The Effects of the Internet on U.S. Bilateral Trade in Agricultural and Horticultural Commodities

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Abstract

This paper discusses some of the reasons why the Internet might have a positive effect on the international trade in agricultural and horticultural commodities between the United States and its partners. It provides some simple econometric tests which differentiate the export and import effects of Internet infrastructure and cost. It also shows that the effect may be dependent on product heterogeneity/perishability. Given the growth of the Internet over the past decade, coming to terms and measuring these effects is important to both producers and policymakers in considering the competitive impacts of this new technology.

Keywords: Internet, trade, agricultural commodities, and technology

JEL: F10, O39, Q17

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Introduction

Agricultural trade represents a significant component of U.S. exports. Furthermore, trade in agricultural products with the United States represents an important source of foreign exchange for many countries. The rise of the Internet provided a technological improvement in the infrastructure of trade and accordingly one would expect it to have some positive impact on trade in most sectors. Freund and Weinhold (2004) tested the aggregate impact of the Internet on international trade; however, their work does not tease out the commodity specific impacts of the Internet. To that end, this paper will analyze the effects of the Internet on U.S. bilateral trade of agricultural and horticultural commodities.

In considering the impact of the Internet on international trade of agricultural and horticultural products, two arguments may be put forth. The reach of the Internet both through search engines and e-mail provides important connections among possible traders and lowers the fixed costs of forming trading relationships internationally. The potential to sink costs in developing new but potentially non-persistent relationships will tend to slow the development of trade. Baldwin (1989); Tybout and Roberts (1997); and Freund and Weinhold (2004) all point to the importance of sunk costs in constraining the growth of trade and explaining the persistence of certain trading relationships. If the Internet lowers the initial fixed costs of switching and/or developing new relationships, then one would expect to see significant effect on trading patterns in agricultural and horticultural products. Other research by Fink, Mattoo, and Neagu (2002) provides an alternative perspective where the Internet reduces the transaction costs per load or shipment (i.e., lowers the variable costs of trade). Their research uses a similar econometric method as Freund and Weinhold to test the effects of communication costs on international trade in a wide array of products. Their basic idea is that lower costs per unit or load essentially lowers the variable costs in trade and therefore augments the volume. Looking at the literature on market integration, one finds further support for the importance of lowered transaction and transportation costs in facilitating greater trade volumes (Baulch, 1996).

Within this context, we must also be aware of the importance of information as the core factor in the Internet's effects on both fixed and variable costs of trade. Rauch and Casella (2003) have argued that group ties provide a method of circumnavigating or reducing the fixed and variable costs of negotiating trade internationally. In particular, they remark on the ability of such ties to reduce or mitigate informational asymmetries so prevalent in international trade. Whereas Rauch and Watson (2003) have indicated that the normal development of trading relationships often requires the slow and careful development of trust to reduce information differences and strengthen a trading relationship; Rauch and Trindade (2003) have argued that the spread of the Internet can help trade partners to more easily sift through the panoply of buyers and suppliers. In other words, the Internet may provide some substitute for group ties or otherwise slow relationship development. Clearly, if it is complementary to both, then it will further promote trade. Moreover, Rauch and Trindade (2003) note that this lowering of informational barriers will serve to weaken the competitive position of domestic suppliers.

In considering the effects of the Internet, it is immaterial whether the Internet's effects are on fixed or variable costs, and it is unlikely that we would be able to identify the distinct effects at any rate. In terms of testing its effects, we note that the "gravity" econometric framework for estimating these impacts has been used to test both theories as to the Internet's effects (see Freund and Weinhold (2004) and Fink, Mattoo, and Neagu (2002)). The gravity equation has been a workhorse for statistical studies of trade for almost fifty years and remains a useful and parsimonious tool for detecting impacts of policies, events, geography, and other factors on trade. The theoretical justification for the gravity equation can be found in the works of Anderson (1979) and Deardorff (1998). With that information in mind, we expect to use a basic gravity equation to test the importance of the Internet on U.S. bilateral trade in agricultural and horticultural products.

Theoretical Framework

The Internet serves two functions in facilitating international trade of agricultural commodities: (1) it will tend to lower the fixed costs of arranging international trade and the entry of new markets (Freund and Weinhold, 2004) (2) it will tend reduce the marginal effort incurred in arranging the transport any given shipment (Fink, Mattoo, and Neagu, 2002). The basic support for both of these views is further supported by the work of Rauch and Trindade (2003). Given the general discussion provided above, we form the following hypothesis and subsidiary hypotheses as to the effect of the Internet on the international trade in agricultural commodities.

With the broad support for the Internet as a trade augmenting technology, the first hypothesis is as follows.

Hypothesis 1: The Internet should have a non-decreasing effect on bilateral trade in agricultural commodities.

