Location Patterns of Confectionery Manufacturers in a Post NAFTA Environment

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Abstract

Changes in international trade agreements while retaining protectionist sugar policies have led to the opportunity for confectionery manufacturers to relocate to take advantage of favorable international trade policies. Results suggest that NAFTA did not have a significant impact on location decisions of confectionery manufacturers in the U.S.

Introduction

The U.S. sugar program is one of the most debated and studied pieces of American agricultural policies (e.g. Beghin, El Osta, Cherlow, and Mohanty 2003; Moss and Schmitz 2002; Rendleman and Hertel 1993). Disagreement exists between the sugar producers and industrial users of sugar, specifically the confectionery industry, on the impact of sugar policy on prices. More detailed discussions of the U.S. sugar program as well as the industry in Mexico and Canada may be found in Alvarez and Popolous (2002) and the U.S. International Trade Commission (2001). One of the primary tools used in these studies is general or partial equilibrium modeling to assess the welfare gains (or losses) to the U.S. economy from changing U.S. sugar policy. However, impacts on actual location and employment of confectionery manufacturers in the U.S. have not been frequently analyzed.

International agreements such as the North American Free Trade Agreement (NAFTA) and the Central American Free Trade Agreement (CAFTA) have altered the trade flows of confectionery products due to the reduced tariffs that were negotiated. Figure 1 illustrates how

trade flows were altered during the 1990s in part due to international agreements as Brazil was replaced by Canada and Mexico as the leading source of confectionery imports from the mid 1990s through the present. The confectionery industry is widely viewed as a "footloose" industry due to relocation being inexpensive as there is not a dominant cost factor (Connor and Schiek 1997). *Current Industrial Reports* published by the Census Bureau show that nearly a fourth of the quantity of confectioneries consumed in the U.S. were imported in 2006 up from roughly 16% in 2001. While not all of this surge in imports may not be a direct result of NAFTA (and CAFTA to a lesser extent), it shows how quickly sources of supply can change in such a short time span with a footloose industry. Peter Buzzanell and Associates (2003) in a study commissioned by the American Sugar Alliance note that executives of many confectionery firms believe firm location will continue to move to areas where sugar costs and labor are cheaper than in the U.S. or Mexico such as Latin America, Brazil, or Argentina.

A recent publication by the Department of Commerce's International Trade Administration (2006) estimated that for every job saved in the growing and harvesting of sugar in the U.S., three jobs were lost in the confectionery industry. This estimate was based on press clippings from the 1990s that documented the closing of confectionery factories throughout the U.S. This report admits that it may have underestimated the total number of jobs lost due to U.S. sugar policy which has remained largely the same since the 1990s. Jusko (2002) and Napolitano (2004) further discuss plants that have closed operations or relocated across international borders to take advantage of sugar policy and international trade agreements. Despite these reports, apparent domestic production of confectionery products has increased in the U.S. over the past five years despite an increase in imports (U.S. Census Bureau).

The combination of a protectionist U.S. sugar program through its use of marketing allotments and loan rates in conjunction with NAFTA has not caused the loss of the confectionery industry in the U.S. However since the confectionery industry is footloose, confectionery manufacturers could be taking advantage of location opportunities that did not exist prior to the adoption and implementation of NAFTA and continuation of the U.S. sugar program. Hanson (1998) states that "as NAFTA consolidates the process of USA-Mexico economic integration it is likely to contribute to further relocation of US production towards US cities on the Mexican border."

This paper uses a location model to analyze growth patterns in the confectionery industry using county and state level data from 1993 to 2005. This time frame allows for changes in location to become evident due to the long-term nature of plant investment decisions. Data from the Census Bureau's County Business Pattern data is used which allows for analysis of segments of the confectionery industry including chocolate and non-chocolate confectionery. Similarly, the relatively unchanged nature of sugar policy in the U.S. will allow comparisons of results to previous studies of the confectionery industry such as Goetz (1997). Although this modeling method will not definitively prove if NAFTA had an impact on location decisions, the importance of counties that border Canada or Mexico along with access to interstates will be measured and serve as a proxy. Traditional factors that attract footloose industries as outlined in Goetz (1997) and Henderson and McNamara (2000) have likely not changed, though access to infrastructure and proximity to other food manufacturers may have grown in importance.

