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**Household Dairy Demand in Mexico: A Regional and Expenditure
Analysis with Implications for U.S.-Mexico Trade**

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October, 1996

Prepared for presentation at the Tri-National Research Symposium on “NAFTA and
Agriculture:
Is the Experiment Working?” San Antonio Texas, November 1 and 2, 1996.

1. Introduction

Between 1992 and 1995, numerous efforts were made to forecast the future effects of the North American Free Trade Agreement (NAFTA) on the U.S. dairy industry (Barham, Cornick, and Cox; McClain and Harris; Hallberget *al.*; and Schulties and Schwartz). Most forecasts were optimistic, predicting rising U.S. exports to Mexico based on a burgeoning demand driven by income and population growth, elastic demand for dairy products among Mexican consumers, and a considerably less dynamic supply-side. Because of data limitations on both the demand and supply sides, truth-in-advertising - where practiced - led researchers to qualify their forecasts with warnings about the need for further work using more reliable data. In addition, the need to make assumptions about the future income growth of Mexican consumers also required researchers to tie their forecasts to specific scenarios for the overall economy.

No forecaster, to our knowledge, went further on the demand side than to borrow an income elasticity of demand from somewhere, often estimates made outside of Mexico or perhaps from Mexico but from years ago, and to apply that economy-wide estimate along with forecasts of overall national per capita income growth under NAFTA in order to generate a path for demand growth over time. In other words, demand-side analyses were not disaggregated by income class, region, or along any other lines, nor were recent income or price elasticity measures used. The resulting demand forecasts were, in other words, quite crudely fashioned.

They were also quite wrong in their optimism. Since NAFTA took effect in January of 1994, U.S. dairy exports to Mexico have declined from \$244 million in 1993 to \$176 million in 1994 to \$124 million in 1995, an overall decline of 49 percent. These export figures do not look as bad when compared with the five year average between 1988 and 1992 which was about \$150 million. Nonetheless, the peso collapse of late 1994, the resulting structural adjustment policies of 1995, and the related declines in Mexican dairy imports were not a part of the post-NAFTA export scenarios, and they expose rather harshly the underlying fragility of these forecasts to their assumptions, especially the income growth projections. Indeed, the fact is the optimistic export forecasts for U.S. dairy might have been wrong even if income growth projections for the post-NAFTA period had occurred, or if income growth recovery happens in the years ahead. All it would take is some combination of overestimating income elasticities and underestimating Mexican dairy supply responsiveness to generate problematic estimates of U.S. dairy export growth.

This paper attempts to strengthen our understanding of Mexican dairy demand and our ability to make better forecasts by examining household consumption patterns of dairy products and estimating demand functions for several classes of dairy products. In particular, we use a 1989 national expenditure survey which offers comprehensive data on dairy consumption for over 10,000 Mexican households. Combined with the survey data on household income and other expenditures, household demographics and other characteristics,

and regional variables, the dairy consumption information permits the development of a much more nuanced picture of the nature of Mexican dairy demand than has heretofore been available. Estimates of per capita consumption levels of different dairy products across income groups and regions are developed, as are price and income elasticity estimates which can be used to forecast the effects of various price and income projections on demand for specific dairy products.

The bottom-line outcome of the econometric analysis of demand patterns is that previous forecasts appear to be far too optimistic about income elasticities for dairy products in Mexico. If the estimates we obtained are correct, future demand growth for dairy products in Mexico could be much less dynamic than suggested in many previous works, including our own. Further work with 1992 and 1994 household data from Mexico, now just underway, should allow us to test the robustness of the 1989 estimates, during a period of considerable income growth. We do a rough appraisal of the descriptive statistics from the 1992 and 1994 data which gives the impression of a greater income elasticity in the aggregate data than is evident in the regression results. We discuss the discrepancy between descriptive comparisons and our econometric results in the conclusion.