Secondarily, it is also reasonable to believe that the extent to which both these costs are lowered is conditional on the past experience of the United States in shipping to a particular market and conversely on the past experience of other countries shipping to the United States. In short, the greater the past experience, the lower the total and marginal benefits associated with the Internet. The logic behind this assertion is that past experience and Internet-reduced information costs are substitutes. Rauch and Watson (2003) argue that buyers will often start small with potential supplier due to limited experience and uncertainty about the future. While the future remains, to some extent, uncertain, the Internet can help to reduce the need for such slow starts. Consequently, if a given exporter, say, of grain to China has developed many partners over many years of trade, then the introduction of the Internet is likely to have only a minimal additional effect on trade. That is, they will have already spent a great deal of time in developing relationships. However, a flower exporter from South America who has limited experience in exporting flowers to the United States should be able to obtain significant benefits by being able to more easily engage in market research than in the past, to more cheaply develop working relationships with U.S. buyers, and to more easily manage the logistics of shipment. Moreover, its potential buyers will find it less costly in developing such procurement relationships due to the falling costs information. For all intents and purposes, the barrier of information might have been too high to allow for such trade prior to the arrival of the more efficient medium of communication. This discussion leads us to the second hypothesis:

Hypothesis 2: Given the long history of U.S. exports of agricultural commodities, the marginal impact of the Internet on exports should be relatively small. Conversely, for the briefer and weaker histories of international penetration into U.S. commodity markets, the effect of the Internet on imports should be positive and significant.

Finally, one must consider one other factor in discussing the trade effects of the Internet. Specifically, the Internet's effect on imports and exports should be conditioned on the relative homogeneity and perishability of goods. For goods where quality is more highly variable, the Internet can facilitate more and quicker communications about product quality verification. To that end, when one compares livestock trade to grain trade, one would tend to expect a greater impact on livestock trade given the greater number of quality dimensions which must be considered. Similarly, the question of perishability is tandem to the product homogeneity issue, one expects that inability to monitor the speed and care of trade via the Internet has acted as a constraint on trade development. The Internet eases this process therefore it should increase the volume of bilateral trade for more perishable commodities.

Hypothesis 3: The impact of the Internet on the trade of a good should increase as the quality heterogeneity or perishability of that good increases.

Empirical Approach and Specification

In approaching the test of the above hypothesis, we will consider three basic specifications. Specification (1) is consistent with that forwarded by Freund and Weinhold (2003).

$$(1)\ Trade_{ij} = \beta_o + \beta_1(GDP_i*GDP_j) + \beta_2(Pop_i*Pop_j) + \beta_3 dist_{ij} + \beta_4 ADJ_{ij} + \beta_5 LANG + \\ + \beta_6 FTA + \beta_7 INTPEN_i*INTPENT_j + \varepsilon_{ij}.$$

$Trade_{ij}$ is the volume in dollar terms of the bilateral trade between country i and country j. The significant "gravity" components of the equation relate to GDP, population, and the distances between countries. Intuitively, large products of GDP or population (i.e., GDP_i*GDP_j and Pop_i*Pop_j) between two trading partners would tend to increase the volume of trade between the two countries. Similarly, the closer are two countries as measured by geographic distance ($dist_{ij}$), the greater the "attraction" between two countries in terms of trade volumes. Notably, our measure of geographic distances between countries is drawn from Fitzpatrick and Modlin (1986). Other factors which are considered to be important to bilateral trade include: ADJ_{ij} as a dummy capturing whether the two countries are adjacent to one another, LANG capturing whether the trading partners share a common language, and FTA as a dummy denoting whether two countries are members of the same free trade area or association. Finally, the addition we include to the model is $INTPENT_i*INTPENT_j$ which is product of the trading partners' degree of Internet penetration. This last variable is basically the same regressor as was developed by Freund and Weinhold (2003). In the above equation, all non-dummy variables are in natural log form so as to allow for the estimation of elasticities and is consistent with traditional specifications of gravity equations.

Recognizing what Fink, Mattoo, and Neagu (2002) call the important cost effects of price on Internet use, we also consider two other alternative specifications for the effects of price on Internet use. Specification (2) is as follows:

$$(2)\ Trade_{ij} = \beta_o + \beta_1(GDP_i*GDP_j) + \beta_2(Pop_i*Pop_j) + \beta_3 dist_{ij} + \beta_4 ADJ_{ij} + \beta_5 LANG + \beta_6 FTA + \beta_7 INTPEN_i*INTPENT_j + \beta_8 P_i*P_j\ \ \varepsilon_{ij}.$$

Note, the only addition to this estimation is P_i*P_j which is simply the product of the log price per month for Internet service in country i and country j, respectively. Country i is always the United States in our estimations.

Finally, to account for some joint or interaction between the size of infrastructure and the monthly price of Internet use, we considered the following final specification:

$$(3)\ Trade_{ij} = \beta_o + \beta_1(GDP_i*GDP_j) + \beta_2(Pop_i*Pop_j) + \beta_3 dist_{ij} + \beta_4 ADJ_{ij} + \beta_5 LANG + \beta_6 LINK + \beta_7 FTA + \beta_8 INTPEN_i*INTPENT_j + \beta_9 *INTPENT_i*INTPENT_j/P_i*P_j + \varepsilon_{ij}.$$

In general, this variable allows for interaction between the size of infrastructure and its price. As the degree of penetration rises relative to the price of Internet use, one expects a greater effect on trade. This variable, then, captures a general accessibility of the Internet.