Literature Review

Readers interested in U.S. and world sugar policy are directed to Alvarez and Popolous (2002), U.S. International Trade Commission (2001) and Peter Buzzanell and Associates (2003) for background on U.S. sugar policy that is omitted here. Concerns about U.S. confectionery manufacturers' ability to remain competitive in the export market led to the establishment of the Sugar Containing Products Re-Export Program (SCPREP) in 1984 which allows for world-priced sugar imports to be used in the production of goods that are destined for the export markets. However, any products produced in the U.S. that are intended for the domestic market must contain domestic sugar.

Like the U.S., Mexican sugarcane production is highly regulated and producers receiving a price for their sugar approximately two and one-half times the world price for raw sugar. Canada is the only North American market that does not have protectionist policies for sugar beet producers and has no import restrictions on raw sugar and minimal duties on refined sugar. Like the U.S., the Mexican PITEX and *Maquiladora* programs act in a similar fashion to the U.S. SCPREP. The Mexican programs allow for confectionery manufacturers to benefit from savings in labor, energy, and sugar costs that Mexico can offer to firms relative to the U.S. A breakdown of the cost savings between firms operating in Canada, Mexico, and the U.S. can be found in Buzzanell and Associates (2003).

With transport costs being relatively unimportant for footloose firms, Alonso (1972) states that one of the three mechanisms that can make these types of firms more footloose is a decline in the relative prices of transported inputs. Such a reduction occurred with the signing of NAFTA as Mexico was granted a declining tariff schedule for sugar through 2008 when these rates would become zero in addition to having no limit on the amount of sugar that can be

exported to the U.S. While the reduction in cost of sugar because of reduced tariff rates is not sufficient to overcome other labor and energy cost advantages Mexico has, the reduced cost of Mexican sugar may spark relocation plans among confectionery manufacturers internally in the U.S.

Methodology

Industrial location decisions are often viewed as a two-stage process with each stage being independent of each other (Goetz 1997; Henderson and McNamara 1997 2000; Blair and Premus 1987; Alonso 1972; and Woodward 1992). The initial step is to select regions for consideration with the second step to select certain areas for consideration in the final location decision. The first stage sees regions selected that will help the firm achieve its investment criteria including proximity to "raw materials, entrance into product markets, or increase market share" (Henderson and McNamara 2000).

Once those regions have been selected, the second phase of the decision process occurs. Much effort has focused on the factors affecting the decisions that attract manufacturing firms to a given location (whether food or non-food). The industrial location literature suggests that the final location decision is described in the following process where $CM_j = f$**(M, L, I, A, F)** where CM_{ij} is the number of confectionery manufacturers in county *i,* **M** is a vector of market factors, **L** is a vector of labor market characteristics, **I** is a vector associated with infrastructure in county *i*, **A** is a vector of agglomeration economies, and **F** is a vector of fiscal polices. The independent variables are included in analysis of location decisions regardless of whether the firm is supply or demand oriented or footloose, and would be necessary to ensure that a firm remains viable in a given county.

Numerous approaches have been used in the location literature to determine the factors affecting firm location from the net growth model (Goetz 1997; Henderson and McNamara 1997) to estimating the probability of location through a conditional logit (Woodward 1992; Levinson 1996) to count data models (Henderson and McNamara 2000; List 2001) to name a few. Count data models (i.e. Poisson) have been used in a variety of applications including the number of defects in a manufacturing process, recreational demand literature, and firm location. One advantage the count data models have over conditional logit models in firm location studies is the fact that each choice becomes an observation in a large data set as the independence of irrelevant attributes (IIA) is not a factor (Guimarães, Figueiredo, and Woodward 2004). Lambert (1992) was the first to use a zero-inflated Poisson (ZIP) model which allowed for datasets that contained a large number of zeroes to be used, such as firm location decisions using counties in the U.S. as the dependent variable.