The organization of the paper is as follows. Section 2 provides a description of data sources, the main variables available, and the procedures used in constructing the data we analyze. Section 3 offers a descriptive analysis of demand patterns. It explores basic features of dairy consumption among the interviewed households, including the proportion of households consuming different dairy products by region, the average prices paid for dairy products by region, and the levels of demand by households of different expenditure classes. These descriptive demand statistics demonstrate the considerable variation that exists in prices and quantities demanded across regions and expenditure groups and show the sizeable proportion of households in some regions and among some classes that report very little dairy consumption expenditure.

The fourth section develops econometric estimates of demand elasticities, particularly price and income elasticities for different dairy products. Because of the prevalence of households with zero consumption of individual dairy products, we estimate the demand equations using Tobit estimation techniques and then generate own-price, cross-price, and expenditure elasticity measures. The estimates in this section are the core empirical contribution of this paper for future forecasts of Mexican dairy demand. Section 5 concludes the paper, with attention to the implications of the econometric estimates for future Mexican dairy demand and for more aggregated methods of estimating income elasticities.

2. Data Source, Variable Description, and Data Set

The empirical work of this paper uses primarily information provided by the 1989 Encuesta Nacional de Ingresos y Gastos del Hogar - ENIGH (Household's Income and Expenditure National Survey), with some supplementary information on dairy consumption

patterns derived from the 1992 and 1994 ENIGH expenditure surveys. These national income and expenditure surveys were conducted by the Instituto Nacional de Estadística, Geografía e Informática - INEGI (National Institute of Statistics, Geography and Information) - of Mexico. The sample units are the household and individuals identified by their housing status.

The survey was designed to collect data nationally from the most important metropolitan areas of the country and in areas of high and low density. The survey was drawn using a stratified and multi-stage sampling method from three different regions (metropolitan areas and high and low density areas). Overall, there were 10 regions and 32 states designated. High density areas were defined for municipalities with a total population of above 100,000 inhabitants or containing a specific location of at least 15,000 inhabitants. The ten regions (and states within them) are given below.

REGION 1:Baja California, Baja California Sur, Nayarit, Sinaloa, Sonora

REGION 2:Chihuahua, Durango, San Luis Potosi, Tamaulipas, Zacatecas

REGION 3:Coahuila, Nuevo Leon, Tabasco

REGION 4:Veracruz

REGION 5:Aguas Calientes, Colima, Jalisco, Michoacan

REGION 6:Guanajuato, Hidalgo, Queretaro

REGION 7:Campeche, Chiapas, Quintana Roo, Yucatan

REGION 8:Oaxaca, Puebla, Tlaxcala

REGION 9:Guerrero, Estado de Mexico, Morelos

REGION 10:Distrito Federal

The number of observations in the survey was originally 11,535 households. The observations with incomplete surveys or with inconsistencies such as zero total expenditure, zero food or non food share, or one of the shares being equal to one, were eliminated from the data set. Some additional observations were eliminated because of extreme outliers in price or expenditure data. After the data cleaning and outlier analysis, the total number of observations in the data set was 10,847 households with a total of 53,841 individuals.

The survey was conducted during the period of August 21 to November 15 of 1989. There were different reference periods used according to the characteristics of the variable under consideration. Table 1 gives the variable and its reference period. Note that for food expenditures, the week of the survey was used as the recall period, while for durable goods' expenditures longer periods were used. Income was reported for the six months before the survey.

Because expenditure, income, and demographic data play a central role in our demand estimation, it is worthwhile describing briefly the variables definition. Total expenditures, meanwhile, are divided into current expenditures and non-monetary expenditures. The former is the portion of total income that households use to purchase

goods and services and includes transfers directed to other units, such as insurance premiums, donations and gifts outside the household, and taxes. The latter non-monetary expenditures include self consumption, payment in kind, gifts received and estimated housing rent.

Income is divided into current and non-current sources. Current income is the amount of money received by an individual as a result of work, rent, dividends from assets, transfers, etc. Non-current income is the estimated market value of the goods and services used by the household and its members. These can be, self consumption, payment in kind, gifts received, estimated house rent, etc.

