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# NONPARAMETRIC TESTING FOR STRUCTURAL CHANGE IN THE DEMAND FOR SELECTED DAIRY PRODUCTS

A Thesis

Presented for the

Master of Science

Degree

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Phillip Scott Bevins

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ABSTRACT

The objective of this study was to test for evidence of structural change during the years 1967-1986 in U.S. per capita demand for whole milk, lowfat milk, juices and other beverages and in the U.S. per capita demand for butter, margarine, and salad and cooking oils. If the data, consisting of prices and consumption quantities, adhere to the behavior of a stable demand function, then the data should conform to a given set of criteria. These criteria are that the data do not violate the Weak Axiom of Revealed Preference (WARP) and do not violate the Strong Axiom of Revealed Preference (SARP). Violations of WARP and SARP suggest that factors other than changes in prices and expenditures have influenced changes in consumption patterns. A nonparametric approach to testing for violations within the consumption patterns was used.

The results showed that whole milk and lowfat milk consumption patterns were consistent with stable preferences under utility maximization. Therefore changes in consumption patterns among these beverages were explained by changes in prices and expenditures. Addition of juices into the group introduced violations, but they were small in magnitude. Inclusion of "other beverages" introduced numerous inconsistencies. The largest violation in any of the beverages groupings was by less than seven percent. Consumption patterns among all of the groupings of butter, margarine, and salad and cooking oils either met or nearly met the criteria of revealed preference.

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# CHAPTER 1

## INTRODUCTION

Per capita consumption of total dairy products has remained relatively constant since 1967, as shown in Figure 1. It was only during the period from 1983 to 1986 that total consumption of dairy products rose significantly.

While overall consumption of dairy products has been relatively stable, there have been marked changes in the consumption of various products within the dairy products group (Figure 2). Only 46.4 percent of the consumption of fluid milk in 1987 consisted of whole milk as opposed to over 80 percent in 1967 (Smith and Yonkers). According to Haidacher, Blaylock, and Myers, per capita consumption of whole milk declined about 3 percent per year from 1965 to 1986. Lowfat milk consumption increased at an average annual rate of over 5 percent. The consumption of skim milk experienced little change through the mid-eighties; however, in 1985 per capita consumption was 3.8 pounds, 4.3 pounds in 1986, and 4.2 pounds in 1987. During the 1980's, increases in consumption of lowfat and skim milk, cheese, and frozen products were sufficient to offset declines in the consumption of whole milk and butter.

Several factors may have contributed to the decline in consumption of whole fluid milk and to the increase in consumption of lowfat milk, skim milk, and other lowfat dairy products. These factors include changing health concerns, demographic patterns, and effects of prices and incomes.

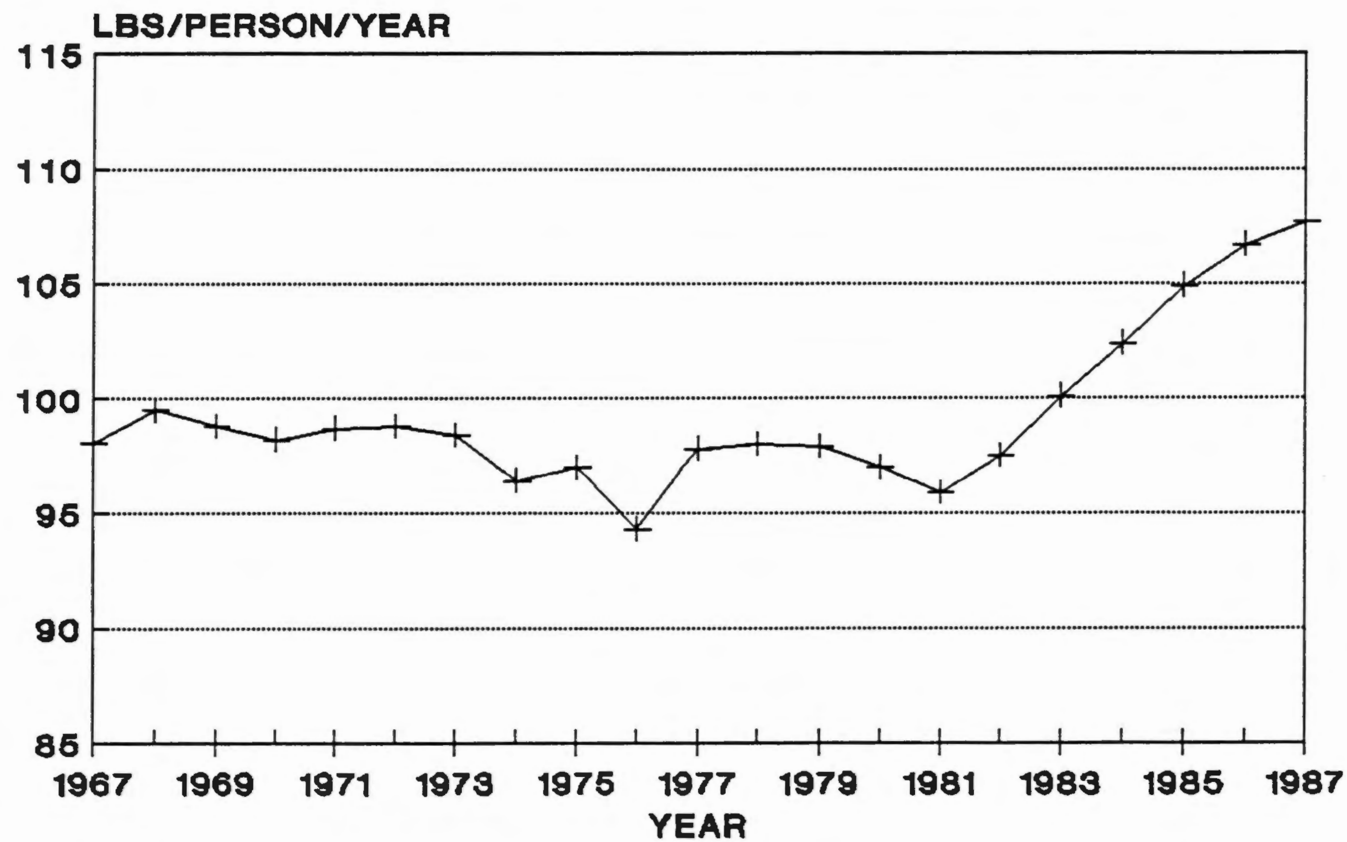


**Figure 1.** U.S. Per Capita Consumption of Total Dairy Products, 1967-1987.

Source: USDA, <u>Food Consumption, Prices, and Expenditures</u>, Economic Research Service, Washington, DC, various issues, 1964-1988.

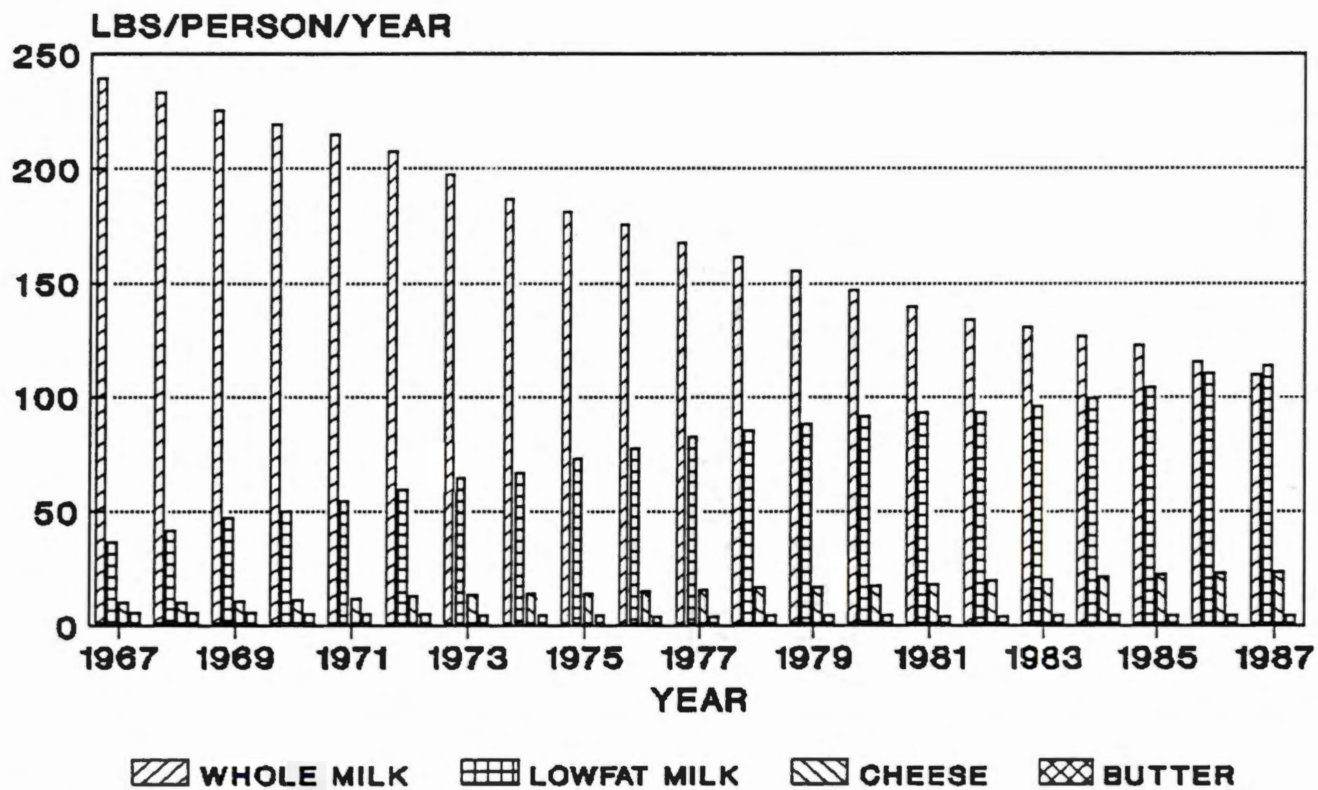


**Figure 2.** U.S. Per Capita Consumption of Whole Milk, Lowfat Milk, Cheese, and Butter, 1967-1987.

Source: USDA, Food Consumption, Prices, and Expenditures, Economic Research Service, Washington, DC, various issues, 1964-1988.

Since the 1960's, the American Heart Association and other health related groups have urged individuals to decrease their consumption of foods high in fat and cholesterol to lessen the possibility of heart disease (Hettinga). In 1984, experts selected by the National Institute of Health reported that, on the average, the blood cholesterol level of a majority of individuals in the United States was too high (Hettinga). The experts attributed the high blood cholesterol level to the consumption of calories, saturated fat, and cholesterol. According to Hettinga, many experts regard consumers' concerns about the potential for heart disease and other health risks from too much fat and cholesterol in their diets as the greatest reason for the transition away from certain dairy products and eggs. Smith, Herrmann, and Warland found that consumers, who were concerned with decreasing intake of foods high in cholesterol and saturated fats were likely to have decreased overall consumption of milk in the last two to three years and to have moved toward consuming milk with lower fat content.

While individuals may have become more concerned with the fat content in dairy products, they may be just as concerned with the content of other nutrients in dairy products. According to Hettinga, dairy products are the chief source for such nutritional ingredients as calcium, protein, zinc, riboflavin, magnesium, and fortified vitamin D. As a result of such concerns, the dairy industry has attempted to reach these individuals through advertising and new dairy product lines. These new lines enhanced the calcium content while reducing the fat content in cheeses and lactose content in milk and processed cheeses.

While health concerns may have contributed significantly to the transition in types of dairy products consumed, other factors that may have also played a significant role include changing demographics, milk substitutes, prices, and incomes. Sullivan found that milk was consumed in greater quantities in conjunction with meals prepared at home. With the increased consumption of food away from home, milk intake declined. Consumers, especially those with higher incomes, who consume a greater proportion of their meals away from home, substituted other beverages for milk. According to Sullivan, soft drink consumption increased from 18 gallons per person in 1966 to 30 gallons per person in 1986; juice consumption increased from 2.8 gallons per person in 1966 to 5.5 gallons per person in 1986; and beer and ale use increased from 16.5 gallons per person in 1966 to 24 gallons per person in 1987. Other dairy products have benefitted from the increased consumption of foods away from home. In particular, with the popularity of pizza, consumption of mozzarella cheese in away from home markets has increased over the last decade (Hettinga).