The ZIP model is essentially a single hurdle model as described in Shonkwiler and Shaw (1996). Consistent with the firm location literature, the ZIP model separates the decision process into a two-step process. The probability of a county having a confectionery manufacturer, Y_i, is defined as

$$(1) \qquad Y_i \sim \begin{cases} 0, & \text{with probability } p_i; \\ \text{Poisson}(\lambda_i), & \text{with probability } 1 - p_i, \end{cases}$$

with the probability function assumed to be Poisson which is

$$(2) \qquad \text{Prob}(Y_i = y_i) = \frac{e^{-\lambda_i}\lambda_i^{y_i}}{y_i!}, \; y_i = 0, 1, 2, \ldots$$

where y_i is the number of confectionery manufacturers, Y_i is a potential integer outcome, and $E(Y_i) = \lambda_i$. An underlying assumption of the above is that $y_i = y_i^*$, or rather desired location is equal to observed location. The term $\log(\lambda_i) = X_i\beta$ which are the county specific characteristics

that affect the decision of whether or not to locate or retain a confectionery manufacturer in a given county. This leads to the following sets of expressions adapted from Lambert (1992) and List (2001):

(3) $$\text{Prob}[y_i = 0] = p_i + (1 - p_i)e^{-\lambda_i}$$

(4) $$\text{Prob}[Y = y_i \mid Y > 0] = (1 - p_i)\frac{e^{-\lambda_i}\lambda_i^{y_i}}{y_i!}$$

with the notation following from the above descriptions.

Two processes are at work in a ZIP model, the process that generates a nonzero value (the Poisson probability function) and the process that generates a zero value which is a logistic probability function in this empirical application. The covariates used in each step of the regression may or may not be the same. Some factors may not be important in the second stage of a location decision due to the assumption that sites in the final round of the decision process have already met threshold criteria used in the first round. The parameters employed in the logistic function, **p**, is defined as logit(**p**) = log(**p**/(1-**p**) = $Z_i\gamma$.

Count data models such as zero-inflated Poisson models are fixed effects models. Hall (2000) demonstrated the addition of a random intercept to ZIP models. The random effect was placed only in the log-linear regression model yielding the following equation:

(5) $$\log(\lambda_i) = X_i\beta + \sigma b_i .$$

In both Hall (2000) and this application, the random intercept, b_i, is assumed to be an independent standard normal random variable. The estimated likelihood function using a ZIP model with a random intercept is then:

(6) $$\frac{\prod_{y=0}\exp(-Z_i\gamma)\prod_{y>0}(1-\exp(-Z_i\gamma))\exp(-\lambda_i)\lambda_i^{y_i}}{[(1-\exp(-\lambda_i))y_i!]}$$

The excess zeros in a zero-inflated model induce overdispersion especially with greater occurrences of overdispersion when the zero state (i.e. the logit regression) is more likely. The occurrence of overdispersion is a result of the assumption that the Poisson mean is equal to its variance (Greene, 2003). Care must be taken to ensure that the proper model (whether a ZIP, Poisson, or negative binomial) is used due to probability of overdispersion. Lambert (1992) uses the estimated probabilities plotted against the empirical probabilities to determine which of the four types count models is most appropriate for the given modeling equation. List (2001) uses the Vuong statistic to test for which type of Poisson model is most appropriate given that the ZIP and Poisson models are non-nested.

Data

Dependent variables

The number of confectionery manufacturers in a given county was obtained from Census Bureau's County Business Population dataset from 1993 to 2005. This dataset breaks down the number of manufacturers by employment size and type of confectionery produced by SIC codes prior to 1997 and NAICS codes from 1998 to 2005. Information on amount of sales was not available. There were 3,080 counties in this dataset for the contiguous U.S. states plus the District of Columbia. This provides 40,031 counties in the thirteen year period from 1993 to 2005 with 7,047 (17.6%) of those counties having had at least one confectionery manufacturer in their borders. The majority of those counties had only one manufacturer (3,980 total counties) operating during the thirteen year time period. Of the 7,047 observations present, 6,863 counties had no more than 10 confectionery manufacturers present.

The NAICS codes for confectionery replaced the Standard Industrial Classification (SIC) upon the implementation of NAFTA to allow direct comparisons among data originating in Canada, Mexico, and the U.S. The chocolate confectionery code (NAICS 31132 and SIC 2066) is directly comparable across the time period studied in this paper. The non-chocolate (NAICS 31134) and purchased chocolate codes (NAICS 31133) are derived from the SIC code 2064, but the NAICS values are only within three percent of the SIC values.

Independent Variables

The regressors chosen are consistent with the location literature which states that location decisions are based on market factors, labor market characteristics, infrastructure, agglomeration economies, and fiscal polices. Summary statistics, expected signs, and description of the regressors are provided in Table 1.