Three demographic variables are considered in the analysis. They are:

- (1) Family size, which reports the number of persons in the household (NROPERS);
- (2) Education Level for the head of the household. This variable is categorical, with EA denoting no formal education, EB denoting at least one year of primary education but no secondary education, EC denoting at least one year of secondary education but no preparatory or vocational school, ED denoting at least one year of preparatory or vocational school but no university, and EE denoting at least one term of university;
- (3) Refrigerator availability (FRIDGE = 1 if the house has a refrigerator; 0 otherwise).

Dairy products have been aggregated into the following categories:

- (1) Fluid milk: Pasteurized milk and raw milk
- (2) Soft Products: Soft milk products such as cottage cheese, cream, yogurt, and butter
- (3) Cheese: All cheese types including fresh cheese.
- (4) Other milk products: Other milk products such as dry milk powder, baby formula, evaporated, and condensed milk.

The remaining food items were aggregated into a separate category of other foods, and all non-food items were aggregated into one variable which includes housing, health, education, clothing, energy, transportation and other goods and services.

One major issue in the analysis was how to handle prices where no expenditures on an item were reported. For items a household did not consume, prices were assigned using the following criteria. In those cases where at least 30 consumers were observed in a municipality, we used the median price of the municipality. If there were less than 30 consumers of the item in the municipality, then we used the median from the state level. If there were still less than 30 consumers of that item at the state level, then we used the median of the region. Finally, if there were less than 30 consumers at the regional level we used the national median.

All prices were standardized on a monthly basis. As indicated before, food

expenditures were reported for the week of the survey and some non-food expenditures were reported for the last six months and three months before the survey. All prices were deflated by the consumer price index for the region based on when the surveys were conducted.

3. Descriptive Analysis of Mexican Dairy Demand Patterns

This section explores basic features of dairy demand among Mexican households. We begin with a discussion of the national consumption levels of four categories of dairy products and all other food. Then, we examine the extent of regional and expenditure class variation in consumption of dairy products, both in terms of proportions of households consuming and shares of food budgets apportioned to dairy products. We also take a first look at the price data to see the degree of variation in prices by region and expenditure class.

3.1 National Dairy Consumption Patterns

Fluid milk is the most commonly consumed dairy product, with about 60% of Mexican households reporting expenditures. Next is cheese with 34% reporting expenditures. For other milk products and soft milk products, respectively, 14% and 12% of households nationally report expenditures on these categories.

Mexican and U.S. per capita consumption figures for fluid, non-fat dry milk (NFDM), cheese, and butter are given in Table 2. In 1989, the year of the survey data, Mexican per capita consumption for fluid milk, cheese, and butter were, respectively, 44%, 40%, and 22% of U.S. levels. For NFDM, Mexican consumption levels were considerably higher, but overall the volumes were relatively small, compared to cheese or butter. Overall, the relatively low per capita consumption figures for Mexico underly some of the optimism about the potential for expansion in demand with further income growth.

According to the INEGI data, the average Mexican household spent about 4% of their total budget and 10% of their food budget on dairy products in 1989. Fluid milk accounts for the bulk of the expenditures on dairy products, about 2.5% of total household expenditures, while cheese accounts for about 1%. The remaining dairy products account for about 0.5% of total household expenditures.

3.2 Dairy Consumption by Region

As shown in Table 3, a surprising degree of variation in dairy consumption occurs across different regions of Mexico. At the top end, about 80% of households in the Northwest region (1) and Federal District (10) reported expenditures on fluid milk, compared with lows of 18% of households in the Yucatan (7) and 36% of households in the Southern

region (8). Most of the other regions ranged between 50% and 70% of households reporting expenditures on fluid milk products. In per capita terms, the higher consuming regions (1,5 and 10) report almost ten times the fluid milk consumption per capita as the lowest region (7).