Data

To come to terms with the effects of the Internet on trade of agricultural commodities, we collected bilateral trade data from the Foreign Agricultural Trade of the United States database of the Foreign Agricultural Service of the United States Department of Agriculture. Special attention was paid to our hypotheses when gathering data. To obtain the general effects, we obtained 1995-2003 data on the total value of agricultural exports and imports. At a more disaggregated level, we also collected export value data for the following groups (i) animals and products, (ii) cotton, excluding linters, (iii) grains and feeds, (iv) fruits and preparations, (v) fruit juices, (vi) nursery stocks, bulbs, and related products, (vii) nuts and preparations, (viii) oilseeds and products, (ix) vegetables and preparations, and (x) wine. For imports, only one additional trade value was used: cut flowers. The diversity of these data types will allow us to further test for the differences in the responsiveness of commodity trade due to differences in quality and perishability.

Given that we are attempting to test the importance of the Internet on trade and our specifications described above, we will consider two types of data. Our primary measure (as was used by Freund and Weinhold, 2003) will be a measure of Internet penetration from the Internet Software Corporation's (ISC) survey which provides data on the number of Internet hosts in a country. Freund and Weinhold (2003) discuss that this may be a relatively weak direct measure for Internet penetration due to the fact that U.S. and European sites may host sites for firms and individuals from other countries; however, given the paucity of other generally available data across many countries, it should provide a reasonable proxy. The specific data used was the number of hosts from 1995 until 2004 in the ISC January report. In our empirical implementation, since the host data is perhaps a better indicator of the previous year's level of Internet penetration, we will use its lagged value in our estimations. In accord with Fink, Mattoo, and Neagu (2002), it may also be worthwhile to account for the fact that the cost of Internet use will affect the degree to which businesses can exploit the informational advantages provided by using it. To that end, we obtain World Development Indicator's data on the average monthly price for Internet use. Note, this latter data is only available for the year 2003 so we will only be able to consider its impact in a restricted cross-sectional setting for 2003.

Other data which is used to control for cross-national differences and causes of bilateral data include the following: GDP, whether the U.S. is in a trade agreement or adjacent to a country, the distance between the U.S. and a trading partner, and if the countries share common languages. Our measure of geographic distances between countries is drawn from Fitzpatrick and Modlin (1986). GDP data is obtained from the World Development Indicators. Language data is obtained from the Central Intelligence Agency and is used simply to distinguish between English speakers or not since we are only looking at U.S. bilateral trade. Trade agreement data is obtained from the World Trade Organization; while adjacency data simply includes Mexico and Canada. Given that this research is specifically regarding U.S. bilateral trade, the trade agreement and adjacency data only include Mexico and Canada, so we merge the two dummy variables. Table 1 shows the summary statistics of our data once it is in gravity form (i.e. $\ln(GDP_{US}*GDP_j)$).

[Table 1 Here]

As a precursor to a more detailed empirical investigation, it is worthwhile to consider some interesting scatter plots. In considering a scatter plot of the Internet penetration or host values against the natural log of agricultural exports (in $1,000) and imports (in $1,000) respectively, we find no clear relationship as to exports; however with imports, we obtain Figure 1. For graphical purposes, we excluded zero values before taking logs for this first view of the relationship. As we can see, the relationship between Internet penetration and Imports, there appears to be a positive relationship. This information provides some initial validation of the view that the impact on imports should be greater than that on exports.

[Figure 1 Here]

Now, given Hypothesis 3 which states that we generally expect heterogeneous/perishable products to show stronger Internet effects, let us also consider a graph against two different types of goods: homogeneous/non-perishables and heterogeneous/perishable goods. For illustrative purposes, we see in the Figure 2 below such a comparative scatter plot for grain imports and animal imports. To make comparisons possible, we introduce simple linear trends to see if there exists any difference in the pattern of the effect of Internet on trade. As initial evidence, it does appear that Internet penetration has a slightly larger effect on trade in the more perishable commodity (animal imports) as shown by comparing its trend line (the blue one) with the less perishable commodity (grain imports) whose trend line is red. These scatter plots were created by eliminating all zeros and unobserved variables. The final regressions will, of course, include zero values; however, we do see in this comparison some initial evidence that the effect of the Internet on international trade is commodity dependent.

[Figure 2 Here]

A final scatterplot of the simple relationship between the log of the product of the prices of Internet use reveals that total agricultural imports and exports are both negatively related to the price of Internet use. We now leave this initial exploration of the data to consider some more standard econometric tests of the extent and magnitude of the effect of the Internet on trade in agricultural commodities.

Results

To obtain the following results, we use the whole panel of data for the 1996-2003 period to estimate the specification (1) for both imports and exports. Note, the variance with the initial data coming from 1995-2003 derives from the introduction of the lag on the Internet penetration variable. Also, while we will not specifically account for country fixed effects, we will introduce time dummies to control for trends in the flow of imports and exports. Given, the other important control variables which we use, unobserved cross-national differences should be of second-order importance and should not impede our identification of the relevant parameters. Finally, since our main focus is only on the Internet parameters we will only consider the results for those coefficients in our discussion below. In Table (2a) and Table (2b) below, the results of specification (1) appear in columns (3)-(6), results from specification (2) appear in columns (7)-(10), and results from specification (3) appear in columns (11-14). Table (2a) shows the results for the estimations on exports; while Table (2b) show sthe results of the estimations on imports.