Results from cross-sectional and time-series studies of the demand for dairy products (Boehm; Gould, Cox, and Perali; Haidacher, Blaylock, and Myers; Heien and Wessells) have shown that dairy products consumption, especially milk, is higher in households with children. As the age structure of the population shifts toward a higher proportion in older age groups, this could have a negative impact on the demand for dairy products. Other factors, such as increasing educational levels and incomes, could also shift consumption away from higher milkfat products to lowfat products, as was found for fluid milk by Gould, Cox, and Perali.

Several changes in dairy products consumption patterns suggest that structural change in the demand for dairy products may be occurring. First, as described above, the mix of dairy products consumed has changed dramatically over the last twenty years toward lower fat products. Second, the types of products that compete with dairy products have changed. An example, is the increased consumption of soft drinks as an alternative to milk consumption. Third, the demographic impacts on dairy products consumption measured in cross-sectional studies and time-series studies, suggest that as the demographics of the population continue to change, these changes will impact on dairy products consumption.

While all of these trends point toward the possibility of structural change in the demand for dairy products, there is a lack of empirical tests for structural change. Evidence of structural change would suggest that static models of the demand for dairy products, which incorporate only prices and expenditures, would be inadequate for explaining changes in dairy products consumption.

# CHAPTER 2

# LITERATURE REVIEW

The review of literature consists of three sections. In the first section, studies of the consumption of milk and other dairy products are reviewed and summarized. Cross-sectional and time-series studies of the demand for milk and various dairy products are reviewed in the second section. Findings from the consumption and demand studies which suggest structural change in the demand for dairy products are emphasized. Studies using formal methods of analyzing and testing for structural change in the demand for foods are summarized in the third section.

## Consumption Studies

Results from studies of the consumption of dairy products revealed changes in consumers' concerns regarding the nutritional value and healthiness of dairy products (Hettinga; Smith, Hermann, and Warland; Smith and Yonkers; Vassavada and Smith). These results are summarized in this section.

According to Hettinga, results from a recent survey showed that 53 percent of the respondents consumed lowfat milk for diet or caloric reasons and 26 percent for health or fat reasons. Only 15 percent consumed lowfat milk for taste reasons and 7 percent consumed lowfat milk because of its price.

In a study of the importance of cereal to fluid milk consumption during the last 20 years, Smith and Yonkers found that while fluid milk consumption increased with greater cereal consumption, these increases were comprised primarily of increased lowfat milk consumption. Data were obtained from two surveys, one determining the average quantity of milk used with each average size serving of cereal, the other determining the number of times per week that an individual consumes the cereal, and from the USDA publication Food Consumption, Prices, and Expenditures, 1966-87. Smith and Yonkers found that with an increase in the consumption of ready-to-eat cereal, cereal milk consumption increased by 26.6 percent.

Smith, Herrmann, and Warland analyzed consumers' concerns about fat, cholesterol, and calories and their influence on milk consumption. The study attempted to explain the decline in whole milk consumption and the rise in lowfat and skim milk consumption by identifying the extent to which consumers adhere to product and health information. Data were selected from a random nationwide telephone survey conducted in 1987. The survey consisted of 1402 individuals who were at least 18 years of age. Only responses suggesting some relationship between calorie, fat, and cholesterol with milk consumption were used.

Responses to the survey indicated that individuals had not been appropriately informed as to the structural content of fluid milk. Many had no idea as to the fat content in fluid milk, while half of those responding overestimated the fat content. The study also found that not only were individuals concerned about potential health risks from consuming dairy products, but from consuming other food groups as well. In fact, they found that people were increasing their intake of vegetables, fruit, fish, and chicken and decreasing their intake of beef, pork, and eggs. Smith, Hermann, and Warland concluded that individuals have become more health conscious and place emphasis upon the nutritional value of foods and beverages. Thus, to decrease their intake of fat and cholesterol, while continuing to acquire the needed level of calcium, vitamins, and protein, consumption of milk has shifted to lowfat and skim milk from whole milk. Smith, Hermann, and Warland found that drinkers of whole milk were less likely to be concerned about fat, cholesterol, and calories, less likely to exercise, were more likely to be non-white, were likely to be younger, and more likely to have fewer years of schooling than those who drank lowfat milk.

## Dairy Products Demand Studies

A number of studies have analyzed the demand for milk and other dairy products (Boehm; Boynton; Heien and Wessells; and Gould, Cox, and Perali). In these studies own price elasticities for milk and other dairy products were estimated. The magnitudes of these elasticities vary widely depending upon the type of data used and the demand system used. Some studies used cross- sectional data while other studies used both cross-sectional and time-series data as a basis for comparison. As shown in Table 1, for example, the estimates of the own price elasticity for milk ranged from -.55 to -.37 for time- series data and from -1.33 to -2.24 for cross-sectional data. In each of these studies, demographics were also incorporated into the demand systems. The results from cross-sectional studies of the demand for dairy products suggested strong impacts by such factors as region, race, and the population's age structure. According to Haidacher, Blaylock, and Myers, per capita expenditures on total dairy and related products were found to be 14 percent greater in the Northeast than in the South. With the exception of canned milk, weekly

Table 1. Elasticities of Demand for Dairy Products Estimated in Past Studies.

| Product | Own-Price Elasticity | Data Type | Study |
|---|---|---|---|
| **Milk:** | | | |
| All | - .63 | Cross-sectional | Heien & Wessells |
| Whole | -1.70 | Cross-sectional | Boehm |
| | - .37 | Time-series | Boehm |
| | - .32 | Time-series | Gould, et al |
| Two percent | -1.33 | Cross-sectional | Boehm |
| | - .55 | Time-series | Boehm |
| Skim | -1.82 | Cross-sectional | Boynton |
| | - .12 | Time-series | Boynton |
| Lowfat | -.437 | Time-series | Gould, et al |
| Nonfat Dry | -2.24 | Cross-sectional | Boehm |
| | - .45 | Time-series | Boehm |
| **Butter:** | - .17 | Time-series | Myers, et al |
| **Margarine:** | - .27 | Time-series | Myers, et al |
| **Cheese:** | | | |
| All | - .52 | Cross-sectional | Heien & Wessells |
| Cottage Cheese | -1.10 | Cross-sectional | Heien & Wessells |
| | -1.29 | Cross-sectional | Boehm |
| | - .43 | Time-series | Boehm |
| Processed Cheese | -1.71 | Cross-sectional | Boehm |
| | -1.80 | Time-series | Boehm |
| American Cheese | - .44 | Cross-sectional | Boehm |
| | -2.17 | Time-series | Boehm |

| Product | Own-Price Elasticity | Data Type | Study |
|---|---|---|---|
| **Frozen Desserts:** | | | |
| Ice Cream | - .42 | Cross-sectional | Boehm |
| | - .69 | Time-series | Boehm |
| Ice Milk | - .56 | Cross-sectional | Boehm |
| | -1.06 | Time-series | Boehm |
| **Other:** | | | |
| Yogurt | - .51 | Cross-sectional | Boehm |
| | - .36 | Time-series | Boehm |

Source: Boehm (1975); Boynton (1986); Gould (1990); Heien and Wessells (1988).

per capita expenditures for dairy products were greater by whites than by blacks, with whites spending nearly 25 percent more per person on total dairy products than blacks. Weekly per capita expenditures for total dairy products were higher for households having children. Households having teenagers and infants 2 years of age and under spent more on total dairy products as opposed to age groups 3-12, 20-39, and 65 and older. The percentage difference in expenditures between teenagers and infants was 1.9 (Haidacher, Blaylock, Myers).

Heien and Wessells conducted a study on the effects of dairy price support programs on the nutritional intake of consumers. Their objective was to observe the impact that higher dairy prices would have on the consumption of dairy products. Data were obtained from the 1977-78 Household Food Consumption Survey. The Almost Ideal Demand System (AIDS) model was chosen in order to reveal the impact that demographic characteristics (such as household size, number of household members by age and sex, season, region, tenancy, and race), price effects, and income effects have on consumption of various dairy products. The results from the study indicated a decrease in per capita demand for dairy products, particularly for fresh milk and butter. Heien and Wessells attributed the decrease in demand partially to changes in the age structure of the population, with a declining number of teenagers and children. They also noted that a higher proportion of food expenditures away from home had a negative impact on milk and butter consumption.

Boehm analyzed the impact prices, income, and demographic characteristics have on the demand for certain dairy products in the South. Two analyses were performed, one deriving estimates from cross-sectional data, and the other deriving estimates from time-series data. The cross-sectional data were used in determining how income, demographic characteristics, and retail prices have influenced the demand for dairy products. The demand for thirteen dairy products were analyzed. Demographic characteristics were incorporated to include: educational level of the household, occupation of its head, race, housewife employment status and city size. The time-series data were used in estimating the own-price and cross-price elasticities for dairy products. The Market Research Corporation of America provided the necessary data for the purchases of the dairy products needed in each model.

Excluding iced milk, buttermilk, and canned milk, Boehm concluded that Southerners tended to consume lower quantities of dairy products than consumers in the remainder of the United States. He found that the demand for dairy products in the South was generally more price responsive than demand in the rest of the United States (exceptions were buttermilk and American cheese).

Boehm also found that black households consumed lower amounts of dairy products than white households, with the exception of canned milk. Having young people in the household added to the consumption of fluid milk. If the head of the household had less than a college education, the household was more likely to consume whole, rather than two percent milk.

In general, Boehm concluded that higher retail prices in the South, lower levels of annual income, and Southern demographic characteristics, such as household age/sex composition, educational level, and race, distinguish the South from the rest of the United States. These factors contributed to the lower consumption levels in the region.

Gould, Cox, and Perali incorporated demographic variables into an AIDS time-series model of the demand for fluid milk. They estimated expenditure shares allocated to whole milk, lowfat milk, juices, other beverages, and other food as functions of prices of these goods, expenditures, and variables representing age, race, and education levels. They found that an increase in the age of the population decreases the demand for whole milk, while increasing the demand for lowfat milk. They also found that an increasing median years of schooling of the population decreases the demand for whole milk and increases the demand for lowfat milk. Based on projections of age, educational, and racial populations, they forecasted that the demand for whole milk would continue to decline, while the demand for lowfat milk would continue to increase.

Gould, Cox, and Perali also estimated a similar type of demand system for fats, including butter. They found that factors such as increased educational levels would decrease the demand for butter and increase the demand for margarine. In addition, they found that the oldest age grouping had the highest per capita consumption of butter, perhaps indicating consumption patterns fixed before heightened health concerns.

## Studies of Structural Change in the Demand for Food

The identification of the origin and the time at which structural change in demand for a given commodity occurs is very difficult to determine. Such structural changes are the result of changes in the utility function which rid the set of demand functions of a portion or all of the parameters (Haidacher; Chavas). Consequently, a number of different methodologies have been used to test for and incorporate structural change into demand functions. These methodologies are reviewed for studies of various food commodities which incorporate structural change. These commodities include meats, such as beef, pork, and poultry, and butter, fats, and oils.

### Parametric Studies of Structural Change

Evidence of structural change may come from a number of parametric methods. One method for obtaining evidence of structural change is to test a model with parameters that are invariant with respect to time. If the model fails a given set of tests, this is used as evidence of structural change. Other studies have interjected time varying parameters into a model. If the parameters are significant, then the assumption is made that structural change has occurred (Chavas; Choi and Sosin).

Examples of studies which estimated static models of the demand for food products and then tested for structural change from these models include Chang and Kinnucan, Braschler, and Haidacher. Chang and Kinnucan tested for structural change in Canadian demand for butter and other fats using the Chow test. The test was used to determine whether or not estimated demand coefficients for butter and other fats were changing over time. Braschler also used the Chow test to examine whether or not the demand for red meats changed during the 1970's. In both of these studies, given demand structures were assumed, static models were estimated, and the Chow test was performed on these models. The Chow test is a parametric method to test for discrete structural change (Chow). In the Chow test, the observations are split into more than one segment. The first n observations are used to fit an estimated regression. Then, a regression is fit to the total pooled sample (n + m) observations. The test statistic is used to evaluate whether or not m observations come from the same population as n. The test statistic is:

$$F = \frac{(e'e - e_1'e_1) \;/\; m}{e_1'e_1 \;/\; (n - k)}$$

where $\mathbf{e_1}$ are the residuals from the regression on the first n observations, and e are the residuals from the regression on the pooled observations, and k is the number of explanatory variables. The **F** statistic is distributed as F with (m, n-k) degrees of freedom.