Access to markets. The market factors considered are the percentage of sugar produced in the county each year, the presence of a sugarcane or sugar beet refinery in the county, population, and per capita personal income. The percentage of a state's sugar crop produced in each county (*SUGARPCT*) was obtained from yearly Census of Agriculture estimates. Although as stated previously, the confectionery industry is viewed as a footloose industry and is not directly tied to sources of raw materials such as sugar, this variable is included to determine if confectionery manufacturers are seeking areas that are close to areas of sugar production. The presence of sugarcane or sugar beet refineries (*CANEREFINE* and *BEETREFINE*) from the Census Bureau's County Business Patterns dataset were also included in the vector of market related variables as their presence in a county would further allow confectionery manufacturers access to sugar needed for their production of various types of candies. An additional variable,

NAFTA, was included to measure the impact of NAFTA on location decisions. Attempts to get historical tariff rate quota (TRQ) information proved unsuccessful, so this variable counts the years that NAFTA was in effect. The variable ranges from negative one (1993) to eleven (2005).

County population (*POP*) from the BEA REIS was also included in the market vector of independent variables. Due to the County Business Patterns data including smaller confectionery manufacturers that likely produce candies for sale at their location, in addition to large multinational companies including Hershey's and M&M Mars, these manufacturers must have sufficiently large potential market to tap into to ensure their viability. An additional market variable included was personal per capita income (*INCOME*) from REIS. This variable was then deflated by the implicit price deflator for GDP. Income has been used to measure market demand and a proxy for quality of life in that county (Henderson and McNamara 1997 and 2000). A market potential variable (Plaut and Pluta 1983; Goetz 1997) has been included in some studies to measure the access to markets, but that is done at a state level due to the fact this is gravity adjusted across states and typically not counties.

Labor force factors. Labor characteristics included reflect the business climate in the states and counties. Some data such as unionization and high school education rates were only available at the state level. Labor unionization (*UNION*) rates were obtained from Hirsch, Macpherson, and Vroman (2001) which are based on the Bureau of Labor Statistics publication, *Directory of National Unions and Employee Associations*. It is assumed that the unionization in each county is the same as the state numbers. The percentage of persons over the age of 25 with a high school diploma (*HSED)* is included to reflect the skill set of potential employees in a selected county. Attempts to find rates at the county level were unsuccessful as these were not

consistently reported across the study period. This led to the state high school education percentages being used as a proxy.

An additional labor characteristic included is the unemployment percentage rate in each county. Unemployment percentages (*UNEMP)* were obtained from the Bureau of Labor Statistics' Local Area Unemployment Statistics. These annual averages are available for every county in the U.S. dating back to 1990. The average hourly wage rate was not available for confectionery manufacturers from governmental sources, but the manufacturing earnings (from REIS[1]) of each county were used instead as a wage proxy (*WAGE)*. The wage earnings from food manufacturing would have been ideal, but disclosure rules prevented publishing of earnings in many counties, so total manufacturing earnings were used instead. Values for each county were divided by one million and then deflated by the implicit price deflator for GDP to aid in scaling for the model.

Infrastructure. Many different variables have been used to measure the impact of infrastructure from port access to amount of road miles in a county (Henderson and McNamara 1997; Henderson and McNamara 2000; Goetz 1997) . Lack of availability of data such as county road miles on a yearly basis led to the use of only the presence of interstates (as a dummy variable) in regards to transportation networks. No new sections of interstate have been built since 1993 allowing no assumptions having to be made about the presence of interstates in a county from 1993 to 2005. A dummy variable was also included that indicates if the county shares a border with Canada or Mexico. Some counties in northern states including Maine, Michigan, Pennsylvania, and Wisconsin were included as border counties even if they did not have a land border with Canada due to access through either the one of the great lakes or the Atlantic Ocean in the case of Maine. However, southern states such as Alabama, Florida, and

[1] Values in REIS were in thousands (000s).

Louisiana were not included as they do not share land border with Mexico or are in close proximity to Mexico.