[Table 2a and Table 2b Here]

Specification 1

As for specification (1), the effect on exports of lagged Internet penetration is insignificant except in the one case where a 1% increase in the Internet penetration variable will actually to a 0.03 percent fall in the size of nursery exports. This results runs counter to prediction of Hypothesis (1) of the non-negative impacts of the Internet on trade. However, in accord with Hypothesis (2), we see much stronger positive effects of Internet infrastructure on imports to the United States. In all cases, the import elasticity coefficient estimate is positive, and it is significant at the 99% level for total imports, animal imports, fruit imports, floral imports, and vegetable imports. Notably those products with the greatest degree of perishability have significant coefficients therefore supporting Hypothesis (3).

Specification 2

Considering specification (2), we note once again that the effects are stronger on imports than exports. Moreover, the signs on the Internet penetration coefficient show greater variability for exports. As to the price term we note that only two cases have significant and correctly signed values, total exports and nuts. In both cases, higher Internet prices per month cause lower volumes for exports, although it should be noted that nuts have a positive, significant coefficient only at the 93% level of significance.

As for imports, most signs on the Internet penetration variable are robust to changes in specification although the coefficients on vegetables and flowers have now become insignificant. Moreover, the magnitudes are much larger such that a one percent increases in internet penetration leads to a 0.63% increase in the volume of imports. Also, when considering Hypothesis 3, we note that the coefficients on grain and nuts have become positive and significant. While one might argue that nuts are both perishable and differentiated, grains are clearly not so. Considering the confidence intervals on the Internet penetration parameter estimates for the animal, fruit, and nut estimations, we note that they overlap heavily with those from the grain estimation such that we could not claim that the Internet has a statistically stronger effect on perishable/differentiated versus non-perishable/non-differentiated products in this estimation.

Specification 3

Finally, we consider specification (3) in which we do not consider the raw price variable but the ratio of Internet penetration variable to the price variable (intrat2 in Tables 2a and 2b). The coefficient on Internet penetration remains insignificant for exports; however, the ratio coefficient is now positive and significant for total exports, animals, nuts, and oilseeds. For imports, the effects of Internet penetration remain positive and significant for total imports, animal imports, fruit imports, and nut imports at the 95% or better level of significance. Unlike exports, the intrat2 variable is insignificant. Fortunately, specification (3) shows slightly better evidence that more perishable/differentiated products receive stronger effects than non-perishables.

Overall Significance of Regressions

For completeness, we report the F values, R-squared values, and F tests in Appendix Table 2a and 2b. In all cases, we fail to reject the null hypothesis that all of the regression coefficients are zero thereby lending weight to the models efficacy and consistent with traditional gravity equation results. Also, we see that for most regressions that the models explain greater than 50 percent of the variation in international trade in imports and exports.

Conclusions

This research represents an important contribution to the ongoing dialogue of the impacts of the Internet on farmers, agricultural industries and agricultural trade. We show evidence that the Internet has augmented imports of various commodities to the United States and has limited statistical impact on U.S. exports of agricultural commodities. From the perspective of countries wishing to export to the United States, this indicates that they have benefited from the expansion of the Internet and its falling costs; however, from the perspective of domestic producers, the Internet appears to have brought increased competition with little help in securing greater exports.

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Table 1. Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Ln(Internet Penetration$_{ij}$) lintpent	711	20.96324	8.193654	-9.21034	30.40817
Ln(Price of Internet$_{ij}$) (lprice)	79	5.825467	0.601976	4.052784	7.276945
Ln(distance$_{ij}$) distance	711	8.480619	0.529396	6.49224	9.208639
Ln(GDP$_{ij}$) lngdp	708	54.5149	1.94943	49.87199	59.28101
Ln(Populationij) lnpop	711	36.04602	1.416152	31.89323	40.46565
Ln(Total Exports) lntotex	708	11.79661	1.924501	5.560682	16.27778
Ln(Animal Exports) lanimex	688	9.171226	2.533418	1.098612	15.06358
Ln(Cotton Exports) lcotex	451	8.148237	2.907766	1.098612	13.62775
Ln(Fruit Juices Exports) lfrujex	561	6.788543	2.320546	1.098612	12.52816
Ln(Fruit Exports) lfruitex	583	8.197793	2.515091	1.098612	13.80477
Ln(Grain Exports) lgrainex	682	10.54086	1.938128	2.397895	15.24676
Ln(Nursery Exports) lnurex	535	5.330533	2.406354	1.098612	11.88161
Ln(Nut Exports) lnutex	587	7.697168	2.587267	1.098612	12.60176
Ln(Oilseed Exports) loilex	687	9.871984	2.307167	2.302585	14.92302
Ln(Vegetable Exports) lvegex	657	8.723894	2.178013	1.386294	14.44198
Ln(Wine Exports) lwinex	534	6.367688	2.334374	1.098612	12.26718
Ln (Total Imports) ltotimp	692	11.33122	2.473413	0	16.15246
Ln (Animal Imports) lanimimp	622	8.452289	3.142601	0	15.19174
Ln(Cotton Imports) lcottim	99	4.231244	3.381751	0	11.36426
Ln (Floral Imports) lflorimp	398	5.850648	2.916873	0	12.81147
Ln(Fruits Imports) lfrutim	579	8.15884	3.093253	0.693147	13.72326
Ln(Grain Imports) lgrainim	595	7.941628	2.710891	0.693147	14.54082
Ln(Nursery Imports) lnursim	477	6.09168	2.529214	0.693147	12.6433
Ln(Nut Imports) lnutimp	488	6.61407	2.721695	0	12.6044
Ln(Oilseed Imports) loilimp	560	7.304426	2.890994	0.693147	13.61171
Ln(Field Seed Imports) lseedim	488	6.243958	2.757891	0	11.72913
Ln(Vegetable Imports) lvegimp	619	8.311563	2.923561	0.693147	14.69324
Ln(Wine Imports) lwinimp	372	6.805597	3.30193	0.693147	13.93072