Haidacher used a different approach to measure structural change in the demand for food and food commodities. In his study, Haidacher used an indirect approach for assessing structural change in the demand for food commodities, rather than incorporating time varying parameters. He proposed that if a postulated demand structure reflected the true demand structure, then values simulated from the postulated demand structure would be the same as the realized values if no structural changes in demand had occurred. Given that this assumption is correct, then errors between simulated values and actual values provide a rough estimate of the outer bound of structural change. Haidacher introduced a constant term, $\tilde{s}_i$ into each equation, such that:

$$\dot{q}_{it} = \sum_{j=1}^{n} e_{ij}\, \dot{p}_{jt} + \eta_i\, \dot{m}_t + \tilde{s}_i \ ,$$

where $\dot{q}_{it} = \Delta q_{it} \,/\, q_{it}$ , $\dot{p}_{it} = \Delta p_{it} \,/\, p_{it}$ , $\dot{m}_t = \Delta m_t \,/\, m_t$ . The price elasticities are $e_{ij}$ and the income elasticity vector is $\eta_i$. An interpretation of $\tilde{s}_i$ is that if the changes in prices and incomes are equal to 0, then quantity will change by $\tilde{s}_i$ for each unit change in t. Therefore, $\tilde{s}_i$ provides a rough estimate of the bounds of structural change over time.

Several studies incorporated time varying parameters into demand systems. If the parameters were significant, this served as evidence of structural change. Choi

and Sosin, in order to measure structural changes in the demand for meats, interjected time dependent parameters into a translog model. Choi and Sosin concluded that the parameters of the model were time dependent, and reflected the occurrence of a shift in the demand for red meat during the 1970's. Other studies incorporating time varying parameters into food demand systems include studies by Wohlgenant and by Chavas.

## Nonparametric Methods for Testing for Structural Change

Parametric methodologies usually present the problem that they assume the functional form of the selected utility function is correct. As Chalfant and Alston point out, selection of the incorrect functional form can introduce results which may give the appearance that structural change has occurred, when it may not have. Therefore, indicators of structural change may be the product of specification choices.

A non-parametric approach for testing for structural change involves testing for revealed preference (Chalfant and Alston; Varian (1983)). In order to test for the stability of demand, the null hypothesis is that observed data conform to the restrictions implied by stable well-behaved preference. If this is the case, then prices and expenditures explain consumption patterns.[1] The test for revealed preference is

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[1] The underlying assumption is that the commodities under consideration form a weakly separable group and that the per capita consumption data are the result of utility maximization on the part of a "representative consumer". It is assumed that aggregation conditions hold so that the average may be used. It is also assumed that the composite commodity theorem holds; that is, the prices for each of the two groups of commodities always change in the same proportion. Thus, the aggregate demand for each group of commodities behaves as a single commodity (Henderson and Quandt).

applied to the data without imposing an assumed functional form for demand.

Chalfant and Alston tested for revealed preference in meat demand. They found no switch of preference, and therefore concluded that relative prices and expenditures explained shifts in consumption patterns. This was in direct conflict with findings from a number of other meat demand studies which used the methodology of selecting a functional form and then testing for structural change based on that functional form (i.e. Choi and Sosin; Chavas; Wohlgenant).

# CHAPTER 3

## OBJECTIVE

The objective of this study is to determine whether or not structural change has occurred in the demand for dairy products. As part of this objective, nonparametric tests will be conducted for evidence of structural change within the demand for dairy products. Evidence of structural change will be tested in two groupings of dairy products. These are consumption of whole milk, lowfat milk, juices, and other beverages and consumption of butter, margarine, and salad and cooking oils. These groupings are tested due to the data availability for these products and also because there have been major changes in consumption patterns among these groups.

# CHAPTER 4

# DATA

The beverages data are comprised of whole milk, lowfat milk, juices, and other beverages. Other beverages consist primarily of carbonated soft drinks, coffee, and tea. The quantity data for each of these are per capita consumption data in gallons per year. The quantity data are from Food Consumption, Prices, and Expenditures, 1964-88. The consumption of lowfat milk is represented by an aggregation of one percent, two percent, and skim milk. Consumer price indexes and retail prices for whole milk and other beverages are from Food Consumption, Prices, and Expenditures, 1964-88 and U.S. Bureau of Labor Statistics sources. However, price indexes for skim milk and juices for 1967-77 are from U.S. Bureau of Labor Statistics sources and are used in conjunction with retail prices for 1980-86 taken from Food Consumption, Prices, and Expenditures, 1964-88. Because a retail price or consumer price index was not available for skim milk or juices during the two year period 1978-79, prices were estimated.[2] All prices are adjusted to a 1982-84 base year index.

The fats and oils group consists of three commodities: butter, margarine, and salad and cooking oils. Per capita consumption for the three subgroups and consumer price indexes for butter and margarine are from Food Consumption, Prices, and

[2]The missing skim milk prices are estimated based on their historical relationship with whole milk prices. The missing retail juice prices are estimated based on historical wholesale juice prices.

Expenditures, 1964-88. Per capita consumption is in pounds per year. Consumer price indexes for salad and cooking oils are from U.S. Bureau of Labor Statistics sources. All prices are indexes adjusted to a 1982-84 base year index. Price series for all of the commodities are derived from price indexes and prices of the individual commodities. Prices were obtained from Food Consumption Households in the U.S., Seasons and Year 1977-78 and from Food Consumption, Prices, and Expenditures, 1964-88. All prices are deflated by the consumer price index.

# CHAPTER 5

# METHODOLOGY

A nonparametric approach will be used to test for structural change in dairy products demand. The nonparametric approach is used, because it allows for testing for revealed references, but does not impose an a priori assumed functional form for demand upon the data (Chalfant and Alston; Varian (1983)). As discussed by Chalfant and Alston, imposition of the incorrect functional form can produce results which give the appearance of structural change in demand, when there may be none.

If the data, consisting of prices and consumption quantities, adhere to the behavior of a stable demand function, then the data should conform to a given set of criteria. These criteria are that the data do not violate the Weak Axiom of Revealed Preference (WARP) and do not violate the Strong Axiom of Revealed Preference (SARP). Violations of WARP and SARP suggest that factors other than changes in prices and expenditures have influenced changes in consumption patterns.

Let $\mathbf{P_a}$ be a vector of prices for bundle **a** and $\mathbf{Q_a}$ be the quantity vector for bundle **a**. The cost of purchasing bundle **a** is then represented by $\mathbf{P_a}'\mathbf{Q_a}$ or $\Phi_{aa}$. Suppose that **a** is the bundle of **N** goods purchased at a given time period, and **b** is the bundle of **N** goods purchased at another time period. According to the WARP, bundle **a** is revealed preferred to any other bundle **b** that could have been purchased (abbreviated **aRb**), if bundle **b** was affordable at period **a** prices, but bundle **a** was selected instead. If **aRb**, assuming the data behave according to WARP, then **b** will

never be revealed preferred to **a**. The Weak Axiom of Revealed Preference is violated if any bundle **b** is also revealed preferred to bundle **a**, as is shown in Figure 3. Satisfaction of WARP implies homogeneity of degree zero of the demand function and that demand relations are single valued (for any price-income vector, a single consumption point is chosen).

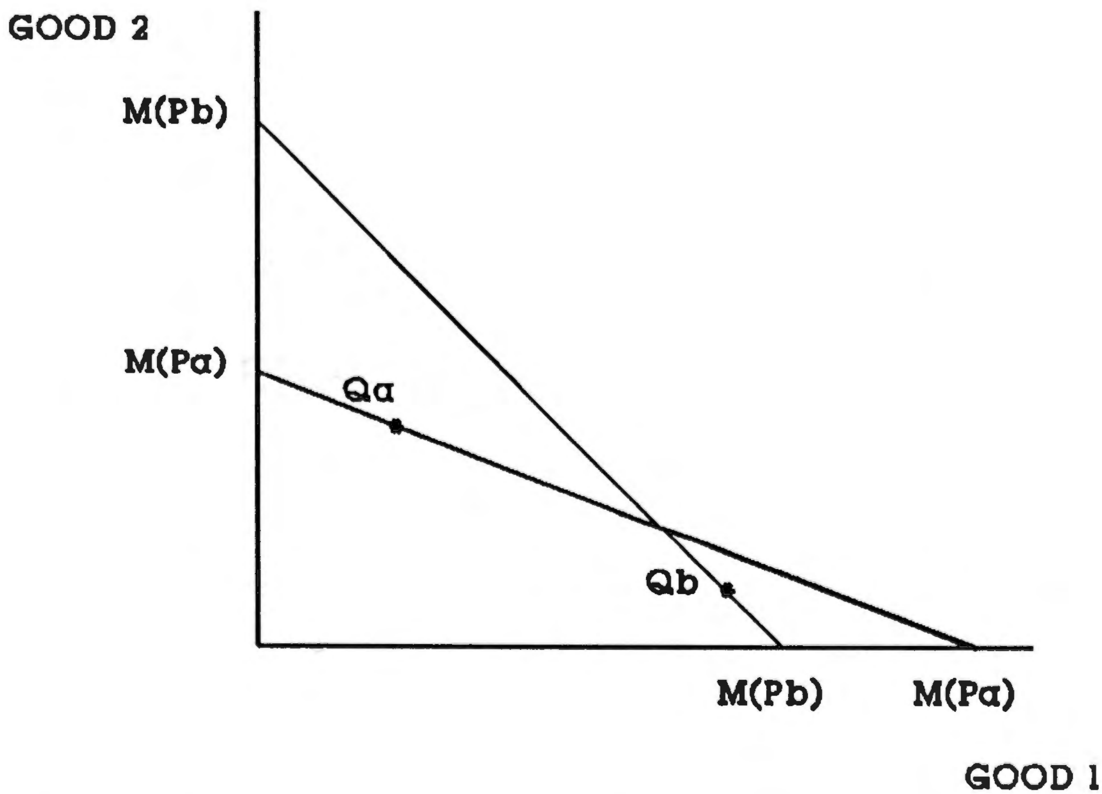


**Figure 3.** Example of Violation of the Weak Axiom of Revealed Preference.

If the number of bundles is greater than two, then it also becomes necessary to test for transitivity under the Strong Axiom of Revealed Preference. Transitivity implies that if **aRb** and **bRc**, then **aRc**. For example, if **aRb**, **bRc**, and **cRa**, there is intransitivity of preferences. In the example shown in Figure 4, **cRb**. Bundles **c** and **a** lie on the same indifference curve, which means that **a** must also be preferred to **b**. However, **a** and **b** lie on the same curve, implying indifference. Therefore, satisfaction of SARP implies non-intersecting indifference curves.