Agglomeration. Although footloose firms are not tied to specific areas of the country in an effort to minimize costs associated with acquisition of raw materials or distribution of finished products, these types of firms may still choose to locate near other food manufacturers. This would allow confectionery manufacturers to potentially reduce costs due to shared knowledge or a more skilled workforce due to the presence of other food manufacturers. While the presence of other food manufacturers may cause firms to raise the wage of its employees, firms would be spending less on training employees due to the skill set already gained by employees. The variable, *FOODMFGS*, represents all other food manufacturers in a county. This is net of all other confectionery manufacturers in the county as well as the presence of sugarcane or sugar beet refineries. These numbers are based on the SIC code 20 which represents Food and Kindred Products for 1993-1997 and NAICS code 311 (Food Manufacturing). Additional dummy variables are included for regions of the country based on Census Bureau definitions. The Census Bureau divides the country into four sections: *Northeast, South, Midwest, and West*. Inclusion of these regional dummy variables allows for the detection of differences between the parts of the country that may not be detected elsewhere including quality of life.

Fiscal Policy. Fiscal policies are included in the final vector in location study determinants, despite mixed results in terms of significance and direction. Previous studies including Henderson and McNamara (1997 and 2000) used fiscal policy variables provided by the Advisory Commission on Intergovernmental Relations (ACIR) including tax capacity and tax effort. However, the ACIR was closed in the late 1990s leading to no data from that time point forward being available. Other sources for data regarding fiscal policy were available, but only

aggregated for all counties in a state. The Census of Government provides yearly fiscal data in terms of total collections from a wide variety of tax sources (i.e. corporate, alcohol, individual, motor vehicle, etc.) as well as total expenditures. Data was not available on a state by state basis for 2001 and 2003, leading to the use of data interpolation in those instances. Two ratios were created to determine the effect, if any, that fiscal policies have on location decisions by confectionery manufacturers. The first ratio was the total property taxes collected by counties in a state divided by the total county level expenditures in that state. Each component of the ratio was deflated by the implicit price deflator for GDP before calculating the ratio. This ratio is similar to the one calculated by Goetz (1997) except that ratio was not aggregated for all counties in a state. The second ratio calculated was the deflated corporate tax collections in the state divided by the deflated state expenditures. This ratio relates how business friendly the state is in terms of corporate tax collections which were not available for all years in the study period.

Empirical Results

Empirical estimates of the zero-inflated Poisson and zero-inflated negative binomial (ZINB) models are presented in Table 2. Results were obtained by using the nlmixed procedure in SAS 9.1. First stage regression results (i.e. the logit model) are available upon request. Signs of the estimates were generally as expected from location theory. Akaike's information criterion (AIC) suggests that the ZIP model is preferred to the ZINB model. More analysis is needed to determine the appropriateness of the ZIP relative to the ZINB model for this application. All discussion of results refers to the ZIP model. The coefficient estimates represent a percentage change in λ given a unit change in X_i.

Despite the confectionery industry being footloose, confectionery manufacturers tended to locate in or close to counties with sugarcane or sugar beet refineries. This may largely be a result of counties having a significant population on which to draw their workforce as population (in thousands) was also highly significant. Consistent with the food manufacturing location literature, the prevalence of sugar being produced in the county did not have a significant impact upon confectionery manufacturers' location decisions. Regional differences do exist in terms of locations decisions for the industry relative to the northeast. These regional dummy variables were included to measure non-economic variables including quality of life. Manufacturers were more likely to locate in counties that border Canada or Mexico. It is possible that the SCPREP is effective in providing opportunities for confectionery manufacturers to remain viable.

The *NAFTA* variable was not a significant factor in location of confectionery manufacturing firms. Given that this was essentially a time trend variable extending from 1993 to 2005, this may account for its lack of significance. A more proper way to model the presence of NAFTA would be to include the amount of confectionery products allowed to enter the U.S. from Canada and Mexico duty free under the appropriate TRQs. Even then, the *NAFTA* variable may remain insignificant due to the number of small confectionery manufacturers that are present in the U.S. One unexpected result of this analysis was the relatively large negative sign of the *FOODMFGS* variable. The initial expectation for this variable was to be positive as this variable was included as an agglomeration factor as food manufacturers might tend to locate near each other to benefit from potential synergies and experiences. However, additional thought leads to the conclusion that the presence of other food manufacturers would lead to additional competition for employees, thereby increasing wages paid to employees by the respective firms. The *WAGE* variable was also significant with a different sign than expected. This may be due in

part to use of the all manufacturing earnings (food and non-food). Such a finding leads to the belief that confectionery manufacturers tend to locate in areas where manufacturing is prevalent (regardless of type, food or non-food). This may also reflect upon that a sufficient population base is needed to draw upon to have a confectionery manufacturer locate in the county.