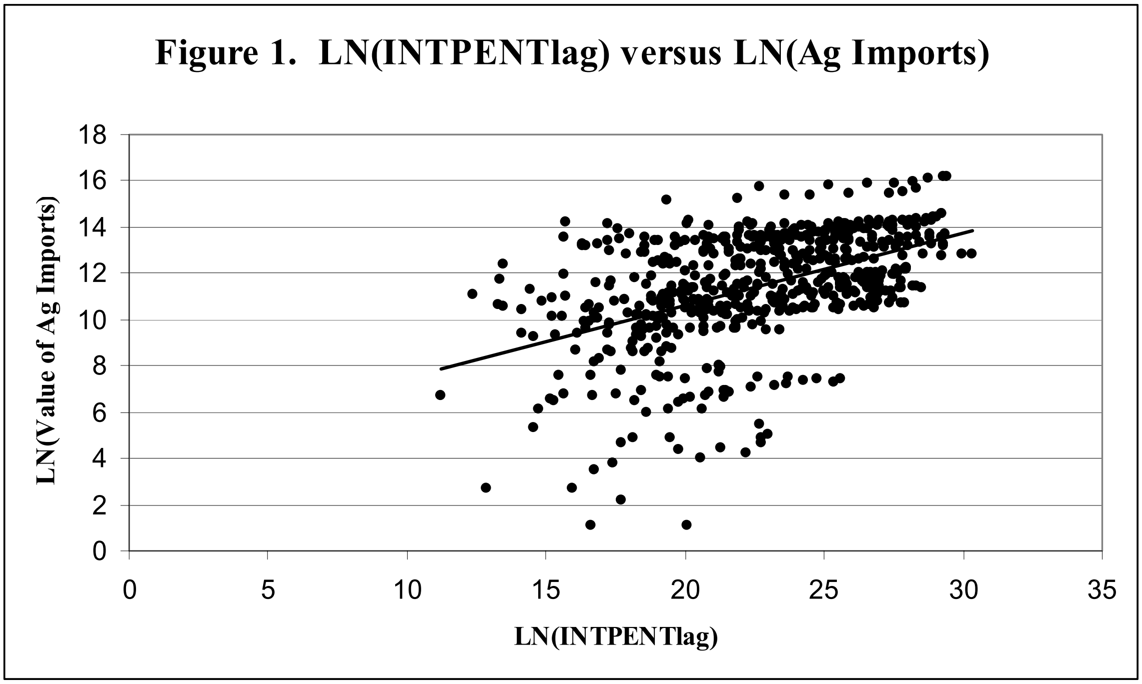
Figure 1. LN(INTPENTlag) versus LN(Ag Imports)
LN(Value of Ag Imports)
18
16
14
12
10
8
6
4
2
0
0
5
10
15
20
25
30
35
LN(INTPENTlag)

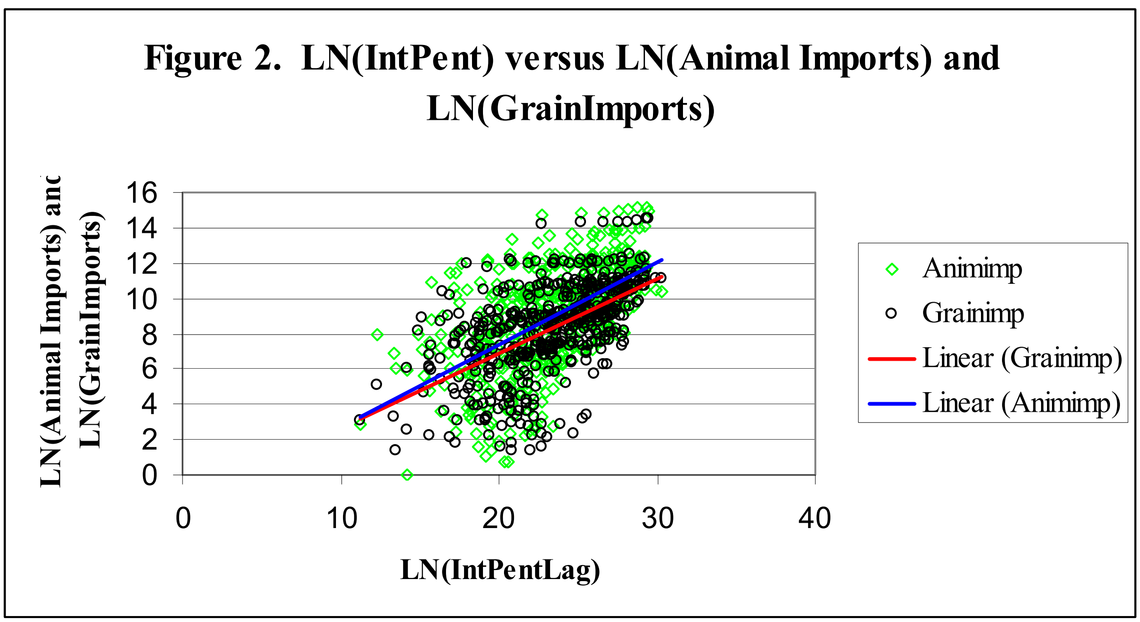
Figure 2. LN(IntPent) versus LN(Animal Imports) and LN(GrainImports)
LN(Animal Imports) and LN(GrainImports)
16
14
12
10
8
6
4
2
0
0
10
20
30
40
LN(IntPentLag)
Animimp
Grainimp
Linear (Grainimp)
Linear (Animimp)

