Factors Influencing the Propensity for Cross-Border Trade

by

Satheesh Aradhyula
University of Arizona
satheesh@ag.arizona.edu
(520-621-6260)

Russell Tronstad
University of Arizona
tronstad@ag.arizona.edu
(520-621-2425)

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Abstract

We estimate a simultaneous bivariate qualitative choice model of Arizona agribusiness firms' propensity to trade and visit as a tourist with the cross-border state of Sonora, Mexico. The trade equation is estimated as an ordered probit model with responses of:: 1) a firm has not ever traded or investigated doing any trading activities with Sonora, 2) the firm has not done any trade with Sonora but they have investigated doing business in this cross-border state, and 3) the firm has traded with Sonora, either directly or through a second handler like a broker. A proprietor's propensity to visit Sonora as a tourist is modeled from the binary response of whether the individual has ever visited Sonora as a tourist or not. Simultaneity arises since both trade and tourist visits are hypothesized to influence one another. Results indicate that tourist visits have a greater influence on whether firms trade than traditional variables considered like firm age and size. Venture business visits, quantified through the tourism equation, were also found to have a greater impact on an agribusiness firm's propensity to trade than traditional variables. Our results suggest that communities seeking to develop and expand cross-border trading activities should target entrepreneurs with an exploratory and venture spirit first. Then, target firms that are fairly established (over 15 years in age) and desire to diversity their production risk through multiple geographic production regions. Firm size and foreign language fluency of the agribusiness owner were found to be less significant than tourist visits, venture business visits, and firm age.

Key words: agribusiness, Arizona, marginal effects, ordered probit, Sonora, tourism, trade

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Implementation of the North American Free Trade Agreement (NAFTA) on January 1, 1994 was accompanied with high publicity and a much brighter future for expanding trade of agricultural products. Indeed, food and agricultural trade among NAFTA countries has grown remarkably, particularly between the United States and Mexico. In spite of transportation bottlenecks, trade activity between Mexico and the US has more than doubled for agriculture in the last decade, increasing from $5.2 to $11.5 billion between 1990 and 2000 (FATUS: Foreign Agricultural Trade of the US). This growth in trade is faster than what has occurred between the US and other developed foreign markets like Japan, Taiwan, and the European Union (Coyle). While much of the US-Mexico trade has been generated from states along the border, some border states and communities have fared better than others at attracting cross-border trading activities (Business Frontier, Pavlakovich-Kochi, Erie and Nathanson, Walker and Morehouse). In addition, several states and communities have pursued activities and projects (e.g., publications, trade shows, tours) with the intent to attract more trade and economic activity to their locations. For example, the Federal Reserve Bank of Dallas is launching a new ongoing publication series entitled "The Border Economy" to focus on Texas-Mexico border economic issues. Our analysis is aimed at helping address what kind of firms, policies, and activities, including tourism, should be targeted in order to attract more regional trade.

Prior studies have also found a linkage between export activity and firm characteristics such as size, experience, years in business, and type of product. For example, Cavusgil and Naor found that larger firms are more likely to develop exports since they are better able to reallocate resources and expand into foreign markets. In a survey of Wisconsin firms, Moini found that 38.7 percent of firms with more than 50 employees were exporters while only 10.4 percent of

non-exporting firms had over 50 employees. Larger firms are also more likely to already have multiple site locations and distribution logistics in place. These characteristics allow them to enter international markets with greater ease than firms without these traits. Adequate cross-cultural skills needed for exporting have also been found to be positively associated with larger firms (Ali and Swiercz). Years in business, most likely related to experience, is another firm characteristic that has been shown to be influential for determining whether a firm trades or not. Moini found that 60.4 percent of exporters had been in business for more than 20 years versus a somewhat reduced 52.6 percent of non-exporting firms. Jensen and Hollis found that agribusiness firms located in the western US were more likely to be exporters than firms from the rest of the US. Regional location may also influence trade beyond travel logistics and production opportunities. Shoham and Albaum report that "cultural distance" or management's attitude toward exporting also varies by region. The above studies indicate that not all firms are homogeneous in their ability to capitalize on trade opportunities. Thus, quantifying factors which influence a firm's propensity to trade are important for targeting firms, and prioritizing policies and activities that will expand trade the most.