Conclusions

The purpose of this paper was to determine how the confectionery manufacturing industry has altered location decisions from 1993 to 2005. Counties in the lower forty-eight states plus the District of Columbia provided over forty thousand observations upon which to estimate a zero-inflated Poisson model and zero-inflated negative binomial model. Despite the possibility of overdispersion, results indicate the zero-inflated Poisson model is preferred to the zero-inflated negative binomial model.

Despite the protective measures that remain in place to ensure sugar production in the U.S. in the face of increasing trade liberalization including NAFTA, confectionery manufacturers were not adversely affected by the agreement from 1993 to 2005. More refinement of the model is needed to ensure this result is not reflective of some variable the authors have not considered. Presence of other food manufacturing firms did have a significant negative impact on location decisions by confectionery manufacturers, suggesting that firms engaged in this industry face wage pressure from other firms due to the apparent skills that employees possess.

This paper measures location decisions by all confectionery manufacturers. More analysis is yet to be done on specific sectors of confectionery manufacturers (non-chocolate versus chocolate) as well as employment size. Research on these sub-sectors of the confectionery industry may result in findings that are masked by agglomeration of confectionery

types. Additionally, the small size of coefficients included in this model suggests that other, non-economic factors omitted are factors in location decisions. This is possible due to many confectionery manufacturers being smaller firms. Such a finding would suggest that the International Trade Administration (2006) estimates were correct in that larger manufacturers have already left the U.S. for more favorable business locations where U.S. policies (or lack thereof) are used against this country. Smaller scale operations would be able to survive the implementation of NAFTA with a sufficiently large and loyal customer base due to the production of specialty products that larger manufacturers do not produce. Recent consumer scares over the contents of foreign made products may yet lead to a revival of pride in purchase of products made in the U.S. which would further benefit domestic confectionery manufacturers.

References

Alonso, W. 1972. "Location Theory." In M. Edel, and J. Rothenberg, ed. *Readings in Urban Economics*. NewYork: Macmillian Publishing, pp. 16-36.

Alvarez, J. and L.C. Polopolus. 2002. "The History of U.S. Sugar Protection." SC 019, Institute of Food and Agricultural Sciences, University of Florida.

Beghin, J.C., B. El Osta, J.R. Cherlow, and S. Mohanty. 2003. "The Cost of the U.S. Sugar Program Revisited." *Contemporary Economic Policy*. 21:106-16.

Blair, J.P., and R. Premus. 1987. "Major Factors in Industrial Location: A Review." *Economic Development Quarterly*. 1:72-85.

Goetz, S.J. 1997. "State- and County-Level Determinants of Food Manufacturing Establishment Growth: 1987-93." *American Journal of Agricultural Economics*. 79:838-50.

Greene, W.H. 2003. *Econometric Analysis*. Upper Saddle River NJ: Prentice Hall.

Guimarães, P., O. Figueiredo, and D. Woodward. 2004. "Industrial Location Modeling: Extending the Random Utility Framework." *Journal of Regional Science*. 44:1-20.

Hall, D. B. 2000. "Zero-Inflated Poisson and Binomial Regression with Random Effects: A Case Study." *Biometrics*. 56:1030-39.

Hanson, G. 1998. "North American Economic Integration and Industry Location." *Oxford Review of Economic Policy*. 14:30-44.

Henderson, J.R., and K.T. McNamara. 2000. "The Location of Food Manufacturing Plant Investments in Corn Belt Counties." *Journal of Agricultural and Resource Economics*. 25:680-97.

Henderson, J.R., and K.T. McNamara. 1997. "Community Attributes Influencing Local Food Processing Growth in the U.S. Corn Belt." *Canadian Journal of Agricultural Economics*. 45:235-50.

Hirsch, B.T., D.A. Macpherson, and W.G. Vroman. 2001. "Estimates of Union Density by State." *Monthly Labor Review.* 124(7):51-55. Available at http://www.unionstats.com.

Jusko, J. "Bitter Goodbye." http://www.industryweek.com. July 2002. Accessed on September 9, 2005.

Lambert, D. 1992. "Zero-Inflated Poisson Regression, With an Application to Defects in Manufacturing." *Technometrics*. 34:1-14.