Table 2a. Regression Results for Exports

		Specification 1				Specification 2				Specification 3			
(1)	(2)	(3) Coef.	(4) Std. Err.	(5) t	(6) P>|t|	(7) Coef.	(8) Std. Err.	(9) t.	(10) P>|t|	(11) Coef.	(12) Std. Err.	(13) t.	(14) P>|t|
lntotex	lintpent	0.0046	0.0096	0.48	0.63	-0.0883	0.0966	-0.91	0.36	-0.2043	0.1136	-1.80	0.08
	lprice					**-0.5179**	**0.2839**	**-1.82**	**0.07**				
	intrat2									**0.7218**	**0.3349**	**2.16**	**0.04**
lanimex	lintpent	0.0354	0.0171	2.07	0.04	0.2212	0.1967	1.13	0.27	0.0279	0.1908	0.15	0.88
	lprice					-0.7766	0.4735	-1.64	0.11				
	intrat2									**1.1986**	**0.5143**	**2.33**	**0.02**
lcotex	lintpent	-0.0125	0.0282	-0.44	0.66	-0.0513	0.3330	-0.15	0.88	-0.2437	0.3041	-0.80	0.43
	lprice					-1.1290	0.8761	-1.29	0.21				
	intrat2									1.2026	0.9097	1.32	0.19
lfrujex	lintpent	0.0100	0.0180	0.56	0.58	0.1027	0.2136	0.48	0.63	-0.0027	0.2284	-0.01	0.99
	lprice					-0.3875	0.5568	-0.70	0.49				
	intrat2									0.6220	0.6175	1.01	0.32
lfruitex	lintpent	0.0238	0.0215	1.11	0.27	0.3087	0.1914	1.61	0.11	0.1098	0.2371	0.46	0.65
	lprice					-0.8790	0.5490	-1.60	0.12				
	intrat2									1.1219	0.5915	1.90	0.06
lgrainex	lintpent	-0.0011	0.0115	-0.10	0.92	-0.1771	0.1328	-1.33	0.19	-0.1909	0.1804	-1.06	0.29
	lprice					-0.0543	0.4761	-0.11	0.91				
	intrat2									0.0858	0.5780	0.15	0.88
lnurex	lintpent	**-0.0332**	**0.0126**	**-2.63**	**0.01**	-0.3147	0.2424	-1.30	0.20	-0.3093	0.2458	-1.26	0.21
	lprice					0.1124	0.5791	0.19	0.85				
	intrat2									0.0475	0.6867	0.07	0.95
lnutex	lintpent	-0.0031	0.0163	-0.19	0.85	-0.0968	0.1424	-0.68	0.50	-0.2271	0.1386	-1.64	0.11
	lprice					**-0.6314**	**0.3471**	**-1.82**	**0.07**				
	intrat2									**0.7509**	**0.3769**	**1.99**	**0.05**
loilex	lintpent	0.0195	0.0164	1.19	0.24	-0.0915	0.1304	-0.70	0.49	-0.2206	0.1348	-1.64	0.11
	lprice					-0.6606	0.3126	-2.11	0.04				
	intrat2									**0.7964**	**0.3813**	**2.09**	**0.04**
lvegex	lintpent	0.0049	0.0123	0.40	0.69	0.2220	0.1706	1.30	0.20	0.1737	0.2105	0.83	0.41
	lprice					-0.0491	0.4483	-0.11	0.91				
	intrat2									0.2757	0.5164	0.53	0.60
lwinex	lintpent	-0.0121	0.0186	-0.65	0.52	0.0832	0.2009	0.41	0.68	0.0465	0.2425	0.19	0.85
	lprice					-0.1270	0.5356	-0.24	0.81				
	intrat2									0.2193	0.5571	0.39	0.70