Many states have expressed great interest in tourism and related recreation activities as a way to increase and diversify their economic base, particularly for rural areas (Fawson, Thilmany, and Keith). While tourism has direct, indirect, and induced impacts on economic development (Slee, Farr, and Snowdon), it may also have a more subtle impact on economic activity by influencing a firm's propensity to trade. That is, a tourist visit from an international traveler who owns or manages a firm may influence this firm's propensity to trade with the country visited. In their "first ever" study related to this issue, Kulendran and Wilson tested the three hypotheses that: 1) business travel leads to international trade, 2) international trade leads

to international travel, and 3) international travel, other than business, leads to international trade. They found support for their hypotheses using cointegration and Granger-causality techniques in analyzing aggregate international trade and travel flow data for Australia and it's four main trading partners of the US, United Kingdom, New Zealand, and Japan. In particular, they discovered that real exports from Australia Granger-cause holiday travel in the US and UK. Encouraging support was also found for the hypothesis that international travel, other than business travel, leads to international trade. However, limited evidence was found that real imports influence international travel. Using similar aggregate time series data, Shan and Wilson found two-way Granger causality between international travel and trade for China with Australia, Japan, and the US. Their results imply that trade flows are linked with tourism for China and that tourism forecasting studies should simultaneously consider trade and tourism effects.

This study analyzes how both firm characteristics and cross-border tourism travel impact a firm's propensity to trade. To our knowledge, this analysis is the first of its kind to simultaneously model trade and tourism effects using cross sectional data. The next section discusses our survey data and the ordered probit – probit model we utilize to quantify our hypothesized relationships. Then, results of our bivariate model are presented and followed by a conclusion section that discusses the policy implications of this study.

Data and Methods

To quantify the impact of tourism and firm attributes on cross-border trade, we analyzed survey data obtained from Arizona agribusiness firms regarding their business activities in Sonora.[1] Questionnaires were sent to agribusiness leaders mainly identified by Arizona's Department of Agriculture. From a total of 130 questionnaires sent out to agribusiness firms, we received 78

responses and 66 were useable for our analysis. At least two follow-up phone calls were made to individuals that did not return a completed questionnaire. Survey responses were received in 1997, three years after the initiation of NAFTA. Thus, survey participants could have had the opportunity to develop or at least explore cross-border trading opportunities after the euphoria of a much freer trading environment associated with NAFTA was put in place. In our survey, firms were asked to identify if they were doing any business or trade activities with Sonora[2] and if they had ever investigated doing business with firms in Sonora. In addition, respondents were also asked whether they had ever visited Sonora as a tourist. From these questions, we constructed dependent variables for our model to quantify trade and tourism effects.

An Arizona firm's observed propensity to trade, $TRADE_i$, has three possible discrete and ordered values. A value of 0 indicates that a firm has not ever traded or investigated doing any trading activities with Sonora, 1 indicates that they have not done any trade with Sonora but they have investigated doing business with this cross-border state, and 2 indicates that the firm has traded with Sonora, either directly or through a second handler like a broker. An Arizona agribusiness firm's observed propensity to visit Sonora as a tourist, $TVISIT_i$, is a 0 or 1 binary variable. Table 1 describes the discrete nature associated with all variables and their respective sample means.

We use an ordered probit model to explain Arizona agribusiness firms' propensity to trade with Sonora. Ordered probit models are cast in terms of a latent continuous random variable. For a dependent variable with three possible discrete values, the ordered probit model is given by:

(1) $TRADE_i^* = \beta_0 + \beta_1 \cdot TVISIT_i^* + \beta_2 \cdot FIRMSIZE_i + \beta_3 \cdot FIRMAGE_i + \beta_4 \cdot GEODIV_i + u_{1i}$ and

$$TRADE_i = \begin{cases} 0 & \text{if } TRADE_i^* \leq 0 \\ 1 & \text{if } 0 < TRADE_i^* \leq \mu \\ 2 & \text{if } \mu < TRADE_i^* \end{cases}$$

where, $TRADE_i^*$ is the firm's unobserved propensity to trade, $TRADE_i$ is the firm's observed

propensity to trade, $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4$, and μ are unknown parameters to be estimated, and u_{1i} is a

random variable. Explanatory variables include: propensity to visit Sonora as a tourist

($TVISIT_i^*$), size of its operation relative to others selling similar products ($FIRMSIZE_i$), how

long the company has been in business in Arizona ($FIRMAGE_i$), and the importance of

geographic diversity ($GEODIV_i$) to a firm when two production regions have the same

harvest/shipping period.