For other dairy products, there are less extreme differences in regional consumption patterns. Again, the Northwest (1) and Federal District (10) regions have considerably higher proportions of households reporting expenditures. For example, about 48% of households in the Federal District and 45% of households in the Northwest reported expenditures on cheese, compared to lows of 22% and 25% in the Southern region (8) and Yucatan (7), respectively. In per capita terms, the higher regions report about three times the cheese consumption of the lower regions and between three and six times the soft product consumption of the lower regions.

Regional gaps in the share of household budgets expended on dairy products (Table 4) are not nearly as large as the consumption differences given above. For example, about 0.6% of household expenditures in the Yucatan are on fluid milk, compared with 1.6% in the Federal District. Thus, while per capita consumption figures differ by ten fold between these two regions, budget shares only differ by two and a half fold. **Certainly, regional income gaps account for some of the differences in regional dairy consumption patterns across regions.** This explanation is also suggested by the fact that per capita fluid milk consumption figures in the Federal District are comparable with those of the Northwest and the Westcentral Region (5), even though those other two regions expend more than twice the budget share on milk products (3.5% and 4.2%) than do consumers in the Federal District (1.6%).

Comparing average fluid milk prices across regions, however, reveals that price differences also account for some of the Federal District's high levels of fluid milk consumption but relatively low budget share expended on fluid milk products. Consider the figures in Table 5 that show Federal District consumers paying, on average, fluid milk prices that are 20% less than the next lowest price (1.69 pesos per kilo, compared with 2.03 in region 9), almost 33% lower than the other two top consuming regions of Northwest and Westcentral Mexico (2.38 and 2.30 per kilo, respectively), and almost 50% lower than in the Yucatan.

Given that a substantial proportion of the country's fluid milk is produced in the Northern region, it appears that fluid milk subsidy programs sponsored by the Mexican government (see McClain and Harris, for more details) may favor consumers in the Federal District of Mexico City. This inference is also reflected in the fact that average price differences for cheese and soft dairy products (shown in Table 5), which are not subsidized by the government, do not show similar pricing patterns that favor Mexico City consumers. The other milk products category, some of which are also subsidized, does show a similar price gap favoring Mexico City consumers. Roughly speaking, it appears that income

differences and price gaps equally account for why Mexico City consumers in 1989 reported comparable per capita fluid milk consumption levels to those of consumers in Northwest and Westcentral Mexico (5) but considerably lower budget shares expended in this category.

Overall, the extensive variation in regional demand levels underscores the potential value of building future demand analyses for dairy imports for Mexico in a way that incorporates regional variation across the country, not only in transportation costs but in likely demand patterns. The econometrics developed below do not do this, but this is a topic of ongoing investigation by the authors.

3.3 Dairy Consumption by Total Expenditure Deciles

When we consider variations in demand for dairy products across expenditure deciles, the differences in some respects are quite dramatic. As illustrated in Table 6, only 12% of the households in the lowest decile in 1989 reported expenditures on fluid milk, compared with 82% of the households in the top decile. Similarly, only 7% of households in the lowest decile reported expenditures on cheese, compared to 49% of households in the top decile.

Gaps in mean expenditures on dairy products per household across total expenditure deciles are also quite astounding, though they are not directly reported in a table. As an example, the mean expenditure on fluid milk and cheese are about 15 to 17 times higher in the top decile than they are in the bottom decile, while the gap between soft products is more than fifty-fold. It is these types of comparisons that could be viewed as indicative of the potential for strong demand growth via high expenditure elasticities of demand.

Another comparison that provides support for rather high expenditure elasticities comes from Table 6 which reports the budget shares spent on milk products by expenditure deciles. For example, fluid milk consumption's share of the total household budget rises from 1.4% in the lowest expenditure decile to 2.4% in the third lowest decile and then centers around 2.6 to 2.7% for the next five decile groups before falling back off to 1.6% in the top decile. *Ceteris paribus*, this could suggest a strong expenditure elasticity. The evidence from cheese is less clear, as its share in the household budget peaks in the second to fourth lowest expenditure deciles at about 1.1% and falls off below 1% for the top four deciles. Overall, though, it seems that the aggregate consumption data reported at the decile level reflects strong expenditure elasticities, especially among the lower quintiles.