Levinson, A. 1996. "Environmental Regulations and Manufacturers' Location Choices: Evidence from the Census of Manufactures." *Journal of Public Economics*. 62:5-29.

List, J.A. 2001. "U.S. County-Level Determinants of Inbound FDI: Evidence From a Two-Step Modified Count Data Model." *International Journal of Industrial Organization*. 19:953-973.

Moss, C.B. and A. Schmitz. 2002. "Coalition Structures and U.S. Sugar Policy." In A. Schmitz, T.H. Spreen, W.A. Messina, and C.B. Moss, ed. *Sugar and Related Sweetener Markets*. Wallingford UK: CABI Publishing, pp. 259-80.

Napolitano, J. "Chicago to Lose Two Historic Candy Brands." *New York Times*. January 20, 2004, page A14.

Peter Buzzanell & Associates. 2003. "North America's Confectionery Industries: Structure, Trade, and Costs and Trends in Sugar Demand." March 24. Available at: http://www.sugaralliance.org/library/2004/030103-candy_study-buzzanell.pdf.

Plaut, T.R., and J.E. Pluta. 1983. "Business Climate: Taxes and Expenditures, and State Industrial Growth in the United States." *Southern Economic Journal.* 50:99-119.

Rendleman, C.M. and T.W. Hertel. 1993. "Do Corn Farmers Have Too Much Faith in the Sugar Program?" *Journal of Agricultural and Resource Economics*. 18:86-95.

Shonkwiler, J.S., and W.D. Shaw. 1996. "Hurdle Count-Data Models in Recreation Demand Analysis." *Journal of Agricultural and Resource Economics*. 21:210-19.

U.S. Department of Commerce, Bureau of the Census. Various issues of MA311D. *Current Industrial Reports: Confectionery*. Washington DC,

U.S. Department of Commerce, International Trade Administration. 2006. *Employment Changes in U.S. Food Manufacturing: The Impact of Sugar Prices*. Washington DC, February 14.

U.S. International Trade Commission. 2001. *Industry and Trade Summary: Sugar.* Washington DC, March.

Woodward, D.P. 1992. "Location Determinants of Japanese Manufacturing Start-Ups in the United States." *Southern Economic Journal*. 58:690-708.

Table 1. Definitions and Summary Statistics for Regressors

Variable	Description	Mean	Standard Deviation	Expected Sign
SUGARPCT[a]	Percentage of sugar grown	0.005	0.036	(-)
CANEREFINE[b]	Number of sugarcane refineries	0.006	0.088	(+)
BEETREFINE[b]	Number of sugar beet refineries	0.012	0.118	(+)
POP[c]	Population (in thousands)	89.900	292.503	(+)
INCOME[c]	Per capita personal income (in thousands)	0.220	0.546	(+)
UNION[d,h]	Unionization rate	11.473	5.602	(-)
HSED[e,h]	High school graduation rates (% of persons 25 and over)	83.221	4.772	(+)
UNEMP[c]	Unemployment rate (% of workers)	5.594	2.599	(-)
WAGE[c,i]	Manufacturing earnings (in billions)	0.003	0.012	(-)
HWY[f]	Interstate highway (DV = 1 if highway crosses county)	0.443	0.497	(+)
BORDER[f]	County borders Canada or Mexico (DV = 1 if true)	0.051	0.220	(+)
FOODMFGS[b]	All other food manufacturers in the county	7.395	26.610	(+)
NORTHEAST	County in Northeast	0.070	0.256	
SOUTH	County in the South	0.453	0.498	(-)
MIDWEST	County in the Midwest	0.357	0.479	(+)
WEST	County in the West	0.120	0.325	(+)
PROPEXP[g,i]	Property tax per general direct expenditures	0.246	0.081	(-)
CORPEXP[g,h,i]	Corporate tax per general direct expenditures	0.025	0.023	(-)
NAFTA	Number of years into NAFTA agreement	5.000	3.742	(-)

[a] Census of Agriculture yearly estimates
[b] Census Bureau's County Business Patterns
[c] Bureau of Economic Analysis Regional Economic Information System (REIS)
[d] Hirsch, Macpherson, and Vroman (2001)
[e] Census Bureau County Population Survey
[f] ESRI GIS Tiger File
[g] Census of Government
[h] Measured at state level
[i] Deflated by the implicit price GDP deflator