A proprietor's propensity to visit Sonora as a tourist ($TVISIT_i^*$) is unobservable. Instead,

what is observed is a binary variable indicating whether the proprietor has visited Sonora

($TVISIT_i=1$) or not ($TVISIT_i=0$). Thus, in order to operationalize equation (1), it is necessary to

estimate a model that explains the propensity to visit Sonora as a tourist. We model the decision

to visit Sonora as a tourist with the following probit framework:

(2) $TVISIT_i^* = \gamma_0 + \gamma_1 \cdot TRADE_i^* + \gamma_2 \cdot VVISIT_i + \gamma_3 \cdot SPANISH_i + u_{2i}$ and

$$TVISIT_i = \begin{cases} 0 & \text{if } TVISIT_i^* \leq 0 \\ 1 & \text{if } TVISIT_i^* > 0 \end{cases}$$

where, $VVISIT_i$ is a binary variable indicating whether the participant has ever made a business

venture visit to Sonora in the past ($VVISIT_i=1$) or not ($VVISIT_i=0$). The venture visit could be

for exploring the formation of a new joint venture business or trade relationship, or simply

visiting an operation similar to their own in Sonora. $SPANISH_i$ indicates whether the

participant's Spanish speaking skills are none, some, or fluent when $SPANISH_i$ equals 0, 1, or 2,

respectively. $\gamma_0, \gamma_1, \gamma_2$, and γ_3 are unknown parameters to be estimated and u_{2i} is a random variable. We assume that u_{1i} and u_{2i} from equations (1) and (2), respectively, are jointly normally distributed with a correlation coefficient of ρ. As is customary in ordered probit and probit models, we normalize the mean and variance of both u_{1i} and u_{2i} to 0 and 1, respectively.

The structural model given in equations (1) and (2) is simultaneous with unobservable endogenous variables on the right hand side. An estimation procedure should account for this simultaneity and possible correlation between u_1 and u_2 to obtain consistent and efficient parameter estimates. Traditional instrumental methods are not feasible because of the unobservable nature of the endogenous variables. We derive the reduced form model from the structural model and estimate it with full information maximum likelihood methods.

The reduced form for the structural model given in equations (1) and (2) is:

(3) $TRADE_i^* = (xb_{1i} + \beta_1 \cdot xb_{2i}) / (1 - \gamma_1\beta_1) + \varepsilon_{1i}$

(4) $TVISIT_i^* = (xb_{2i} + \gamma_1 \cdot xb_{1i}) / (1 - \gamma_1\beta_1) + \varepsilon_{2i}$

where, $xb_{1i} = \beta_0 + \beta_2 \cdot FIRMSIZE_i + \beta_3 \cdot FIRMAGE_i + \beta_4 \cdot GEODIV_i$,

$xb_{2i} = \gamma_0 + \gamma_2 \cdot VVISIT_i + \gamma_3 \cdot SPANISH_i$,

$\varepsilon_{1i} = (u_{1t} + \beta_1 u_{2i}) / (1 - \gamma_1\beta_1)$, and

$\varepsilon_{2i} = (\gamma_1 u_{1t} + u_{2i}) / (1 - \gamma_1\beta_1)$.

Given that u_{1i} and u_{2i} are normally distributed random variables, ε_{1i} and ε_{2i} are also normally distributed. That is,

(5) $\begin{pmatrix} \varepsilon_{1i} \\ \varepsilon_{2i} \end{pmatrix} \sim N\left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \sigma_1^2 & \sigma_{12} \\ \sigma_{12} & \sigma_2^2 \end{pmatrix} \right] = N\left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \dfrac{1 + 2\beta_1\rho + \beta_1^2}{(1 - \gamma_1\beta_1)^2} & \dfrac{\beta_1 + \gamma_1 + \rho + \gamma_1\beta_1\rho}{(1 - \gamma_1\beta_1)^2} \\ & \dfrac{1 + 2\gamma_1\rho + \gamma_1^2}{(1 - \gamma_1\beta_1)^2} \end{pmatrix} \right].$

Maximum likelihood estimates of the parameters $(\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \mu, \gamma_0, \gamma_1, \gamma_2, \gamma_3,$ and $\rho)$ are

obtained by maximizing the following log-likelihood:

$$
\begin{aligned}
(6)\quad \ln L &= \sum_{\substack{TRADE_i=0\\TVISIT_i=0}} \ln\Phi\!\left(\frac{-w_{1i}}{\sigma_1}, \frac{-w_{2i}}{\sigma_2}, \rho^*\right) + \sum_{\substack{TRADE_i=0\\TVISIT_i=1}} \ln\Phi\!\left(\frac{-w_{1i}}{\sigma_1}, \frac{w_{2i}}{\sigma_2}, -\rho^*\right) + \sum_{\substack{TRADE_i=1\\TVISIT_i=0}} \ln\Phi\!\left(\frac{\mu-w_{1i}}{\sigma_1}, \frac{-w_{2i}}{\sigma_2}, \rho^*\right) - \\[2mm]
&\quad \sum_{\substack{TRADE_i=1\\TVISIT_i=0}} \ln\Phi\!\left(\frac{-w_{1i}}{\sigma_1}, \frac{-w_{2i}}{\sigma_2}, \rho^*\right) + \sum_{\substack{TRADE_i=1\\TVISIT_i=1}} \ln\Phi\!\left(\frac{\mu-w_{1i}}{\sigma_1}, \frac{w_{2i}}{\sigma_2}, -\rho^*\right) - \sum_{\substack{TRADE_i=1\\TVISIT_i=1}} \ln\Phi\!\left(\frac{-w_{1i}}{\sigma_1}, \frac{w_{2i}}{\sigma_2}, -\rho^*\right) + \\[2mm]
&\quad \sum_{\substack{TRADE_i=2\\TVISIT_i=0}} \ln\Phi\!\left(\frac{-\mu-w_{1i}}{\sigma_1}, \frac{-w_{2i}}{\sigma_2}, -\rho^*\right) + \sum_{\substack{TRADE_i=2\\TVISIT_i=1}} \ln\Phi\!\left(\frac{-\mu-w_{1i}}{\sigma_1}, \frac{w_{2i}}{\sigma_2}, \rho^*\right)
\end{aligned}
$$