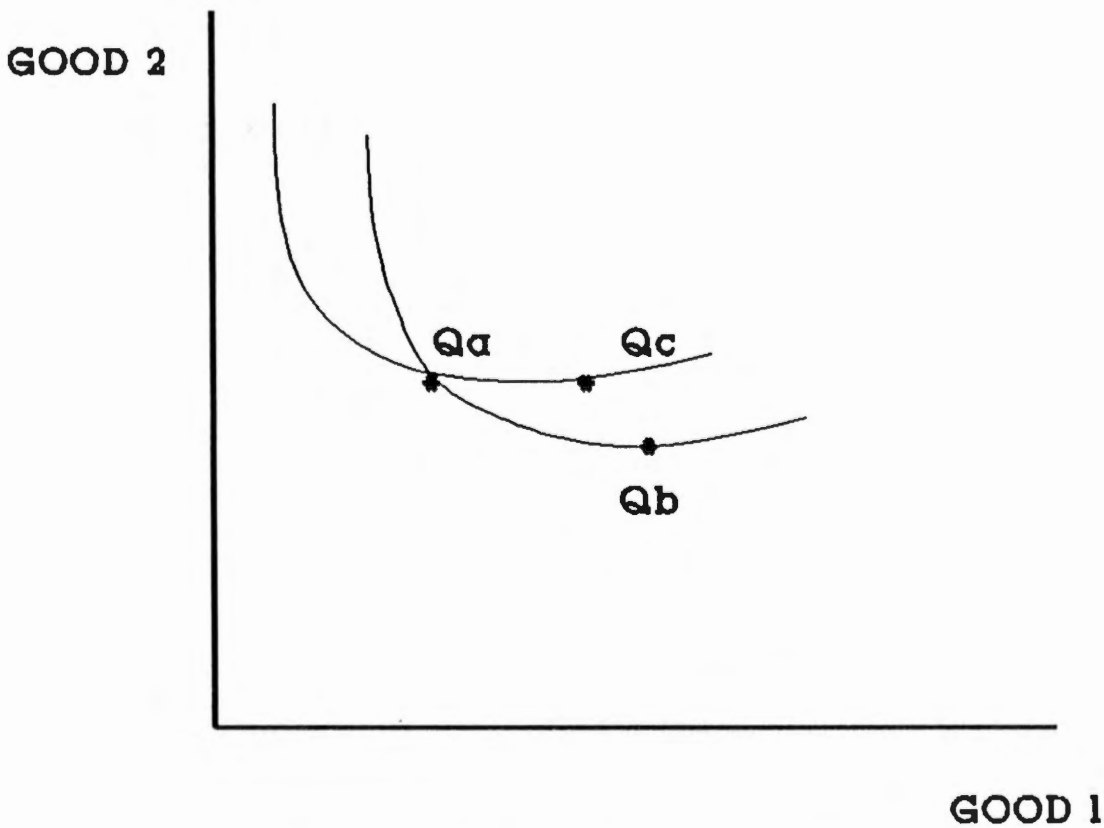


**Figure 4.** Example of Violation of the Strong Axiom of Revealed Preference.

A matrix, $\Phi$, can be used to test for the consistency of consumption behavior with WARP and SARP. The matrix for bundles **a** and **b** is:

$$\Phi = \begin{bmatrix} \Phi_{aa} & \Phi_{ab} \\ \Phi_{ba} & \Phi_{bb} \end{bmatrix}$$

When $\Phi aa > \Phi ab$, **aRb.**

A convenient representation of the matrix $\Phi$, is found by dividing each element of the matrix by the diagonal element in the same row. For example, each element in the row with $\Phi_{aa}$, would be divided by $\Phi_{aa}$. This representation allows comparison of the affordability of the bundle actually purchased at **a**, with alternative bundles, **b** and **c.** The matrix is calculated as:

$$\Gamma = \begin{bmatrix} \frac{\Phi_{aa}}{\Phi_{aa}} & \frac{\Phi_{ab}}{\Phi_{aa}} & \frac{\Phi_{ac}}{\Phi_{aa}} \\ \frac{\Phi_{ba}}{\Phi_{bb}} & \frac{\Phi_{bb}}{\Phi_{bb}} & \frac{\Phi_{bc}}{\Phi_{bb}} \\ \frac{\Phi_{ca}}{\Phi_{cc}} & \frac{\Phi_{cb}}{\Phi_{cc}} & \frac{\Phi_{cc}}{\Phi_{cc}} \end{bmatrix}$$

For purposes of convenience, each quotient can be abbreviated. For example,

$$\Gamma_{ab/aa} = \frac{\Phi_{ab}}{\Phi_{aa}}.$$

Suppose that $\Gamma_{ab/aa}$ is less than one. This indicates that the bundle purchased at time **b** was affordable at time period **a**, although it was not purchased at time period **a**. Therefore, if $\Gamma_{ab/aa} < 1$, then **aRb.** Given this representation, violation of

WARP would occur, for example, if $\Gamma_{ab/aa}$ and $\Gamma_{ba/bb}$ were both greater than one, or were both less than one. An example violation of SARP would be if $\Gamma_{ab/aa}$, $\Gamma_{bc/bb}$, and $\Gamma_{ca/cc}$ were all less than one.

A drawback of using a nonparametric test is that there is no method to measure the power of the test. Furthermore, the power of this type of test may be diminished when there is a strong trend in expenditures (Alston and Chalfant). However, the ability of parametric methods to pick up substitution effects is also diminished when there is a strong trend in expenditures (Pitts and Herlihy). When overall consumption is rising rapidly over time, the budget lines rarely cross. Therefore, few violations of revealed preference will be detected.

A large increase in real expenditures over time will be evidenced in the $\Gamma$ matrix. The result will be a much greater number of elements of $\Gamma$ with values greater than one above the diagonal than below the diagonal. Moving across the rows of $\Gamma$ beyond the diagonal, each element compares the cost of bundles purchased in later time periods, if they were purchased at an earlier time period's prices, with actual expenditures in the earlier time period. If real expenditures are rising over time, then the cost of purchasing the later bundles at the earlier time period's prices should be greater than actual expenditures in the earlier time period. For example, if real expenditures were rising, a likely situation might be that $\Phi_{ab}>\Phi_{aa}$, so that $\Gamma_{ab/aa} > 1$. However, $\Gamma_{ba/bb}$ might likely be less than one.

If there is evidence of a strong trend in expenditures, Alston and Chalfant suggest adjusting the data for real expenditures. Observed quantities can be replaced by a quantity adjusted by the growth in real expenditures. The percentage difference between expenditures in time period t and the minimum for the sample is used to adjust the observed quantity. These adjusted quantities are then used to calculate the elements of $\Phi$. The quantities should then lie along closer budget lines, such that these budget lines may cross.

A potential source of error when using this test for structural change, which can also be a potential source of error when using a parametric test, is that the grouping of commodities chosen for the test may produce results which appear as structural change. Selection of the correct commodities to be included in the group is of great importance. Therefore, for each grouping, components of the group are deleted to test for their impact on the number of violations.

For each of the products groupings, the matrices $\Phi$ and $\Gamma$ are calculated. Using these matrices, tests are performed for violation of WARP and SARP within each grouping of dairy products. Each matrix is a 20 by 20 matrix, dimensioned, $i=1...20$, $j=1...20$, since the years 1967 through 1986 are used. Where there is evidence of a strong trend in real expenditures, adjusted data are also tested for violation of WARP and SARP.

The groupings of dairy products used in the tests for structural change place heavy emphasis on the assumption of weak separability, and two stage budgeting for the groups of products. Two stage budgeting results as consumers decide first how best to budget their incomes among each individual group of like-commodities and secondly, how best to allocate within each group of like-commodities. For example, consumers first allocate their income among beverages, fats and oils, cereals, and a number of other broad food groupings. They then are assumed to allocate expenditures within each grouping, such as allocation of beverage expenditures among different types of beverages. The use of two stage budgeting relies on weak separability because: 1) it is assumed that the set of commodities within the group has common characteristics, that suffice in distinguishing commodities within the group from commodities outside the group and 2) it is assumed that the marginal rate of substitution between any two commodities in the beverages or the fats and oils grouping is independent of the quantity of commodities not included in that particular group in question (Johnson, Hassan, and Green).

The groupings used in this study were selected upon their like characteristics and similarity of use by the consumer. They were also selected due to their similarity to groupings used in past studies, so that comparison of results could be made. The number of possible combinations of foods and beverages which could be tested for separability is quite large. It is beyond the scope of this study to test all possible combinations.[3]

[3]The methodology used in this study can also be used to test for weak separability. If a subset of the goods satisfies the Generalized Axiom of Revealed Preference, while an aggregate of these goods along with other goods still meets the consistency property, then a utility function exists which rationalizes the data and is weakly separable in these goods (Varian (1983) and Belongia and Chalfant).

# CHAPTER 6

# RESULTS AND CONCLUSIONS

## Results

Summaries of the results from the nonparametric tests of the beverages and fats and oils data are presented in Tables 2 through 5. Table 2 summarizes the test results for revealed preference within the beverages group, while Table 4 summarizes results within the fats and oils group. Each table is divided into two sections, one displaying the analyses of the unadjusted data, while the other section displays that of the adjusted data. Within each section, the number of elements above and below the diagonal that are greater than one is shown. The number of violations of the Weak Axiom of Revealed Preference and whether or not the data are consistent with the Strong Axiom of Revealed Preference are also shown. Tables 3 and 5 display the location of the violations of WARP and SARP and the size of the largest violation for the unadjusted and adjusted data within the beverages group and the fats and oils group.

The results displayed in Tables 2 through 5 are derived from the ratio tables found in the Appendix. The ratios compare bundles of $\phi_{ij}$ and $\phi_{ii}$ for the particular group of commodities being tested. Both the unadjusted and the adjusted ratio tables for the 1967-86 year period are presented.

## Beverages

Shown in Table 2, when all beverages (whole milk, lowfat milk, juices, and other beverages) are included in the group, the unadjusted data show 18 violations of WARP and SARP. The violations appear between pairs consisting of 1967 and each of the years: 1973, 1976, 1985, and 1986. Violations also occur between 1968 and 1973 and 1968 and 1986, and between pairs consisting of 1969 and 1970, 1974, 1979, 1985, and 1986. Other violations are between 1970 and 1979, 1970 and 1985, and 1970 and 1986, 1971 and 1986, 1974 and 1986, 1975 and 1986, and between 1977 and 1980. Presented in Table 3 and Table A.1, when all beverages are included in the group, the unadjusted data exhibit the largest violation between the pair of years 1967 and 1986, yielding values of .9339 and .9941.

Each of the component beverages is deleted from the beverages group to check for its impact on the data meeting the criteria of revealed preferences. Shown in Table 2, when each of the beverages are deleted from the group, the existing group still violates WARP and SARP in the unadjusted data, with the exception of the grouping of whole milk and skim milk and the grouping of whole milk, juices, and "other beverages". Addition of juices into the grouping with whole and lowfat milk introduces five violations into the unadjusted data. The violations are between consumption in the years 1967 and 1972, 1968 and 1977, 1970 and 1976, 1970 and 1977, and 1973 and 1975. However, each of the violations are by less than one percent (Table 3).

Table 2. Summary of Test Results for Revealed Preference Within the Beverages Group.

| | Unadjusted Data | | | | Adjusted Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Number of $\Gamma_{ij/ii}$ in Relation to Diagonal | | Number of Violations of | Consistency of Data With | Number of $\Gamma_{ij/ii}$ in Relation to Diagonal | | Number of Violations of | Consistency of Data With |
| Grouping | Above | Below | WARP | SARP | Above | Below | WARP | SARP |
| Whole Milk, Lowfat Milk, Juices, and Other Beverages | 47 | 131 | 18 | NO | 62 | 126 | 2 | NO |
| Whole Milk, Lowfat Milk, and Juices | 28 | 159 | 5 | NO | 160 | 24 | 6 | NO |
| Whole Milk, Lowfat Milk, and Other Beverages | 27 | 160 | 3 | NO | 64 | 120 | 6 | NO |
| Lowfat Milk, Juices, and Other Beverages | 178 | 16 | 4 | NO | 54 | 137 | 1 | NO |
| Whole Milk, Juices, and Other Beverages | 20 | 170 | 0 | YES | 61 | 130 | 1 | NO |
| Whole Milk and Lowfat Milk | 6 | 184 | 0 | YES | 179 | 11 | 0 | YES |
| Lowfat Milk and Juice | 186 | 7 | 3 | NO | 106 | 110 | 28 | NO |
| Whole Milk and Juice | 7 | 183 | 2 | NO | 162 | 19 | 9 | NO |

Table 3. Location of Violations and Size of Largest Violation Within the Beverages Group.