In contrast to the regional data, which revealed some significant price gaps that might account for some of the expenditure differences, very little of the gap in expenditures across deciles appears to be accounted for by differences in prices paid for dairy products. As shown in Table 7, only for cheese is there a consistent increase in the prices paid in the higher expenditure deciles, with the top decile paying about 20% more than the bottom

decile. This gap could reflect quality differences. On the whole, expenditure differences in dairy products across the total expenditure deciles are dominated by major gaps in total expenditures and potential differences in expenditure elasticities rather than by price differentials.

4. Econometric Estimates of Dairy Demand Patterns Among Mexican Households

In this section, we estimate quantity dependent, Marshallian demand functions for four dairy product categories (i.e., fluid milk, cheese, soft products, and other dairy products), plus a composite other food category. We use a Tobit demand specification because of the prevalence of households with zero purchases of the four dairy product categories during the survey reference period (weekly purchases). Recall that the national proportions of consuming households ranges from 60% for fluid milk, to 34% for cheese, 14% for other milk products, and 12% for soft products.

4.1 Specification of Demand Equations

Given our single equation Tobit estimation, we impose homogeneity of demand (absence of money illusion) by deflating all prices and total expenditures with a price index which serves as a proxy for all non-food items. Thus, to normalize the individual demand equations, we deflate all price and expenditure variables by the consumer price index for the city or region from which the observation was drawn. The CPI data were obtained separately from INEGI.

The regressors in the demand functions include own, cross-price and total expenditure (as an income proxy) terms, the number of household members (family size), and 0-1 categorical variables (intercept shifters) for the education level of the household head (4 levels) and the possession of a refrigerator. The omitted categories are households with uneducated household heads and without a refrigerator. The demand specification is linear with quadratic total expenditures, and an interaction term between total expenditures and family size.

4.2 Results of Demand Estimation

The Tobit parameter estimates of the Marshallian demand functions are reported in Table 8. As these parameters measure the marginal response of the regressors on the unobserved, latent variable of the Tobit specification, we summarize the corresponding total effect (unconditional) elasticities for all continuous variables in Table 9, and the unconditional marginal effects for the 0-1 categorical variables (intercept shifters) in Table 10. Approximate, asymptotic standard errors are computed using the bootstrap methods discussed in Cox, Zeimer and Chavas.

Table 9 indicates that all own price elasticities are statistically significant at the 95% level (or better) with the exception of soft dairy products. With the exception of other dairy

and soft dairy products (which is not statistically significant), own price effects are negative as expected. Note that both other and soft dairy products have relatively low proportions of consuming households (14% other, 12% soft versus 60%, 34% and 99% for fluid, cheese and other foods), which suggests that the parameter estimates associated with these categories should be interpreted with some caution. Fluid milk and cheese own price elasticity response are -0.44 and -0.78, respectively, which suggests more elastic price response in Mexico than might be found in the U.S. (or other advanced economies), where a similar price elasticity measures would be around -0.1 or -0.2 for fluid milk and -0.3 or -0.4 for cheese.

The total expenditure elasticities in Table 9 are computed at average expenditure and family size levels (recall that the income specification includes a quadratic term and an interaction with family size). All total expenditure elasticities are statistically significant at the 99% level and indicate normal goods which are quite income inelastic ranging from 0.06 (fluid milk) to 0.2 (soft products). These figures are about one-tenth the level of income elasticities commonly assumed in demand scenarios constructed for Mexico. They are also about one-tenth the level of recent estimates by Nicholson (1995) which were obtained from a simple expenditure regression on 1992 data using income decile level information.