where, Φ is the cumulative density function for the standard bivariate normal distribution,

$w_{1i} = (xb_{1i} + \beta_1 \cdot xb_{2i})/(1-\gamma_1\beta_1),\ w_{2i} = (xb_{2i} + \gamma_1 \cdot xb_{1i})/(1-\gamma_1\beta_1),$ and $\rho^* = \sigma_{12}/(\sigma_1 \cdot \sigma_2).$

Empirical Results

Maximum likelihood estimates of parameters for the simultaneous two-equation model are

provided in table 2. As hypothesized, regressors of *TVISIT*, *FIRMSIZE*, *FIRMAGE*, and

GEODIV all positively impact *TRADE*[*]. Tourist visits to a foreign country are believed to

heighten the awareness of potential business opportunities for business entrepreneurs. We expect

that firms which are established will be more likely to seek opportunities abroad than companies

that are not as established and probably have not yet exploited all their local market

opportunities. Moini found a breaking point in his data regarding firm age to exist at 20 years of

age, while 15 years was a more natural breaking point for us.[3] Firms relatively larger than their

competitors (*FIRMSIZE*) are more likely to already have multiple site locations plus the

resources and expertise to manage sites from a distance, allowing them greater ease to enter

international markets. The positive sign associated with *GEODIV* indicates that firms which

benefit from geographical diversity, even when different regions have the same harvest and

shipping date, are more likely to trade. *TVIST* and *FIRMAGE* are both statistically significant at the 10 percent level while *GEODIV* and *FIRMSIZE* are less significant at 14.8 and 41.2 percent levels, respectively.

VVISIT and *SPANISH* positively impact Arizona agribusiness proprietors' propensity to visit Sonora as tourists. Conversely, *TRADE*[*] negatively impacts tourism visits to Sonora. Given the kidnappings and associated ransom demands that have been made for prominent US business individuals in Mexico, it is not entirely surprising that *TRADE*[*] of a firm negatively impacts *TVISIT*[*]. But the exploration of new business or trade ventures and visiting sites with similar operations has a positive influence on tourism. Better exposure or familiarity of an area through venture visits appears to entice these same individuals to explore the region more as a tourist. In addition, individuals that are willing to accept foreign travel risks for tourism also appear willing to take these same travel risks for business. *VVISIT* and *TRADE*[*] are statistically significant at the 1 and 10 percent level, respectively. Although positive, foreign language abilities (*SPANISH*) are quite marginal in their significance at 29.9 percent.

A likelihood ratio test that coefficients on all explanatory variables in both equations are zero is rejected at a 1 percent level of significance. This is based on a calculated χ^2 value of 35.31 with 8 degrees of freedom. Further evidence of model validation can be obtained from the prediction accuracy of the model. Overall, the model performs relatively well by predicting 36 of 66 sample points correctly. Given the six possible combinations of *TRADE* and *TVISIT* for each sample point, this 54.5 percent success rate appears quite reasonable (Greene, page 834). Unlike a single equation case for a binary variable, where a naïve model has a 50 percent chance of making a correct prediction, a purely naïve model for the present two equation system would have only a 1/6th chance (16.67 percent) of making a correct prediction.