| Grouping | Unadjusted Data: Location of Violations | Unadjusted Data: Location/Size of Largest Violation | Adjusted Data: Location of Violations | Adjusted Data: Location/ Size of Largest Violation |
|---|---|---|---|---|
| Whole Milk, Lowfat Milk, Juices, and Other Beverages | 1,7+7,1; 1,10+10,1; 1,19+19,1; 1,20+20,1; 2,7+7,2; 2,20+20,2; 3,4+4,3; 3,8+8,3; 3,13+13,3; 3,19+19,3; 3,20+20,3; 4,13+13,4; 4,19+19,4; 4,20+20,4; 5,20+20,5; 8,20+20,8; 9,20+20,9; 11,14+14,11 | 1,19+19,1; .9941 .9339 | 8,20+20,8;1 10,20+20,10; | 8,20+20,8; .9949 .9961 |
| Whole Milk, Lowfat Milk, and Juices | 1,6+6,1; 2,11+11,2; 4,10+10,4; 4,11+11,4; 7,9+9,7 | 4,11+11,4; .9920 .9903 | 4,9+9,4; 4,12+12,4; 4,13+13,4; 5,13+13,5; 6,13+13,6; 7,12+12,7 | 4,12+12,4; .9636 .9912 |
| Whole Milk, Lowfat Milk, and Other Beverages | 9,20+20,9; 12,19+19,12; 13,20+20,13 | 9,20+20,9; .9990 .9663 | 1,19+ 19,1; 1,20+20,1; 8,18+18,8; 8,19+19,8; 8,20+20,8; 9,19+19,9 | 1,20+20,1; .9965 .9190 |
| Lowfat Milk, Juices, and Other Beverages | 8,11+11,8; 9,11+11,9; 10,13+13,10; 10,18+18,10 | 8,11+11,8; 1.0040 1.0306 | 17,19+19,17 | 17,19+19,17; 1.0049 1.0012 |

Table 3. Continued.

| Grouping | Unadjusted Data: Location of Violations | Unadjusted Data: Location/Size of Largest Violation | Adjusted Data: Location of Violations | Adjusted Data: Location/ Size of Largest Violation |
|---|---|---|---|---|
| Whole Milk, Juices, and Other Beverages | ---- | ---- | 3,4+4,3 | 3,4+4,3; 1.0006 1.0011 |
| Whole Milk and Lowfat Milk | ---- | ---- | ---- | ---- |
| Lowfat Milk and Juices | 10,12+12,10; 11,15+15,11; 16,18+18,16 | 10,12+12,10; 1.0096 1.0108 | 1,17+17,1; 2,14+14,2; 2,16+16,2; 2,18+18,2; 2,19+19,2; 3,16+16,3; 3,18+18,3; 3,19+19,3; 4,17+17,4; 5,17+17,5; 6,9+9,6; 6,14+14,6; 6,17+17,6;7,14+14,7; 7,16+16,7; 7,18+18,7; 7,19+19,7; 8,16+16,8; 8,18+18,8; 8,19+19,8; 9,14+14,9; 9,18+18,9; 9,19+19,9; 10,17+17,10; 11,16+16,11; 11,18+18,11; 11,19+19,11 | 9,19+19,9; 1.0045 1.1295 |
| Whole Milk and Juices | 8,9+9,8; 19,20+20,19 | 19,20+20,19; 1.0010 1.0028 | 4,7+7,4; 4,12+12,4; 4,13+13,4; 5,12+12,5; 5,13+13,5; 6,12+12,6; 6,13+13,6; 7,12+12,7; 7,13+13,7 | 4,13+13,4; .9268 .9764 |

It should be noted that there has been a strong growth in expenditures on "other beverages", which primarily consist of carbonated soft drinks, coffee, and tea. This is evidenced in Table 2 and Table A.3. When the "other beverages" are deleted from the beverages grouping, there are only 28 ratios with values greater than one above the diagonal in the unadjusted data. While there was substantial growth in lowfat milk expenditures, whole milk expenditures declined. Notably, as presented in Table 2 and Table A.7, when whole milk is deleted from the beverages grouping, there are 178 ratios with values greater than one above the diagonal. Furthermore, when lowfat milk is deleted from the beverages grouping, there are only 20 ratios with values greater than one above the diagonal, as shown in Table 2 and Table A.9.

Since a strong trend in expenditures may overshadow substitution effects, when the unadjusted results for data with strong expenditure trends reveal no violations, the adjusted data should also be evaluated (Appendix Tables A.2, A.4, A.6, A.8, A.10, A.12, A.14, and A.16). Shown in Tables A.3 and A.4, the only grouping for which unadjusted and adjusted data exhibit no violations of revealed preference is the grouping of whole milk and lowfat milk. Inclusion of juices along with whole and lowfat milk introduces six violations, however, the violations are all by less than four percent.

## Fats and Oils

Results from the nonparametric tests of the butter, margarine, and salad and cooking oils data are displayed in Table 4 and Appendix Tables A.17 through A.24.

The tests reveal eight violations of WARP in the unadjusted matrix of the original group (butter, margarine, and salad and cooking oils), but each violation is by less than two percent. The results in Table 5 show the violations of WARP in the unadjusted data are between consumption bundles in 1968 and 1971, 1968 and 1974, 1968 and 1975, 1968 and 1977, 1969 and 1974, 1969 and 1975, 1969 and 1977, and 1971 and 1974. Each of the fats and oils is deleted from the group to check for its impact on the data meeting the criteria of revealed preference. As displayed in Table 4, with the exception of butter, when each of the fats and oils is deleted, the existing group still violates WARP and SARP. Shown in Table 4 and Table A.21, when margarine is excluded, there are seven violations of WARP and SARP. Presented in Table 4 and Table A.17, when salad and cooking oils are excluded, there are six violations of WARP. Although there are violations in each of the unadjusted groupings, except margarine and salad and cooking oils, none of the violations is by greater than two percent.

Summarized in Table 4, the groups which include salad and cooking oils, exhibit a large number of elements greater than above the diagonal. The original group contains 166 elements having values greater than one above the diagonal (Table A.17); the group excluding butter has 181 (Table A.23); and the group excluding margarine has 166 (Table A.21). However, when salad and cooking oils are excluded from the grouping, shown in Table 4 and Table A.19, the number of elements greater than one above the diagonal is reduced to 53. Thus, strong growth in expenditures on salad and cooking oils is evidenced. With the exception of the group excluding salad

Table 4. Summary of Test Results for Revealed Preference Within Butter, Margarine, and Salad and Cooking Oils.

| | Unadjusted Data | | | | Adjusted Data | | | |
|---|---|---|---|---|---|---|---|---|
| | Number of $\Gamma_{ij/ii}$ in Relation to Diagonal | | Number of Violations of | Consistency of Data With | Number of $\Gamma_{ij/ii}$ in Relation to Diagonal | | Number of Violations of | Consistency of Data With |
| Grouping | Above | Below | WARP | SARP | Above | Below | WARP | SARP |
| Butter, Margarine, and Salad and Cooking and Oils | 166 | 16 | 8 | NO | 103 | 86 | 1 | NO |
| Butter and Margarine | 53 | 142 | 6 | NO | 126 | 61 | 5 | NO |
| Butter and Salad and Cooking Oils | 166 | 17 | 7 | NO | 98 | 89 | 3 | NO |
| Margarine and Salad and Cooking Oils | 181 | 9 | 0 | YES | 95 | 94 | 1 | NO |

Table 5. Location of Violations and Size of Largest Violation Within the Butter, Margarine, and Salad and Cooking Oils.

| | Unadjusted Data | | Adjusted Data | |
|---|---|---|---|---|
| Grouping | Location of Violations | Location/ Size of Largest Violation | Location of Violations | Location/ Size of Largest Violation |
| Butter, Margarine, and Salad and Cooking Oils | 2,5+5,2; 2,8+8,2; 2,9+9,2; 2,11+11,2; 3,8+8,3; 3,9+9,3; 3,11+11,3; 5,8+8,5 | 2,9+9,2; .9819 .9964 | 3,20+20,3 | 3,20+20,3; .9924 .9948 |
| Margarine and Salad and Cooking Oils | ---- | ---- | 2,17+17,2 | 2,17+17,2; .9987 .9975 |
| Butter and Salad and Cooking Oils | 2,8+8,2; 2,9+9,2; 2,11+11,2; 3,8+8,3; 3,9+9,3; 4,7+7,4; 5,8+8,5 | 3,8+8,3; .9963 .9813 | 1,5+5,1; 1,15+15,1; 3,20+20,3; | 3,20+20,3; .9898 .9949 |
| Butter and Margarine | 8,11+11,8; 8,12+12,8; 8,17+17,8; 8,18+18,8; 9,14+14,9; 17,18+18,17 | 8,17+17,8; .9871 .9923 | 1,13+13,1; 2,14+14,2; 3,7+7,3; 7,15+15,7; 16,18+18,16 | 3,7+7,3; .9872 .9998 |

and cooking oils, the groups of adjusted data show few violations. The group excluding salad and cooking oils yields five violations. The results in Table A.20 show the violations occurring for the pairings 1967 and 1979, 1968 and 1980, 1969 and 1973, 1973 and 1981, and 1982 and 1984. The largest violation occurring between 1969 and 1973, consists of the ratios .9872 and .9998. None of the violations in any of the adjusted groupings of fats and oils is by greater than two percent.

## Conclusions

The results from the nonparametric tests conducted in this study show that whole milk and lowfat milk consumption patterns are consistent with stable preferences under utility maximization. Therefore, prices and expenditures explain changes in consumption patterns among these beverages. Addition of juices into the grouping produces violations, however, they are small in magnitude. When "other beverages" are incorporated into the group, numerous violations are introduced.

The fact that inclusion of "other beverages" introduces violations could have two possible implications. These results could imply that "other beverages" should not be included in the group with whole milk, lowfat milk,and juices. However, the results could also imply that "other beverages" may be the source of structural change within overall beverages. While the inclusion of "other beverages" does introduce violations, the magnitude of the violations are fairly small. As shown in Table 3, the largest violation is by less than seven percent. Examination of Table A.1, reveals that the majority of the violations are by less than two percent. According to

Varian (1985) and Chalfant and Alston, inconsistencies that are small in magnitude could be the result of measurement errors in the data.[4]

Past studies of the demand for various dairy products have hypothesized that factors other than prices and expenditures influence the demand for milk. As these factors change over time, a structural change in the demand for milk would be evidenced. Based upon this hypothesis, Boehm, Heien and Wessells, and Gould, Cox, and Perali incorporated demographics, such as household size, number of household members by age and sex, educational levels, region, tenancy, and race into their models of dairy products demand. The results from Gould, Cox, and Perali's time-series study of the demand for milk and other beverages, indicated that an aging of the population would shift the demand for milk. The results from cross-sectional studies of demand have also shown significant impacts of age upon the demand for fluid milk (Boehm and Heien and Wessells). With a decline in the number of teenagers and children in the household, a decrease in the consumption of fluid milk is projected. Gould, Cox, and Perali attributed the negative impacts of an aging of the population upon the demand for whole milk to heightened concerns about the nutritional value of foods and beverages. Furthermore, Gould, Cox, and Perali and Boehm found that educational levels had a significant impact on the level and type of fluid milk consumed, with increased educational levels contributing to increased consumption of lowfat milk and decreased consumption of whole milk.

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[4] Varian describes a methodology for testing for consistency when measurement errors are present. However, the methodology is beyond the scope of this study.

While each of the aforementioned studies of the demand for fluid milk found that nonprice and nonexpenditure variables were important in explaining consumption patterns, the results from this study do not strongly support the necessity of including these types of variables, especially when "other beverages" are omitted. Therefore, if the correct functional form is specified, then a static model of the demand for whole milk, lowfat milk, and juices should be adequate. Only when "other beverages" are included does evidence appear suggesting that prices and expenditures are inadequate for explaining consumption.

If the violations introduced by including "other beverages" in the grouping signal structural change, this would be consistent with findings from previous studies. For example, Sullivan found that as consumers' incomes increase, there is a tendency to substitute other beverages for milk with meals away from home. Furthermore, Heien and Wessells noted that a higher proportion of food expenditures away from home had a negative impact on milk. The results from Gould, Cox, and Perali's study showed that increasing educational levels had a positive impact on the consumption of "other beverages".

The results from the nonparametric tests on the grouping of butter, margarine, and salad and cooking oils show the criteria for utility maximization under stable preferences is nearly met. Thus, it follows that provided the functional form is correctly specified, prices and expenditure data for butter, margarine, and salad and cooking oils could be sufficient for explaining consumption behavior. These findings are contrary to those by Gould, Cox, and Perali who found that factors, such as increased educational levels would decrease the demand for butter and increase the demand for margarine, and that the oldest age grouping had the highest per capita consumption of butter. Furthermore, as with milk, Heien and Wessells attributed the decline in the consumption of butter to a higher proportion of food expenditures away from home.