Table 2. Empirical estimates of the determinants of confectionery location

	Model type	
Variable	ZIP	ZINB
Intercept	-0.9876***	-1.0892**
	(0.3085)	(0.4082)
SUGARPCT	-0.001	-0.00438*
	(0.001855)	(0.002293)
CANEREFINE	0.1055***	0.2073***
	(0.03360)	(0.06724)
BEETREFINE	0.4345***	0.1551*
	(0.04381)	(0.07656)
POP	0.000399***	0.000651***
	(0.000022)	(0.000059)
INCOME[a]	0.03046***	0.03592***
	(0.001037)	(0.002479)
UNION	-0.00479*	-0.00549
	(0.002486)	(0.003586)
HSED	0.01109***	0.007425
	(0.003473)	(0.004625)
UNEMP	-0.01101*	-0.00786
	(0.005970)	(0.009278)
WAGE[a]	0.01971***	0.008277
	(0.003518)	(0.009026)
HWY	0.6002***	0.4391
	(0.03131)	(0.03767)
BORDER	0.4456***	0.1157**
	(0.02818)	(0.04703)
FOODMFGS[b]	-0.07473***	0.3182***
	(0.01726)	(0.06147)
SOUTH	-0.8989***	-0.9919***
	(0.04547)	(0.06194)
MIDWEST	-0.6652***	-0.709***
	(0.02790)	(0.03973)
WEST	-0.5003***	-0.475***
	(0.03598)	(0.05234)
PROPEXP[a]	-0.01241***	-0.0139***
	(0.001161)	(0.001698)
CORPEXP[a]	-0.02436***	-0.01583***
	(0.004618)	(0.004281)
NAFTA	0.01649	0.02138*
	(0.009572)	(0.01151)
Log-likelhood	-19280.5	-21589.5
AIC	38639	43259

[a] Coefficient and standard error multiplied by 100.
[b] Coefficient and standard error divided by 100.
*, **, and *** denote significance at the 10%, 5%, and 15, respectively.

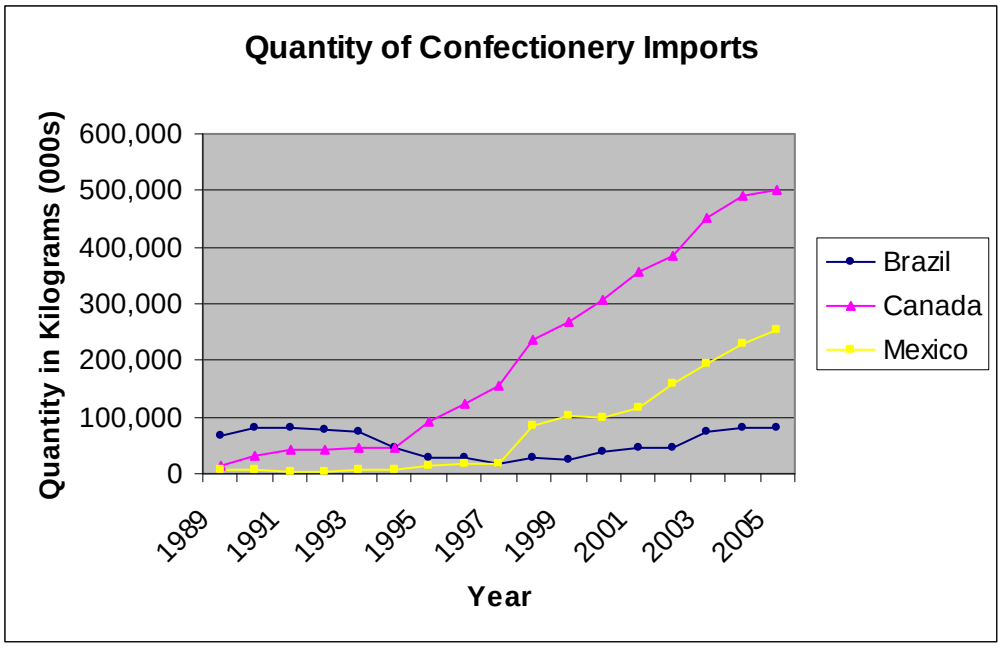

Figure 1, Quantity of Confectionery Imports.
Source: U.S. International Trade Commission.