Table 2b. Regression Results for Imports

			Specification 1				Specification 2				Specification 3		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
		Coef.	Std. Err.	t	P>|t|	Coef.	Std. Err.	t.	P>|t|	Coef.	Std. Err.	t.	P>|t|
ltotimp	lintpent	**0.0518**	**0.0206**	**2.52**	**0.01**	**0.6283**	**0.2014**	**3.12**	**0.00**	**0.6528**	**0.1915**	**3.41**	**0.00**
	lprice					0.0737	0.4324	0.17	0.87				
	intrat2									-0.1510	0.4221	-0.36	0.72
lanimimp	lintpent	**0.0558**	**0.0212**	**2.64**	**0.01**	**0.6053**	**0.2572**	**2.35**	**0.02**	**0.5875**	**0.2796**	**2.10**	**0.04**
	lprice					-0.0161	0.5231	-0.03	0.98				
	intrat2									0.0928	0.5551	0.17	0.87
lflorimp	lintpent	**0.1089**	**0.0393**	**2.77**	**0.01**	0.6669	0.5031	1.33	0.19	0.7023	0.4366	1.61	0.12
	lprice					0.1863	0.9088	0.21	0.84				
	intrat2									-0.0451	1.0450	-0.04	0.97
lfrutim	lintpent	**0.1222**	**0.0310**	**3.94**	**0.00**	**0.5069**	**0.1615**	**3.14**	**0.00**	**0.4249**	**0.1708**	**2.49**	**0.02**
	lprice					-0.4238	0.5752	-0.74	0.46				
	intrat2									0.4425	0.6289	0.70	0.49
lgrainim	lintpent	0.0228	0.0164	1.39	0.17	**0.3925**	**0.1810**	**2.17**	0.03	0.3509	0.2120	1.66	0.10
	lprice					-0.1903	0.4210	-0.45	0.65				
	intrat2									0.2442	0.4644	0.53	0.60
lnursim	lintpent	0.0045	0.0353	0.13	0.90	0.6341	0.4001	1.59	0.12	0.5380	0.3874	1.39	0.17
	lprice					-0.5800	0.6723	-0.86	0.39				
	intrat2									0.5518	0.7205	0.77	0.45
lnutimp	lintpent	0.0478	0.0333	1.44	0.15	**0.6919**	**0.2185**	**3.17**	**0.00**	**0.8317**	**0.2273**	**3.66**	**0.00**
	lprice					0.7881	0.6772	1.16	0.25				
	intrat2									-0.9293	0.7693	-1.21	0.23
loilimp	lintpent	0.0152	0.0304	0.50	0.62	0.2610	0.2848	0.92	0.36	0.2310	0.3124	0.74	0.46
	lprice					-0.2699	0.5522	-0.49	0.63				
	intrat2									0.1692	0.5969	0.28	0.78
lvegimp	lintpent	**0.0624**	**0.0207**	**3.02**	**0.00**	0.2083	0.2230	0.93	0.35	0.0879	0.2354	0.37	0.71
	lprice					-0.5076	0.4566	-1.11	0.27				
	intrat2									0.7263	0.5015	1.45	0.15
lwinimp	lintpent	0.0394	0.0349	1.13	0.26	0.2895	0.2398	1.21	0.24	**0.6155**	**0.3046**	**2.02**	**0.05**
	lprice					**1.6643**	**0.9147**	**1.82**	**0.08**				
	intrat2									**-1.8791**	**0.8432**	**-2.23**	**0.03**

Appendix Table 1. Country List	
Algeria	Japan
Angola	Jordan
Argentina	Kenya
Australia	Korea, Rep.
Austria	Kuwait
Belgium	Madagascar
Benin	Malaysia
Bolivia	Mexico
Brazil	Morocco
Burkina Faso	Mozambique
Cameroon	Netherlands
Canada	New Zealand
Chile	Nicaragua
China	Norway
Colombia	Pakistan
Costa Rica	Panama
Cote d'Ivoire	Papua New Guinea
Denmark	Paraguay
Dominican Republic	Peru
Ecuador	Philippines
Egypt, Arab Rep.	Poland
Ethiopia	Portugal
Finland	Saudi Arabia
France	Singapore
Germany	South Africa
Ghana	Spain
Greece	Sri Lanka
Guatemala	Sweden
Guyana	Switzerland
Honduras	Thailand
Hong Kong, China	Trinidad and Tobago
Hungary	Tunisia
Iceland	Turkey
India	Uganda
Indonesia	United Kingdom
Iran, Islamic Rep.	Uruguay
Ireland	Venezuela, RB
Israel	Zambia
Italy	Zimbabwe
Jamaica	