The results from nonparametric testing of consumption patterns for whole milk, lowfat milk, and juices and for butter, margarine, and salad and cooking oils do not supply strong evidence of structural change. However, it should be noted that a study of this nature is just a partial analysis, and all possible substitutes and complements for these foods and beverages are not considered in the testing. Groupings are limited to those similar to ones used in past econometric studies of the demand for these foods and beverages. Therefore, the analysis relies heavily on the assumption of at least weak separability. It is beyond the scope of this study to perform separability tests for all possible combinations of foods and beverages which are potentially related to the consumption of the ones considered in this study.

It is also important to note that the data used in this study are aggregates and are to represent the "average" consumer. Therefore, it is possible that negative impacts on consumption created by one demographic factor within the population could be offset by positive impacts from another. Therefore, the tests from these data are only capable of revealing violations in overall consumption patterns from patterns which are consistent with utility maximization. This possibility makes comparison with results from cross-sectional studies difficult.

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APPENDIX

Table A.1. Comparison Ratios of Bundles $\Phi_{ij}$ and $\Phi_{ii}$ for Whole Milk, Lowfat Milk, Juices, and Other Beverages, Unadjusted, 1967-1986.

| | $\Gamma_{ij/ii}=(\Phi_{ij}/\Phi_{ii})$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ij | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 | 1.0000 | 1.0023 | 0.9850 | 0.9832 | 0.9940 | 1.0084 | 0.9976 | 0.9821 | 0.9819 | 0.9972 | 0.9559 | 0.9516 | 0.9583 | 0.9376 | 0.9142 | 0.9050 | 0.9180 | 0.9063 | 0.9339 | 0.9471 |
| 2 | 0.9985 | 1.0000 | 0.9828 | 0.9824 | 0.9944 | 1.0095 | 0.9988 | 0.9841 | 0.9856 | 1.0006 | 0.9605 | 0.9544 | 0.9613 | 0.9412 | 0.9173 | 0.9088 | 0.9230 | 0.9091 | 0.9374 | 0.9513 |
| 3 | 1.0157 | 1.0173 | 1.0000 | 1.0000 | 1.0126 | 1.0285 | 1.0177 | 1.0032 | 1.0053 | 1.0207 | 0.9804 | 0.9738 | 0.9810 | 0.9609 | 0.9365 | 0.9281 | 0.9429 | 0.9284 | 0.9576 | 0.9722 |
| 4 | 1.0157 | 1.0188 | 1.0015 | 1.0000 | 1.0114 | 1.0268 | 1.0165 | 1.0011 | 1.0011 | 1.0176 | 0.9751 | 0.9716 | 0.9791 | 0.9582 | 0.9347 | 0.9255 | 0.9391 | 0.9277 | 0.9565 | 0.9706 |
| 5 | 1.0033 | 1.0062 | 0.9892 | 0.9883 | 1.0000 | 1.0157 | 1.0057 | 0.9909 | 0.9915 | 1.0079 | 0.9661 | 0.9622 | 0.9699 | 0.9495 | 0.9261 | 0.9174 | 0.9313 | 0.9194 | 0.9482 | 0.9627 |
| 6 | 0.9865 | 0.9889 | 0.9722 | 0.9720 | 0.9842 | 1.0000 | 0.9901 | 0.9761 | 0.9776 | 0.9935 | 0.9531 | 0.9482 | 0.9558 | 0.9361 | 0.9128 | 0.9046 | 0.9189 | 0.9059 | 0.9347 | 0.9493 |
| 7 | 0.9972 | 0.9999 | 0.9833 | 0.9825 | 0.9944 | 1.0100 | 1.0000 | 0.9854 | 0.9865 | 1.0025 | 0.9620 | 0.9575 | 0.9649 | 0.9449 | 0.9217 | 0.9130 | 0.9269 | 0.9148 | 0.9435 | 0.9578 |
| 8 | 1.0149 | 1.0184 | 1.0017 | 0.9997 | 1.0108 | 1.0258 | 1.0157 | 1.0000 | 0.9999 | 1.0162 | 0.9746 | 0.9715 | 0.9787 | 0.9580 | 0.9349 | 0.9254 | 0.9383 | 0.9281 | 0.9565 | 0.9704 |
| 9 | 1.0095 | 1.0142 | 0.9973 | 0.9959 | 1.0075 | 1.0241 | 1.0151 | 1.0003 | 1.0000 | 1.0182 | 0.9742 | 0.9730 | 0.9817 | 0.9609 | 0.9381 | 0.9292 | 0.9430 | 0.9333 | 0.9630 | 0.9782 |
| 10 | 0.9916 | 0.9978 | 0.9809 | 0.9786 | 0.9891 | 1.0057 | 0.9976 | 0.9828 | 0.9805 | 1.0000 | 0.9535 | 0.9556 | 0.9652 | 0.9440 | 0.9222 | 0.9131 | 0.9262 | 0.9192 | 0.9486 | 0.9636 |
| 11 | 1.0333 | 1.0430 | 1.0243 | 1.0227 | 1.0343 | 1.0556 | 1.0500 | 1.0362 | 1.0318 | 1.0576 | 1.0000 | 1.0088 | 1.0233 | 1.0000 | 0.9779 | 0.9694 | 0.9851 | 0.9801 | 1.0142 | 1.0330 |
| 12 | 1.0142 | 1.0227 | 1.0041 | 1.0053 | 1.0191 | 1.0422 | 1.0372 | 1.0256 | 1.0240 | 1.0501 | 0.9938 | 1.0000 | 1.0155 | 0.9936 | 0.9709 | 0.9640 | 0.9823 | 0.9732 | 1.0088 | 1.0293 |
| 13 | 1.0049 | 1.0124 | 0.9937 | 0.9947 | 1.0079 | 1.0300 | 1.0242 | 1.0123 | 1.0107 | 1.0354 | 0.9805 | 0.9854 | 1.0000 | 0.9781 | 0.9553 | 0.9483 | 0.9661 | 0.9564 | 0.9908 | 1.0103 |
| 14 | 1.0336 | 1.0419 | 1.0225 | 1.0221 | 1.0346 | 1.0565 | 1.0504 | 1.0373 | 1.0340 | 1.0595 | 1.0017 | 1.0084 | 1.0232 | 1.0000 | 0.9770 | 0.9692 | 0.9863 | 0.9782 | 1.0129 | 1.0321 |
| 15 | 1.0456 | 1.0534 | 1.0343 | 1.0361 | 1.0508 | 1.0745 | 1.0688 | 1.0571 | 1.0565 | 1.0825 | 1.0261 | 1.0306 | 1.0461 | 1.0239 | 1.0000 | 0.9932 | 1.0124 | 1.0014 | 1.0380 | 1.0591 |
| 16 | 1.0510 | 1.0592 | 1.0401 | 1.0418 | 1.0566 | 1.0806 | 1.0752 | 1.0635 | 1.0627 | 1.0892 | 1.0321 | 1.0373 | 1.0531 | 1.0307 | 1.0069 | 1.0000 | 1.0193 | 1.0087 | 1.0457 | 1.0671 |
| 17 | 1.0318 | 1.0401 | 1.0214 | 1.0228 | 1.0371 | 1.0606 | 1.0554 | 1.0437 | 1.0425 | 1.0687 | 1.0123 | 1.0179 | 1.0335 | 1.0114 | 0.9882 | 0.9813 | 1.0000 | 0.9902 | 1.0265 | 1.0474 |
| 18 | 1.0339 | 1.0416 | 1.0228 | 1.0261 | 1.0420 | 1.0670 | 1.0621 | 1.0517 | 1.0525 | 1.0790 | 1.0233 | 1.0270 | 1.0433 | 1.0219 | 0.9979 | 0.9920 | 1.0126 | 1.0000 | 1.0377 | 1.0599 |
| 19 | 0.9941 | 1.0014 | 0.9835 | 0.9869 | 1.0025 | 1.0268 | 1.0221 | 1.0123 | 1.0135 | 1.0391 | 0.9857 | 0.9891 | 1.0049 | 0.9845 | 0.9614 | 0.9558 | 0.9758 | 0.9635 | 1.0000 | 1.0217 |
| 20 | 0.9796 | 0.9883 | 0.9704 | 0.9717 | 0.9852 | 1.0082 | 1.0039 | 0.9930 | 0.9913 | 1.0174 | 0.9620 | 0.9689 | 0.9845 | 0.9633 | 0.9415 | 0.9350 | 0.9530 | 0.9446 | 0.9796 | 1.0000 |

Table A.2. Comparison Ratios of Bundles $\Phi_{ij}$ and $\Phi_{ii}$ for Whole Milk, Lowfat Milk, Juices, and Other Beverages, Adjusted, 1967-1986.

| | $\Gamma_{ij/ii}=(\Phi_{ij}/\Phi_{ii})$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ij | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 | 1.0000 | 0.9972 | 1.0188 | 1.0188 | 1.0253 | 1.0399 | 1.0200 | 0.9538 | 0.9809 | 0.9372 | 0.7858 | 0.7151 | 0.7519 | 0.8192 | 0.8434 | 0.8874 | 0.9033 | 0.9048 | 0.9072 | 0.9152 |
| 2 | 1.0037 | 1.0000 | 1.0218 | 1.0233 | 1.0310 | 1.0465 | 1.0265 | 0.9609 | 0.9899 | 0.9457 | 0.7949 | 0.7220 | 0.7591 | 0.8274 | 0.8511 | 0.8960 | 0.9132 | 0.9124 | 0.9156 | 0.9245 |
| 3 | 0.9820 | 0.9784 | 1.0000 | 1.0019 | 1.0099 | 1.0255 | 1.0062 | 0.9423 | 0.9712 | 0.9282 | 0.7809 | 0.7092 | 0.7458 | 0.8129 | 0.8361 | 0.8803 | 0.8975 | 0.8964 | 0.8999 | 0.9090 |
| 4 | 0.9802 | 0.9781 | 0.9996 | 1.0000 | 1.0067 | 1.0219 | 1.0030 | 0.9384 | 0.9653 | 0.9233 | 0.7741 | 0.7057 | 0.7424 | 0.8086 | 0.8327 | 0.8761 | 0.8920 | 0.8940 | 0.8971 | 0.9057 |
| 5 | 0.9727 | 0.9706 | 0.9920 | 0.9929 | 1.0000 | 1.0156 | 0.9970 | 0.9333 | 0.9605 | 0.9190 | 0.7711 | 0.7027 | 0.7395 | 0.8055 | 0.8292 | 0.8726 | 0.8889 | 0.8902 | 0.8937 | 0.9027 |
| 6 | 0.9565 | 0.9539 | 0.9750 | 0.9767 | 0.9843 | 1.0000 | 0.9817 | 0.9195 | 0.9472 | 0.9062 | 0.7615 | 0.6931 | 0.7293 | 0.7946 | 0.8176 | 0.8606 | 0.8774 | 0.8774 | 0.8812 | 0.8904 |
| 7 | 0.9751 | 0.9728 | 0.9946 | 0.9957 | 1.0030 | 1.0186 | 1.0000 | 0.9362 | 0.9640 | 0.9220 | 0.7748 | 0.7056 | 0.7422 | 0.8087 | 0.8325 | 0.8760 | 0.8924 | 0.8935 | 0.8970 | 0.9060 |
| 8 | 1.0448 | 1.0432 | 1.0667 | 1.0665 | 1.0733 | 1.0891 | 1.0692 | 1.0000 | 1.0284 | 0.9835 | 0.8254 | 0.7529 | 0.7917 | 0.8625 | 0.8886 | 0.9346 | 0.9508 | 0.9543 | 0.9572 | 0.9661 |
| 9 | 1.0102 | 1.0097 | 1.0323 | 1.0329 | 1.0400 | 1.0569 | 1.0388 | 0.9726 | 1.0000 | 0.9585 | 0.8028 | 0.7344 | 0.7736 | 0.8421 | 0.8675 | 0.9126 | 0.9294 | 0.9331 | 0.9374 | 0.9474 |
| 10 | 1.0541 | 1.0554 | 1.0786 | 1.0781 | 1.0846 | 1.1027 | 1.0845 | 1.0151 | 1.0416 | 1.0000 | 0.8338 | 0.7661 | 0.8082 | 0.8787 | 0.9060 | 0.9527 | 0.9696 | 0.9764 | 0.9811 | 0.9916 |
| 11 | 1.2548 | 1.2605 | 1.2868 | 1.2872 | 1.2957 | 1.3222 | 1.3042 | 1.2235 | 1.2524 | 1.2098 | 1.0000 | 0.9274 | 0.9833 | 1.0661 | 1.0996 | 1.1565 | 1.1794 | 1.1902 | 1.2000 | 1.2165 |
| 12 | 1.3355 | 1.3400 | 1.3679 | 1.3721 | 1.3844 | 1.4157 | 1.3971 | 1.3138 | 1.3484 | 1.3038 | 1.0807 | 1.0000 | 1.0613 | 1.1509 | 1.1851 | 1.2479 | 1.2761 | 1.2820 | 1.2954 | 1.3158 |
| 13 | 1.2680 | 1.2712 | 1.2972 | 1.3009 | 1.3121 | 1.3407 | 1.3220 | 1.2424 | 1.2751 | 1.2314 | 1.0209 | 0.9429 | 1.0000 | 1.0847 | 1.1168 | 1.1760 | 1.2023 | 1.2070 | 1.2186 | 1.2369 |
| 14 | 1.1773 | 1.1809 | 1.2047 | 1.2066 | 1.2156 | 1.2412 | 1.2237 | 1.1489 | 1.1773 | 1.1368 | 0.9400 | 0.8696 | 0.9223 | 1.0000 | 1.0303 | 1.0844 | 1.1075 | 1.1141 | 1.1240 | 1.1400 |
| 15 | 1.1280 | 1.1307 | 1.1543 | 1.1585 | 1.1695 | 1.1958 | 1.1795 | 1.1094 | 1.1398 | 1.1011 | 0.9146 | 0.8443 | 0.8955 | 0.9716 | 1.0000 | 1.0533 | 1.0775 | 1.0807 | 1.0919 | 1.1090 |
| 16 | 1.0690 | 1.0720 | 1.0945 | 1.0984 | 1.1088 | 1.1339 | 1.1188 | 1.0524 | 1.0810 | 1.0447 | 0.8675 | 0.8015 | 0.8503 | 0.9224 | 0.9495 | 1.0000 | 1.0230 | 1.0265 | 1.0373 | 1.0537 |
| 17 | 1.0458 | 1.0490 | 1.0710 | 1.0745 | 1.0844 | 1.1089 | 1.0943 | 1.0291 | 1.0567 | 1.0214 | 0.8475 | 0.7836 | 0.8314 | 0.9018 | 0.9285 | 0.9778 | 1.0000 | 1.0041 | 1.0146 | 1.0306 |
| 18 | 1.0332 | 1.0356 | 1.0574 | 1.0628 | 1.0743 | 1.1000 | 1.0858 | 1.0227 | 1.0520 | 1.0174 | 0.8463 | 0.7811 | 0.8291 | 0.8995 | 0.9252 | 0.9750 | 0.9988 | 1.0000 | 1.0117 | 1.0289 |
| 19 | 1.0187 | 1.0211 | 1.0427 | 1.0483 | 1.0599 | 1.0855 | 1.0716 | 1.0096 | 1.0389 | 1.0049 | 0.8364 | 0.7719 | 0.8193 | 0.8889 | 0.9143 | 0.9635 | 0.9873 | 0.9882 | 1.0000 | 1.0172 |
| 20 | 1.0087 | 1.0127 | 1.0338 | 1.0372 | 1.0467 | 1.0710 | 1.0575 | 0.9949 | 1.0209 | 0.9881 | 0.8183 | 0.7583 | 0.8054 | 0.8730 | 0.8991 | 0.9467 | 0.9684 | 0.9733 | 0.9840 | 1.0000 |