Marginal Effects

The coefficients in (3) (i.e., β's and γ_1) indicate marginal effects of changes in explanatory

variables on unobserved latent variable, *TRADE**. As in probit models, these coefficients are not

the marginal effects of changes in the regressors on the probabilities. To obtain the marginal

effects of a change in an explanatory variable on probabilities that $TRADE_i$ takes different

values, we first need to obtain marginal and conditional distributions for $TRADE^*$ and $TVISIT^*$

from their estimated joint distribution:

$$(7) \quad \begin{pmatrix} TRADE_i^* \\ TVISIT_i^* \end{pmatrix} \sim N\left[\begin{pmatrix} w_{1i} \\ w_{2i} \end{pmatrix}, \begin{pmatrix} \sigma_1^2 & \sigma_{12} \\ \sigma_{12} & \sigma_2^2 \end{pmatrix} \right].$$

The marginal distributions for bivariate normal are also normal (Greene, page 83). In particular,

the marginal distribution for $TRADE_i^*$ is given by:

$$(8) \quad TRADE_i^* \sim N\left[w_{1i}, \sigma_1^2 \right].$$

The conditional distribution for TRADE* is given by the truncated bivariate normal distribution:

$$(9a) \quad f(TRADE^* \mid TVISIT = 0) = f(TRADE^* \mid TVISIT^* \leq 0) = \frac{\int_{-\infty}^{0} \phi(TRADE^*, TVISIT^*) dTVISIT^*}{prob(TVISIT = 0)},$$

and

$$(9b) \quad f(TRADE^* \mid TVISIT = 1) = f(TRADE^* \mid TVISIT^* > 0) = \frac{\int_{0}^{\infty} \phi(TRADE^*, TVISIT^*) dTVISIT^*}{prob(TVISIT = 1)}$$

where ϕ is the probability density function corresponding to the bivariate normal distribution in

(7). Note that the conditional distributions given in (9a) and (9b) are different from the typical

conditional distributions given for bivariate normal densities (see, for example, equation 3-80,

Greene, page 83). That is, conditional densities are usually obtained when the conditioning

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random variable, *TVISIT**, takes a particular value (e.g., *TVISIT** = 2.1) rather than a range of values (e.g., *TVISIT** > 0).

As described in table 1, all the explanatory variables in the model are themselves discrete and take a finite number of values. For discrete variables that are not binary (e.g., *FIRMSIZE*, *GEODIV*, *SPANISH*), a differentiation technique (Greene, page 877) may not be the most appropriate method to obtain marginal effects. This may especially be the case when comparing magnitudes with binary explanatory variables. Thus, we obtain the marginal effects of explanatory variables by comparing probabilities that result when the explanatory variable takes a different value, holding other variables at their sample means. For example, the marginal effect of a change in *GEODIV* on prob(*TRADE*=2) is obtained by computing: prob(*TRADE*=2|*GEODIV*=j+1) – prob(*TRADE*=2|*GEODIV*=j), holding other explanatory variables at their sample means. All possible increments are averaged to obtain the marginal effect of *GEODIV*.[4] Similarly, the marginal effect of a change in *GEODIV* on E[*TRADE**] is computed as E[*TRADE**|*GEODIV*=j+1] - E[*TRADE**|*GEODIV*=j], holding other explanatory variables at their respective sample means. We obtain the marginal effect of a binary dummy variable by comparing the probabilities that result when the binary dummy variable takes its two different values, holding other variables at their respective sample means. Marginal effects of all exogenous variables are computed using the distribution in (8). Marginal effects of a change in *TVISIT* on *TRADE* were obtained using the same discrete approach as for exogenous variables, but using the conditional distribution in (9) rather than (8).

Table 3 provides the marginal effects of all variables on *TRADE*. Figure 1 graphically portrays the levels associated with E[*TRADE*] that these marginal effects are derived from. Probability levels associated with the firm trading are portrayed in figure 2. Results indicate that

TVISIT has the largest impact on cross-border trade. The probability a firm will trade with the cross-border state of Sonora increases by as much as 43.0 percent when the proprietor visits Sonora as a tourist. The tourist visit also causes the probability that an individual will not trade or just consider trading to fall by 32.5 and 10.4 percent, respectively. The expected value of *TRADE* increases by 0.756 if a proprietor has visited Sonora as a tourist before. The impact of a venture visit that explores a joint business or trade opportunity or a site visit to a similar business in Sonora increases the probability of cross-border trade for this individual by 39.6 percent and the expected value of *TRADE* by 0.641. These results strongly support the hypothesis that both casual exposure and formal business exploration of cross-border business opportunities have a positive impact on trade.

Although our study supports earlier findings that large firms are more likely to trade than small firms, our results indicate that firm age has a greater influence on trade than the size of the firm. Firms that have been in business for fifteen or more years are 22.2 percent more likely to trade than newer less established firms. The expected value of trade increases by 0.335 when a firm is 15 or more years old. This is roughly half the impact of *TVISIT* or *VVISIT* on *TRADE*. The marginal effect of geographic diversity (*GEODIV*) on the expected value of trade appears relatively small at 0.152. But since *GEODIV* goes from 1 (not important) to 5 (very important), the total marginal impact from its minimum to maximum value is 0.606 or almost the impact of *VVIST* on *TRADE*.