Appendix Table 2a. Regression Statistics for Exports

	Specification 1		Specification 2		Specification 3	
lntotex	Number of obs	626	Number of obs	76	Number of obs	76
	F(13, 612)	104.34	F(7, 68)	18.47	F(7, 68)	18.11
	Prob > F	0	Prob > F	0	Prob > F	0
	R-squared	0.6536	R-squared	0.6812	R-squared	0.6859
lanimex	Number of obs	607	Number of obs	74	Number of obs	74
	F(13, 593)	53.96	F(7, 66)	10.53	F(7, 66)	9.6
	Prob > F	0	Prob > F	0	Prob > F	0
	R-squared	0.4352	R-squared	0.4324	R-squared	0.4467
lcotex	Number of obs	391	Number of obs	48	Number of obs	48
	F(13, 377)	83.96	F(7, 40)	18.15	F(7, 40)	18.57
	Prob > F	0	Prob > F	0	Prob > F	0
	R-squared	0.406	R-squared	0.5121	R-squared	0.5113
lfrujex	Number of obs	495	Number of obs	60	Number of obs	60
	F(13, 481)	83.18	F(7, 52)	18.32	F(7, 52)	16.72
	Prob > F	0	Prob > F	0	Prob > F	0
	R-squared	0.4117	R-squared	0.3556	R-squared	0.3611
lfruitex	Number of obs	518	Number of obs	64	Number of obs	64
	F(13, 504)	79.17	F(7, 56)	21.16	F(7, 56)	20.39
	Prob > F	0	Prob > F	0	Prob > F	0
	R-squared	0.4772	R-squared	0.5406	R-squared	0.5467
lgrainex	Number of obs	602	Number of obs	74	Number of obs	74
	F(13, 588)	36.82	F(7, 66)	6.3	F(7, 66)	6.31
	Prob > F	0	Prob > F	0	Prob > F	0
	R-squared	0.4141	R-squared	0.3807	R-squared	0.3808
lnurex	Number of obs	473	Number of obs	56	Number of obs	56
	F(13, 459)	165.57	F(7, 48)	26.86	F(7, 48)	24.39
	Prob > F	0	Prob > F	0	Prob > F	0
	R-squared	0.5675	R-squared	0.634	R-squared	0.6337
lnutex	Number of obs	524	Number of obs	64	Number of obs	64
	F(13, 510)	104.03	F(7, 56)	37.8	F(7, 56)	39.65
	Prob > F	0	Prob > F	0	Prob > F	0
	R-squared	0.6842	R-squared	0.7352	R-squared	0.7356
loilex	Number of obs	608	Number of obs	74	Number of obs	74
	F(13, 594)	67.98	F(7, 66)	12.36	F(7, 66)	12.11
	Prob > F	0	Prob > F	0	Prob > F	0
	R-squared	0.5052	R-squared	0.519	R-squared	0.5176
lvegex	Number of obs	583	Number of obs	72	Number of obs	72
	F(13, 569)	136.53	F(7, 64)	28.2	F(7, 64)	24.29
	Prob > F	0	Prob > F	0	Prob > F	0
	R-squared	0.59	R-squared	0.562	R-squared	0.5643
lwinex	Number of obs	475	Number of obs	57	Number of obs	57
	F(13, 461)	178.85	F(7, 49)	21.3	F(7, 49)	20.43
	Prob > F	0	Prob > F	0	Prob > F	0
	R-squared	0.5626	R-squared	0.5721	R-squared	0.5729

Appendix Table 2b Regression Statistics for Imports

	Specification 1		Specification 2		Specification 3	
ltotimp	Number of obs	614	Number of obs	76	Number of obs	76
	F(13, 600)	64.85	F(7, 68)	32.12	F(7, 68)	33.48
	Prob > F	0	Prob > F	0	Prob > F	0
	R-squared	0.459	R-squared	0.5705	R-squared	0.5708
lanimimp	Number of obs	550	Number of obs	66	Number of obs	66
	F(13, 536)	157.36	F(7, 58)	82.37	F(7, 58)	77.11
	Prob > F	0	Prob > F	0	Prob > F	0
	R-squared	0.6096	R-squared	0.6726	R-squared	0.6728
lflorimp	Number of obs	350	Number of obs	40	Number of obs	40
	F(13, 336)	21.57	F(7, 32)	14.03	F(7, 32)	13.71
	Prob > F	0	Prob > F	0	Prob > F	0
	R-squared	0.1706	R-squared	0.1714	R-squared	0.1708
lfrutim	Number of obs	514	Number of obs	66	Number of obs	66
	F(13, 500)	24.31	F(7, 58)	12.67	F(7, 58)	12.62
	Prob > F	0	Prob > F	0	Prob > F	0
	R-squared	0.3089	R-squared	0.3907	R-squared	0.3896
lgrainim	Number of obs	531	Number of obs	65	Number of obs	65
	F(13, 517)	204.18	F(7, 57)	120.05	F(7, 57)	124.74
	Prob > F	0	Prob > F	0	Prob > F	0
	R-squared	0.6943	R-squared	0.7307	R-squared	0.7311
lnursim	Number of obs	424	Number of obs	51	Number of obs	51
	F(13, 410)	61.87	F(7, 43)	13.27	F(7, 43)	12.9
	Prob > F	0	Prob > F	0	Prob > F	0
	R-squared	0.2891	R-squared	0.3368	R-squared	0.3339
lnutimp	Number of obs	439	Number of obs	59	Number of obs	59
	F(13, 425)	93.84	F(7, 51)	57.5	F(7, 51)	57.81
	Prob > F	0	Prob > F	0	Prob > F	0
	R-squared	0.3672	R-squared	0.4301	R-squared	0.4306
loilimp	Number of obs	500	Number of obs	69	Number of obs	69
	F(13, 486)	39.75	F(7, 61)	18.68	F(7, 61)	18.26
	Prob > F	0	Prob > F	0	Prob > F	0
	R-squared	0.379	R-squared	0.5168	R-squared	0.5154
lseedim	Number of obs	434	Number of obs	53	Number of obs	53
	F(13, 420)	66.56	F(7, 45)	12.33	F(7, 45)	11.93
	Prob > F	0	Prob > F	0	Prob > F	0
	R-squared	0.3602	R-squared	0.4041	R-squared	0.404
lvegimp	Number of obs	551	Number of obs	67	Number of obs	67
	F(13, 537)	64.81	F(7, 59)	14.17	F(7, 59)	14.22
	Prob > F	0	Prob > F	0	Prob > F	0
	R-squared	0.5656	R-squared	0.5895	R-squared	0.5939
lwinimp	Number of obs	332	Number of obs	46	Number of obs	46
	F(13, 318)	28.76	F(7, 38)	9	F(7, 38)	9.11
	Prob > F	0	Prob > F	0	Prob > F	0
	R-squared	0.4122	R-squared	0.4665	R-squared	0.4745