Table A.3. Comparison Ratios of Bundles $\Phi_{ij}$ and $\Phi_{ii}$ for Whole Milk, Lowfat Milk, and Juices, Unadjusted, 1967-1986.

| | $\Gamma_{ij/ii}=(\Phi_{ij}/\Phi_{ii})$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ii \ ij | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 | 1.0000 | 0.9882 | 0.9743 | 0.9762 | 0.9905 | 0.9964 | 0.9767 | 0.9600 | 0.9735 | 0.9707 | 0.9620 | 0.9291 | 0.9229 | 0.9086 | 0.8805 | 0.8715 | 0.8836 | 0.8544 | 0.8750 | 0.8821 |
| 2 | 1.0126 | 1.0000 | 0.9859 | 0.9897 | 1.0058 | 1.0133 | 0.9937 | 0.9781 | 0.9936 | 0.9912 | 0.9828 | 0.9479 | 0.9425 | 0.9286 | 0.8995 | 0.8913 | 0.9055 | 0.8733 | 0.8955 | 0.9041 |
| 3 | 1.0267 | 1.0140 | 1.0000 | 1.0045 | 1.0215 | 1.0296 | 1.0102 | 0.9949 | 1.0114 | 1.0094 | 1.0012 | 0.9655 | 0.9603 | 0.9467 | 0.9170 | 0.9092 | 0.9241 | 0.8909 | 0.9141 | 0.9235 |
| 4 | 1.0227 | 1.0111 | 0.9974 | 1.0000 | 1.0154 | 1.0222 | 1.0027 | 0.9863 | 1.0009 | 0.9987 | 0.9903 | 0.9567 | 0.9508 | 0.9366 | 0.9080 | 0.8991 | 0.9121 | 0.8821 | 0.9040 | 0.9121 |
| 5 | 1.0058 | 0.9941 | 0.9807 | 0.9841 | 1.0000 | 1.0074 | 0.9885 | 0.9729 | 0.9882 | 0.9862 | 0.9783 | 0.9445 | 0.9392 | 0.9256 | 0.8972 | 0.8889 | 0.9024 | 0.8719 | 0.8941 | 0.9028 |
| 6 | 0.9961 | 0.9842 | 0.9710 | 0.9753 | 0.9919 | 1.0000 | 0.9815 | 0.9667 | 0.9828 | 0.9811 | 0.9735 | 0.9392 | 0.9343 | 0.9212 | 0.8927 | 0.8850 | 0.8994 | 0.8678 | 0.8905 | 0.8998 |
| 7 | 1.0160 | 1.0046 | 0.9914 | 0.9949 | 1.0111 | 1.0188 | 1.0000 | 0.9844 | 1.0000 | 0.9983 | 0.9906 | 0.9567 | 0.9514 | 0.9379 | 0.9093 | 0.9010 | 0.9147 | 0.8842 | 0.9069 | 0.9159 |
| 8 | 1.0368 | 1.0261 | 1.0130 | 1.0148 | 1.0298 | 1.0364 | 1.0171 | 1.0000 | 1.0142 | 1.0123 | 1.0042 | 0.9716 | 0.9655 | 0.9512 | 0.9229 | 0.9134 | 0.9256 | 0.8975 | 0.9194 | 0.9275 |
| 9 | 1.0147 | 1.0040 | 0.9914 | 0.9946 | 1.0107 | 1.0184 | 1.0001 | 0.9845 | 1.0000 | 0.9987 | 0.9913 | 0.9583 | 0.9530 | 0.9397 | 0.9116 | 0.9031 | 0.9165 | 0.8872 | 0.9099 | 0.9191 |
| 10 | 1.0199 | 1.0096 | 0.9970 | 0.9993 | 1.0147 | 1.0217 | 1.0032 | 0.9868 | 1.0015 | 1.0000 | 0.9925 | 0.9602 | 0.9545 | 0.9408 | 0.9130 | 0.9039 | 0.9164 | 0.8884 | 0.9106 | 0.9192 |
| 11 | 1.0101 | 0.9987 | 0.9862 | 0.9920 | 1.0104 | 1.0203 | 1.0027 | 0.9890 | 1.0072 | 1.0066 | 1.0000 | 0.9648 | 0.9608 | 0.9486 | 0.9197 | 0.9127 | 0.9286 | 0.8957 | 0.9205 | 0.9317 |
| 12 | 1.0273 | 1.0134 | 1.0003 | 1.0117 | 1.0351 | 1.0494 | 1.0322 | 1.0221 | 1.0461 | 1.0464 | 1.0409 | 1.0000 | 0.9982 | 0.9876 | 0.9561 | 0.9519 | 0.9735 | 0.9319 | 0.9611 | 0.9764 |
| 13 | 1.0399 | 1.0252 | 1.0112 | 1.0217 | 1.0442 | 1.0575 | 1.0392 | 1.0280 | 1.0509 | 1.0504 | 1.0438 | 1.0026 | 1.0000 | 0.9885 | 0.9565 | 0.9517 | 0.9727 | 0.9309 | 0.9592 | 0.9733 |
| 14 | 1.0652 | 1.0505 | 1.0359 | 1.0445 | 1.0656 | 1.0773 | 1.0578 | 1.0447 | 1.0659 | 1.0646 | 1.0571 | 1.0164 | 1.0127 | 1.0000 | 0.9677 | 0.9617 | 0.9812 | 0.9409 | 0.9680 | 0.9807 |
| 15 | 1.0745 | 1.0595 | 1.0457 | 1.0580 | 1.0828 | 1.0981 | 1.0799 | 1.0696 | 1.0951 | 1.0954 | 1.0895 | 1.0461 | 1.0443 | 1.0333 | 1.0000 | 0.9959 | 1.0190 | 0.9744 | 1.0053 | 1.0214 |
| 16 | 1.0759 | 1.0612 | 1.0475 | 1.0600 | 1.0850 | 1.1005 | 1.0826 | 1.0724 | 1.0982 | 1.0987 | 1.0930 | 1.0497 | 1.0481 | 1.0373 | 1.0040 | 1.0000 | 1.0232 | 0.9788 | 1.0099 | 1.0263 |
| 17 | 1.0533 | 1.0391 | 1.0259 | 1.0377 | 1.0618 | 1.0767 | 1.0592 | 1.0489 | 1.0738 | 1.0743 | 1.0687 | 1.0267 | 1.0249 | 1.0143 | 0.9819 | 0.9777 | 1.0000 | 0.9572 | 0.9874 | 1.0033 |
| 18 | 1.0831 | 1.0673 | 1.0537 | 1.0693 | 1.0973 | 1.1155 | 1.0981 | 1.0901 | 1.1193 | 1.1206 | 1.1157 | 1.0695 | 1.0692 | 1.0595 | 1.0250 | 1.0226 | 1.0490 | 1.0000 | 1.0338 | 1.0527 |
| 19 | 1.0428 | 1.0277 | 1.0147 | 1.0303 | 1.0577 | 1.0758 | 1.0594 | 1.0520 | 1.0807 | 1.0822 | 1.0778 | 1.0330 | 1.0330 | 1.0241 | 0.9907 | 0.9887 | 1.0146 | 0.9670 | 1.0000 | 1.0188 |
| 20 | 1.0431 | 1.0290 | 1.0160 | 1.0285 | 1.0531 | 1.0686 | 1.0516 | 1.0420 | 1.0674 | 1.0682 | 1.0630 | 1.0210 | 1.0196 | 1.0094 | 0.9772 | 0.9735 | 0.9962 | 0.9530 | 0.9836 | 1.0000 |

Table A.4. Comparison Ratios of Bundles $\Phi_{ij}$ and $\Phi_{ii}$ for Whole Milk, Lowfat Milk, and Juices, Adjusted, 1967-1986.