Results in table 3 are the effects of changing a single explanatory variable on trade, holding other variables constant. From a policy perspective, it is also useful to look at the joint impact of simultaneous changes in two or more variables on cross-border trade. Table 4 presents joint effects of changes in two or more selected variables. Due to nonlinearities in the model, the

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combined effect of two or more variables is not the sum of their individual effects. For example, from table 4, the joint effect of both a tourist and business venture visit increases the probability of trade by 0.664. This is 16.2 percent less than the sum of their individual marginal effects. Given that both *TVISIT* and *VVISIT* have relatively large individual impacts, it is not surprising that diminishing returns to trade are realized when these two variables are combined. The sum of individual marginal effects for a tourist visit and firm age differ by less than 4 percent from their combined marginal effect. The combined marginal effect of *TVISIT* and *FIRMAGE* on the probability that the firm will trade increases this probability by 0.684 versus 0.652 for the sum of their individual marginal effects. *TVISIT, FIRMAGE,* and *VVISIT* combined have a very large marginal effect of 0.834 on increasing the probability of the firm trading.

Conclusions

Estimated results from our survey data reinforce the findings of recent time series studies (i.e., Kulendran and Wilson, and Shan and Wilson) that non-business international travel leads to trade. Using cross sectional data, we found that a tourist visit increases the probability that an Arizona agribusiness proprietor will trade with their cross-border state of Sonora, Mexico by up to 43.0 percent. Somewhat similar to the hypotheses of these recent time series studies that business travel leads to more international trade, we found that business venture visits increase the probability of trading for the firm by as much as 39.6 percent. These time series studies were looking at aggregate business travel whereas our business travel was limited to visits associated with venture trade or business opportunities and site visits to similar firms in Sonora. Trade was found to have a negative impact on tourism travel for the firm, which may be attributed to the

greater exposure of kidnappings and ransom demands for business individuals traveling in Mexico or due to a desire to not mix vacation with business activities.

Our results strongly support the hypothesis that both casual exposure and formal exploration of cross-border business opportunities have a positive impact on trade. That is, tourist and business venture visits were found to have a greater influence on whether firms trade than traditional variables considered like firm age and size. Trade missions sponsored by government entities can expose entrepreneurs to opportunities, but they probably will not change the exploratory nature and risk preferences of the individuals sponsored. Thus, the magnitude of our impacts for a tourist visit should not be equated with a sponsored trade tour, although we would still expect this to have a positive impact on trade.

Our findings suggest that making it easier for individuals to travel as a tourist to even their cross-border state can have a positive impact on trade. The "Sonora Only" program, adopted in the summer of 1995, does this by reducing the transaction cost of US visitors going into Sonora beyond the Free Trade Zone. This program allows visitors to drive their vehicles into Sonora without posting a bond or providing an international credit card and an original plus two copies of numerous documents. In addition, the program reduces the proof of citizenship requirement from a passport or birth certificate to a valid drivers license and waives the normal $11.50 processing fee. Our results indicate that other border states in Mexico could improve their trade with the US by adopting a similar policy for visitors to their state.

To our knowledge, this analysis is the first of its kind to endogenously model trade and tourism effects using cross sectional data. Unlike aggregate time series studies, cross sectional data provides insights into the kind of firms that should be targeted for trade. Our results indicate that communities seeking to develop or expand cross-border trading activities should first target

entrepreneurs with an exploratory and venture spirit. Then, identify firms that are fairly established (over 15 years in age) and desire to diversify their production risk through multiple geographic production regions. Although positive, firm size and foreign language fluency of the agribusiness owner were found to be marginally significant on influencing trade. Results indicate that the joint effect of several variables exceeds 0.5. Thus, by targeting particular firms, the probability of trade can be increased by as much as 50 percent.

Endnotes

[1] The survey instrument is available from the authors or online at

http://ag.arizona.edu/arec/pubs/azson/agbus.html.

[2] Participants were also asked about their trading activities with the rest of Mexico in addition to

Sonora. However, only 3 of the 68 responses are different if trading activities are quantified

with respect to Mexico versus Sonora. Given these data similarities for trade and that tourism

information was only asked for Sonora, we have chosen to focus on Arizona's trade with

Sonora rather than Mexico.

[3] For the 11 firms in our data that were 15 to 19 years in age, 6 were trading, 3 considered

trading, and 2 had not considered trading. We also considered *FIRMAGE* as a continuous

variable, but this yielded inferior statistical significance for this variable compared to the less

than 15 year breaking point. Similarly, other binary (10 and 20 years) or discretely ordered

breaking points (10, 15, and 20 years of age in combination with 40, 50, and 60 years of age)

yielded inferior statistical significance.

[4] Marginal effects were very similar using either the differential or discrete approach for non-

binary explanatory variables.

