306169	.05141474	OLS
Low Income	.00276286	.00483078	Heckman	.00315725	.00443639	OLS
Middle Income	.00219125	.00440732	Heckman	.00249866	.0040999	OLS
High Income	.00214561	.00436693	Heckman	.00244676	.00406579	OLS
lnDistance	.000183	.00130075	Heckman	.00019674	.00128702	OLS
lnExchange	.00002982	.0000355	Heckman	.00003398	.00003134	Heckman
Adjacent	.00142749	.00198229	Heckman	.00153561	.00187418	OLS
Language	.00063299	.00086212	Heckman	.00071486	.00078026	OLS
Colony	.00108971	.00125048	Heckman	.00122262	.00111757	Heckman
PTA_t	.0011291	.00132631	Heckman	.00126829	.00118713	Heckman
PTA_{t-4}	.00188117	.00213517	Heckman	.00205034	.00196599	Heckman
PTA_{t-8}	.00146989	.00149896	Heckman	.00149291	.00147594	Heckman

Table 9: EMSE Test - Specification 2 - Unconditional Marginal Effects

	Heckman as Consistent			**OLS as Consistent**		
	Unconditional Marginal Effects	OLS	Appropriate Estimator	OLS	Unconditional Marginal Effects	Appropriate Estimator
Brazil	.04072661	.0409972	Heckman	.04099436	.04072945	Heckman
Russia	.00813827	.00820161	Heckman	.00818685	.00815303	Heckman
India	.06647132	.06684819	Heckman	.0668292	.06649031	Heckman
China	.01276148	.01285078	Heckman	.01284743	.01276483	Heckman
Bangladesh	1.3736251	1.3744558	Heckman	1.3728825	1.3751984	OLS
Egypt	.142483	.14334971	Heckman	.14331829	.14251442	Heckman
Indonesia	.03752167	.03775392	Heckman	.0377493	.03752628	Heckman
Iran	.41247173	.41512125	Heckman	.41501451	.41257847	Heckman
Mexico	.07149413	.07196327	Heckman	.07196159	.07149581	Heckman
Nigeria	.03123067	.03150341	Heckman	.03147235	.03126173	Heckman
Pakistan	.21003582	.21106068	Heckman	.21100957	.21008692	Heckman
Philippines	.07453816	.07503731	Heckman	.07502049	.07455498	Heckman
Korea	.07904491	.08129395	Heckman	.08010443	.08023443	OLS
Turkey	.03619865	.0364679	Heckman	.03646483	.03620173	Heckman
Vietnam	.04282812	.04308136	Heckman	.04306169	.04284779	Heckman
Low Income	.00313438	.0031646	Heckman	.00315725	.00314173	Heckman
Middle Income	.00248327	.00251043	Heckman	.00249866	.00249504	Heckman
High Income	.00243147	.00245852	Heckman	.00244676	.00244322	Heckman
lnDistance	.00019678	.00019708	Heckman	.00019674	.00019712	OLS
lnExchange	.00003374	.00003404	Heckman	.00003398	.0000338	Heckman
Adjacent	.00152935	.00153625	Heckman	.00153561	.00153	Heckman
Languge	.00071083	.00071563	Heckman	.00071486	.00071161	Heckman
Colony	.00121469	.00122296	Heckman	.00122262	.00121504	OLS
PTA_t	.00126028	.00126835	Heckman	.00126829	.00126034	Heckman
PTA_{t-4}	.0020377	.00205045	Heckman	.00205034	.0020378	Heckman
PTA_{t-8}	.00148653	.00149968	Heckman	.00149291	.0014933	OLS