To double check our total expenditure results, we estimated two sets of auxiliary double log demand functions with ordinary least squares using the conditional samples (i.e., only those households observed with positive demand for the given dairy products). The only difference between these two sets of OLS regressions was that in one we used total expenditures as our income proxy (as in the Tobit results) and in the other we used total income. The results of those two regressions are reported in Table 11; the estimated parameters (conditional elasticities) are very similar. Note, in particular, that the total expenditure and income elasticities are quite close across the two regressions. Following Greene, a simple check on the limited dependent variable coefficient estimates can be obtained by multiplying these conditional (on positive consumption) coefficient estimates by the probability of observing a positive level of consumption (the sample proportion of consuming households). When we do this, the elasticity estimates turn out to be quite close to our Tobit estimates. For example, the expenditure elasticities for fluid milk and cheese are, respectively, 0.11 and 0.21, which although somewhat higher than the Tobit estimates are still far from the 1 or 1 plus estimates that are sometimes used in demand forecasts.

All estimated cross-price effects are found to be quite inelastic (indicating that cross price affects are relatively small), and 15 out of 20 of these estimates are statistically different from zero. Summarizing the statistically significant cross-price effects by row indicates that fluid milk is a substitute for other dairy products and other foods but a complement for soft products. The price of other dairy products is found to have a statistically significant impact only on fluid milk (complement). Soft products demonstrate a substitute relationship with fluid, cheese and other food, and a complementary relationship with other dairy products. Cheese is found to be a complement with fluid and soft products while a substitute for all other food. As expected, other food is found to be a statistically significant substitute for all

dairy products. Note that these estimates are from Marshallian demand functions, hence all substitute/complementary relationships are gross (versus net).

All family size elasticities are statistically different from zero with the exception of soft products. Fluid milk consumption (0.32) is considerably more responsive to family size than other dairy products and cheese (0.13). The impacts of family size on other food is twice as large (0.62) as on fluid milk. Note that average family size is 4.96 persons; hence, adding one person is roughly equivalent to a 20 percent change in family size indicating considerably larger impacts than the elasticity measures (i.e., for a one percent change). The differential impacts of household composition (adding a child versus adult, male versus female, etc.) on dairy product consumption are being pursued in further research with these data.

Lastly, we summarize the unconditional marginal impacts of the categorical (dummy) variables as intercept shifters rather than elasticities. The results are summarized in Table 10. Recall the omitted categories are a household with no refrigerator and an uneducated household head. Clearly the largest impacts of refrigeration are on fluid milk and other foods: households with refrigerators consume, on average, 11.8 liters more milk and 24.8 kilograms more other food than households without a refrigerator. The impacts of having a refrigerator for other dairy, soft products and cheese are 0.13, 0.16, and 0.25 kilograms, respectively.

The unconditional marginal effects of education of the head of household on consumption generally increase with education level – see Figure 1. With the exception of other food, all education impacts are positive and statistically significant. The negative impacts of increasing education level on the consumption of other foods is unexpected as well as statistically non-significant. Again, these *areceteris paribus* marginal impacts (in particular, holding income and family size constant) of education level relative to households with an uneducated head of household and no refrigerator. These results indicate strong consumption growth potential with increase in the education levels in Mexico. Note that the largest increases generally occur between one year of primary (Education: 1) and one year of secondary (Education:2) education. Other dairy foods also exhibits a similar increase between one year of secondary (Education:2) and one year of preparatory or vocational but no university schooling (Education:3).

4.3 Interpretation and Consistency of Estimates with 1992 and 1994 Descriptive Statistics

The final set of comparisons made in this paper are to see how Mexican household demand for dairy products may have changed since 1989. We have some comparable dairy expenditure data for 1992 and 1994 at the national level and by income deciles. Thus, we can use these data to see how three and five years of dynamic economic growth in Mexico affected dairy demand. In Table 12, we provide a similar table to Table 6, which gives the proportion of households in each decile who consumed the particular product and the share

of the expenditures accounted for by this product in the total household budget.