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Table 1. Variable definitions and sample means

Variable	Variable Definition	Sample Mean
Dependent Variables:		
$TRADE_i$	Represents the ith Arizona firm's inclination to trade with Sonora, Mexico: 2 = firm has traded with another firm in Sonora, directly or through a second handler, 1 = firm has considered trading with Sonora but has never actually traded, and 0 = firm has never investigated or considered trading with Sonora.	1.470
$TVISIT_i$	A binary variable: 1 = the owner has visited Sonora in the past as a tourist and 0 = the owner has not visited Sonora as a tourist.	0.818
Exogenous Variables:		
$FIRMSIZE_i$	Size of the ith firm's operation relative to others that sell similar products or services: 1 = below average, 2 = average, 3 = above average.	2.182
$FIRMAGE_i$	How long the ith firm has been in business in Arizona: 0 = the firm has been in business for less than 15 years, 1 = the firm has been in business for 15 or more years.	0.303
$GEODIV_i$	Importance of geographic diversity to the firm for having different regions of production with the same harvest/shipping period for reducing the firm's risk, measured on a scale of 1 to 5 where 1 is not important, and 5 is very important.	3.621
$VVISIT_i$	A binary variable: 1 = the owner has visited Sonora in the past to explore forming a joint business or trade venture, or has made a site visit to a similar operation, and 0 = the owner has never conducted any such kind of business venture visit in Sonora.	0.667
$SPANISH_i$	Spanish speaking skills of respondent are: 0 = none, 1 = some, and 2 = fluent.	1.849

Table 2. Estimated trade and tourist visit equations

Variable	Estimate	t-statistic	P –values
Trade Equation:			
INTERCEPT	-2.732	-2.874	0.004
TVISIT	1.954	1.722	0.085
FIRMSIZE	0.270	0.821	0.412
FIRMAGE	1.243	1.780	0.075
GEODIV	0.500	1.448	0.148
μ	0.882	1.568	0.117
Tourist Visit Equation:			
INTERCEPT	0.117	0.207	0.836
TRADE	-0.586	-1.730	0.084
VVISIT	1.119	3.229	0.001
SPANISH	0.320	1.038	0.299
ρ	-0.113	-0.157	0.875
Log-likelihood	-74.253		
Sample size	66		

[1] μ is the threshold parameter associated with the ordered probit model.

[2] ρ is the correlation coefficient between the error terms of Trade and Tourist Visit equations.

Table 3. Estimated effects of a one unit increase in explanatory variables on *TRADE* probabilities and E[*TRADE*]

Variable	Variable Range	Estimated Marginal Effects[a] on			
		Prob(*TRADE*=0)	Prob(*TRADE*=1)	Prob(*TRADE*=2)	E[*TRADE*]
Effects based on marginal distribution for *TRADE**:					
FIRMSIZE	1-3[b]	-0.023	-0.025	0.048	0.071
FIRMAGE	0-1	-0.112	-0.110	0.222	0.335
GEODIV	1-5[b]	-0.060	-0.032	0.092	0.152
VVISIT	0-1	-0.245	-0.150	0.396	0.641
SPANISH	1-3[b]	-0.062	-0.053	0.114	0.176
Effects based on conditional distribution for *TRADE**:					
TVISIT	0-1	-0.325	-0.104	0.430	0.756

[a] Marginal effects of *TVISIT* are obtained using the conditional distribution for *TRADE**. For example, -0.325 is obtained by evaluating prob(*TRADE=0|TVISIT=1*)-prob(*TRADE=0|TVISIT=0*), where the first probability is from the conditional distribution in equation (9b) and the second probability is from the conditional distribution in equation (9a). Marginal effects of all the other explanatory variables are calculated similarly, only using the marginal distribution for *TRADE** given in equation (8).
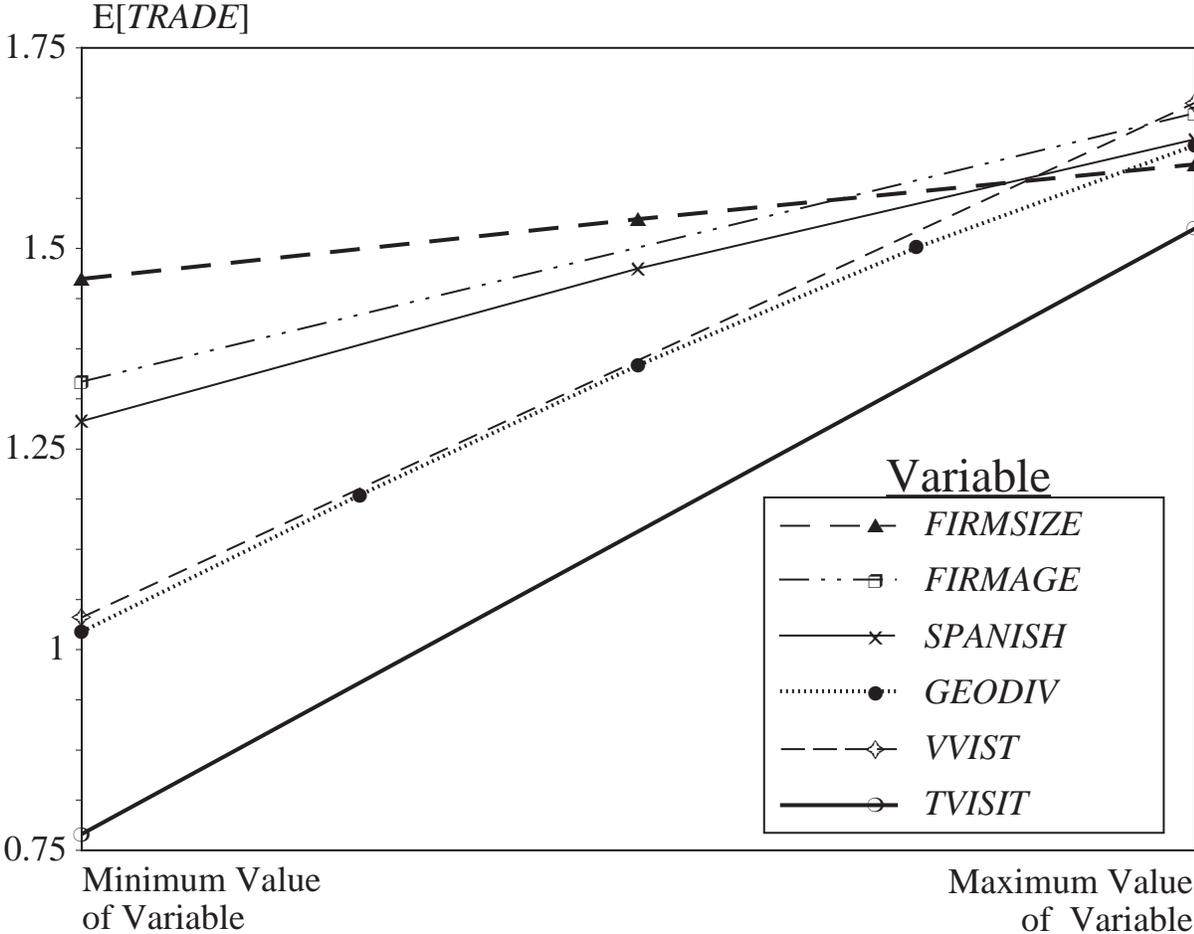
[b] The effect of all one unit increases in the corresponding variable were averaged to obtain marginal effects.

Table 4. Estimated joint effects of simultaneous one unit increase in several variables on *TRADE* probabilities and E[*TRADE*]

Variables	Estimated Effects on			
	Prob(*TRADE*=0)	Prob(*TRADE*=1)	Prob(*TRADE*=2)	E[*TRADE*]
Effects based on conditional distribution for *TRADE**:				
TVISIT and *FIRMAGE*	-0.514	-0.169	0.684	1.198
TVISIT and *VVISIT*	-0.546	-0.118	0.664	1.209
TVISIT and *FIRMSIZE*[a]	-0.311	-0.172	0.483	0.794
TVISIT and *GEODIV*[a]	-0.478	-0.016	0.510	0.973
TVISIT and *SPANISH*[a]	-0.379	-0.131	0.510	0.890
TVISIT, *FIRMAGE*, and *VVISIT*	-0.690	-0.145	0.834	1.524
Effects based on marginal distribution for *TRADE**:				
VVISIT and *FIRMAGE*	-0.347	-0.227	0.574	0.921
VVISIT and *SPANISH*[a]	-0.303	-0.185	0.488	0.791

[a] The effect of all simultaneous one unit increases were averaged to obtain marginal effects.

Figure 1. Linearly interpolated influence of each variable on the firm's expected trading status.[a]

E[*TRADE*]

Variable
— — ▲ *FIRMSIZE*
— · · □ · *FIRMAGE*
— × — *SPANISH*
· · · · ● · · *GEODIV*
— — ◇ *VVIST*
— ⊝ *TVISIT*

Minimum Value
of Variable

Maximum Value
of Variable

[a] When *TRADE* equals, 0, 1, and 2 an Arizona agribusiness firm has not considered trading, considered trading, or has traded before with the cross-border state of Sonora, respectively. Variables not in question are evaluated at their sample means.

Figure 2. Impact that each variable has on the probability that the firm is trading.