These data show some growth in the proportion of households consuming dairy products across almost all of the expenditure deciles. When we compare the share of household budget expenditures accounted for by fluid milk across the income deciles, we see substantive growth in share for all of the deciles except the top one. Almost all of this increase appears to be accounted for by the increase in the proportion of households consuming these products. *Ceteris paribus*, these results suggest a higher income elasticity than the regression results reveal. However, it is, in fact, the *ceteris paribus* and aggregative nature of these comparisons that makes them suspect, compared to the econometric estimates reported above.

5. The Future of Mexican Dairy Demand - Research and Policy Issues

Using household expenditure data from INEGI's 1989 national household survey, we have examined demand patterns of Mexican households for four categories of dairy products. When the data are considered at highly aggregated levels, such as expenditure deciles, there seems to be compelling evidence of strong expenditure elasticities of demand, emanating both from the increasing proportion of households consuming dairy products and rising budget shares over much of the expenditure spectrum. However, when expenditure elasticities are estimated using carefully specified econometric models of demand that account for the censored nature of demand (many zero consumption observations), own and cross price effects, household demographics, education levels, and refrigerator ownership, then the estimates are much less elastic (0.1 to 0.2), or between 5 and 10 times less than most recent dairy trade models have presumed and recent decile based regression results have estimated (Nicholson, 1995).

This discrepancy between highly aggregated observations on expenditure patterns and our econometric findings raises three major concerns. The first concern is which results to trust. The econometric estimates are appealing for many reasons: they are based on household level data rather than decile averages; they incorporate other key intermediating variables like prices and demographics; the Tobit specification addresses the (often heavily) censored nature of household level dairy product consumption in Mexico; and lastly, the econometric results are quite consistent using either total expenditure or income measures. Conversely, however, there is the possibility that the 1989 estimates will not prove to be robust over time. To better assess this prospect, we plan to analyze the 1992 and 1994 Mexican household data to replicate our current model and test the stability of the parameter estimates using more recent data.

A second major concern has to be the implications of these expenditure elasticities for the future of Mexican dairy demand. If they are correct, it will take substantially more income growth in Mexico, especially among the lower income deciles, to stimulate the levels of dairy demand that were generally predicted by analysts who were assuming elasticities 5

to 10 times higher than the estimates we obtain. In future work, we will further develop the implications of these findings for Mexican dairy imports, but our estimates suggest is that it will be tough to get the type of import growth many analysts were predicting. Demand growth simply will not be sufficient to generate significant import increases. The problem for U.S. dairy exporters could be exacerbated if the Mexican government can continue to fill national dairy import needs, mostly with non-fat dry milk imports on world markets at prices much lower than U.S. domestic prices.

Our final concern is whether the econometric analysis we offer is even disaggregated enough to capture the high degree of regional variation in demand patterns that seems to be evident in the descriptive data (see Table 3, for example). Ideally, projections of dairy imports would be tied explicitly to particular ports or points of entry, and would then be allocated interregionally within Mexico depending on the confluence of demand and supply forces. Such an intraregional analysis would include the considerable variations in infrastructure and transport costs within the country. To accomplish such a fine grade model, it would be imperative to take the demand analysis down to regional levels to model more carefully the variation in household demand patterns that appear to be evident among regions. The tradeoffs that may limit the efficacy of regional analysis involve the limited sample sizes, especially in regions with heavily truncated consumption outcomes. This is also a topic of future investigation.

Any resulting dairy trade forecasts will, of course, remain susceptible to the uncertainties associated with Mexico's macroeconomic and policy outcomes - pertinent examples are consumer subsidy policies and producer price ceilings. Nonetheless, finer-grained interregional demand-supply analyses would be a major improvement on previous efforts and would allow for analyses of intraregional trade and welfare outcomes within both the United States and Mexico (see Cox et al. for such a model of the U.S. dairy industry). This type of research will continue to be of considerable value to private and public decision-makers, especially a few years from now when the gradually declining trade barriers on dairy products allow for a much more open trade in dairy products than is currently possible.

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