| | $\Gamma_{ij/ii}=(\Phi_{ij}/\Phi_{ii})$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ii \ ij | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 | 1.0000 | 0.9762 | 1.0151 | 1.0623 | 1.0688 | 1.0744 | 1.0402 | 0.9415 | 1.0520 | 1.0776 | 1.0865 | 1.0164 | 1.0432 | 1.1559 | 1.1413 | 1.2066 | 1.2340 | 1.2356 | 1.2337 | 1.3157 |
| 2 | 1.0256 | 1.0000 | 1.0408 | 1.0928 | 1.1018 | 1.1099 | 1.0750 | 0.9742 | 1.0923 | 1.1197 | 1.1298 | 1.0547 | 1.0840 | 1.2031 | 1.1874 | 1.2572 | 1.2884 | 1.2866 | 1.2863 | 1.3740 |
| 3 | 0.9844 | 0.9599 | 1.0000 | 1.0514 | 1.0609 | 1.0696 | 1.0365 | 0.9396 | 1.0551 | 1.0822 | 1.0927 | 1.0198 | 1.0488 | 1.1651 | 1.1500 | 1.2183 | 1.2493 | 1.2471 | 1.2476 | 1.3336 |
| 4 | 0.9380 | 0.9161 | 0.9541 | 1.0000 | 1.0070 | 1.0134 | 0.9819 | 0.8889 | 0.9953 | 1.0205 | 1.0300 | 0.9636 | 0.9898 | 1.0983 | 1.0850 | 1.1478 | 1.1745 | 1.1763 | 1.1753 | 1.2546 |
| 5 | 0.9289 | 0.9069 | 0.9451 | 0.9921 | 1.0000 | 1.0073 | 0.9764 | 0.8843 | 0.9918 | 1.0174 | 1.0273 | 0.9603 | 0.9871 | 1.0963 | 1.0828 | 1.1463 | 1.1741 | 1.1746 | 1.1743 | 1.2546 |
| 6 | 0.9186 | 0.8962 | 0.9345 | 0.9827 | 0.9916 | 1.0000 | 0.9695 | 0.8787 | 0.9872 | 1.0131 | 1.0234 | 0.9556 | 0.9830 | 1.0926 | 1.0789 | 1.1431 | 1.1720 | 1.1710 | 1.1715 | 1.2525 |
| 7 | 0.9491 | 0.9270 | 0.9668 | 1.0153 | 1.0235 | 1.0313 | 1.0000 | 0.9056 | 1.0163 | 1.0431 | 1.0537 | 0.9853 | 1.0131 | 1.1257 | 1.1123 | 1.1777 | 1.2062 | 1.2074 | 1.2073 | 1.2902 |
| 8 | 1.0550 | 1.0322 | 1.0762 | 1.1268 | 1.1337 | 1.1404 | 1.1057 | 1.0000 | 1.1192 | 1.1483 | 1.1596 | 1.0870 | 1.1164 | 1.2392 | 1.2253 | 1.2956 | 1.3243 | 1.3299 | 1.3283 | 1.4176 |
| 9 | 0.9317 | 0.9110 | 0.9511 | 0.9986 | 1.0065 | 1.0143 | 0.9841 | 0.8908 | 1.0000 | 1.0270 | 1.0380 | 0.9718 | 0.9994 | 1.1110 | 1.0985 | 1.1630 | 1.1906 | 1.1937 | 1.1936 | 1.2756 |
| 10 | 0.9125 | 0.8929 | 0.9320 | 0.9769 | 0.9836 | 0.9903 | 0.9606 | 0.8690 | 0.9740 | 1.0000 | 1.0105 | 0.9471 | 0.9733 | 1.0813 | 1.0695 | 1.1315 | 1.1571 | 1.1619 | 1.1610 | 1.2399 |
| 11 | 0.8789 | 0.8580 | 0.8973 | 0.9468 | 0.9572 | 0.9675 | 0.9394 | 0.8518 | 0.9611 | 0.9881 | 1.0000 | 0.9335 | 0.9620 | 1.0719 | 1.0592 | 1.1239 | 1.1538 | 1.1526 | 1.1548 | 1.2368 |
| 12 | 0.9127 | 0.8874 | 0.9303 | 0.9912 | 1.0083 | 1.0249 | 0.9961 | 0.9067 | 1.0323 | 1.0631 | 1.0778 | 1.0000 | 1.0342 | 1.1570 | 1.1414 | 1.2161 | 1.2554 | 1.2442 | 1.2511 | 1.3452 |
| 13 | 0.8977 | 0.8722 | 0.9121 | 0.9696 | 0.9849 | 0.9995 | 0.9703 | 0.8829 | 1.0023 | 1.0307 | 1.0435 | 0.9681 | 1.0000 | 1.1166 | 1.1009 | 1.1718 | 1.2089 | 1.1976 | 1.2032 | 1.2921 |
| 14 | 0.8207 | 0.7981 | 0.8331 | 0.8820 | 0.8937 | 0.9048 | 0.8775 | 0.7976 | 0.9016 | 0.9261 | 0.9365 | 0.8702 | 0.8974 | 1.0000 | 0.9860 | 1.0478 | 1.0788 | 1.0710 | 1.0743 | 1.1517 |
| 15 | 0.7996 | 0.7769 | 0.8142 | 0.8682 | 0.8835 | 0.8983 | 0.8730 | 0.7949 | 0.9054 | 0.9324 | 0.9452 | 0.8762 | 0.9064 | 1.0140 | 1.0000 | 1.0658 | 1.1008 | 1.0898 | 1.0961 | 1.1788 |
| 16 | 0.7468 | 0.7258 | 0.7612 | 0.8119 | 0.8264 | 0.8405 | 0.8171 | 0.7440 | 0.8478 | 0.8734 | 0.8857 | 0.8213 | 0.8498 | 0.9511 | 0.9382 | 1.0000 | 1.0328 | 1.0229 | 1.0290 | 1.1069 |
| 17 | 0.7248 | 0.7048 | 0.7391 | 0.7878 | 0.8015 | 0.8149 | 0.7922 | 0.7211 | 0.8213 | 0.8460 | 0.8579 | 0.7959 | 0.8233 | 0.9213 | 0.9090 | 0.9686 | 1.0000 | 0.9911 | 0.9967 | 1.0719 |
| 18 | 0.7119 | 0.6906 | 0.7256 | 0.7784 | 0.7950 | 0.8112 | 0.7892 | 0.7200 | 0.8248 | 0.8507 | 0.8638 | 0.7987 | 0.8280 | 0.9290 | 0.9158 | 0.9784 | 1.0133 | 1.0000 | 1.0079 | 1.0865 |
| 19 | 0.7010 | 0.6800 | 0.7151 | 0.7679 | 0.7847 | 0.8013 | 0.7799 | 0.7116 | 0.8161 | 0.8421 | 0.8554 | 0.7907 | 0.8202 | 0.9207 | 0.9078 | 0.9702 | 1.0052 | 0.9918 | 1.0000 | 1.0784 |
| 20 | 0.6695 | 0.6508 | 0.6830 | 0.7292 | 0.7425 | 0.7557 | 0.7348 | 0.6692 | 0.7634 | 0.7867 | 0.7982 | 0.7401 | 0.7661 | 0.8579 | 0.8465 | 0.9025 | 0.9324 | 0.9235 | 0.9293 | 1.0000 |

Table A.5. Comparison Ratios of Bundles $\Phi_{ij}$ and $\Phi_{ii}$ for Whole Milk, Lowfat Milk, and Other Beverages, Unadjusted, 1967-1986.

| | $\Gamma_{ij/ii}=(\Phi_{ij}/\Phi_{ii})$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ij | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 | 1.0000 | 1.0089 | 0.9919 | 0.9770 | 0.9763 | 0.9814 | 0.9696 | 0.9453 | 0.9306 | 0.9453 | 0.8978 | 0.9085 | 0.9112 | 0.8852 | 0.8674 | 0.8512 | 0.8514 | 0.8609 | 0.8795 | 0.8840 |
| 2 | 0.9913 | 1.0000 | 0.9832 | 0.9684 | 0.9677 | 0.9726 | 0.9608 | 0.9366 | 0.9223 | 0.9366 | 0.8901 | 0.9003 | 0.9027 | 0.8771 | 0.8594 | 0.8432 | 0.8434 | 0.8527 | 0.8709 | 0.8753 |
| 3 | 1.0078 | 1.0169 | 1.0000 | 0.9851 | 0.9845 | 0.9897 | 0.9780 | 0.9535 | 0.9391 | 0.9538 | 0.9068 | 0.9173 | 0.9198 | 0.8939 | 0.8761 | 0.8597 | 0.8599 | 0.8695 | 0.8883 | 0.8930 |
| 4 | 1.0221 | 1.0321 | 1.0149 | 1.0000 | 0.9997 | 1.0058 | 0.9945 | 0.9700 | 0.9552 | 0.9713 | 0.9221 | 0.9340 | 0.9375 | 0.9111 | 0.8932 | 0.8767 | 0.8774 | 0.8876 | 0.9075 | 0.9129 |
| 5 | 1.0221 | 1.0322 | 1.0151 | 1.0002 | 1.0000 | 1.0063 | 0.9951 | 0.9707 | 0.9560 | 0.9722 | 0.9229 | 0.9350 | 0.9386 | 0.9123 | 0.8944 | 0.8780 | 0.8788 | 0.8891 | 0.9091 | 0.9147 |
| 6 | 1.0159 | 1.0259 | 1.0090 | 0.9942 | 0.9939 | 1.0000 | 0.9888 | 0.9645 | 0.9500 | 0.9659 | 0.9174 | 0.9291 | 0.9325 | 0.9064 | 0.8886 | 0.8723 | 0.8729 | 0.8831 | 0.9028 | 0.9083 |
| 7 | 1.0269 | 1.0369 | 1.0201 | 1.0052 | 1.0051 | 1.0112 | 1.0000 | 0.9755 | 0.9611 | 0.9771 | 0.9287 | 0.9403 | 0.9436 | 0.9174 | 0.8995 | 0.8830 | 0.8836 | 0.8940 | 0.9140 | 0.9195 |
| 8 | 1.0518 | 1.0623 | 1.0452 | 1.0300 | 1.0300 | 1.0364 | 1.0250 | 1.0000 | 0.9854 | 1.0019 | 0.9526 | 0.9645 | 0.9679 | 0.9412 | 0.9229 | 0.9061 | 0.9067 | 0.9174 | 0.9380 | 0.9438 |
| 9 | 1.0622 | 1.0742 | 1.0567 | 1.0418 | 1.0421 | 1.0501 | 1.0399 | 1.0153 | 1.0000 | 1.0188 | 0.9659 | 0.9805 | 0.9856 | 0.9584 | 0.9402 | 0.9236 | 0.9251 | 0.9369 | 0.9591 | 0.9663 |
| 10 | 1.0373 | 1.0501 | 1.0327 | 1.0183 | 1.0188 | 1.0280 | 1.0189 | 0.9954 | 0.9797 | 1.0000 | 0.9452 | 0.9616 | 0.9682 | 0.9412 | 0.9237 | 0.9077 | 0.9099 | 0.9222 | 0.9450 | 0.9531 |
| 11 | 1.0900 | 1.1073 | 1.0877 | 1.0734 | 1.0745 | 1.0887 | 1.0824 | 1.0596 | 1.0405 | 1.0683 | 1.0000 | 1.0250 | 1.0372 | 1.0073 | 0.9896 | 0.9740 | 0.9786 | 0.9942 | 1.0221 | 1.0341 |
| 12 | 1.0613 | 1.0788 | 1.0594 | 1.0456 | 1.0468 | 1.0612 | 1.0555 | 1.0335 | 1.0146 | 1.0426 | 0.9746 | 1.0000 | 1.0126 | 0.9833 | 0.9662 | 0.9510 | 0.9559 | 0.9715 | 0.9992 | 1.0113 |
| 13 | 1.0560 | 1.0723 | 1.0528 | 1.0387 | 1.0394 | 1.0526 | 1.0460 | 1.0236 | 1.0047 | 1.0312 | 0.9645 | 0.9885 | 1.0000 | 0.9707 | 0.9534 | 0.9380 | 0.9424 | 0.9572 | 0.9837 | 0.9948 |
| 14 | 1.0899 | 1.1066 | 1.0862 | 1.0715 | 1.0721 | 1.0857 | 1.0788 | 1.0556 | 1.0357 | 1.0631 | 0.9935 | 1.0185 | 1.0305 | 1.0000 | 0.9821 | 0.9662 | 0.9707 | 0.9859 | 1.0132 | 1.0246 |
| 15 | 1.1028 | 1.1202 | 1.1002 | 1.0857 | 1.0868 | 1.1010 | 1.0945 | 1.0713 | 1.0520 | 1.0799 | 1.0107 | 1.0360 | 1.0482 | 1.0179 | 1.0000 | 0.9841 | 0.9887 | 1.0045 | 1.0326 | 1.0446 |
| 16 | 1.1175 | 1.1355 | 1.1153 | 1.1008 | 1.1020 | 1.1168 | 1.1105 | 1.0872 | 1.0676 | 1.0964 | 1.0259 | 1.0520 | 1.0647 | 1.0341 | 1.0160 | 1.0000 | 1.0049 | 1.0211 | 1.0499 | 1.0625 |
| 17 | 1.1109 | 1.1290 | 1.1089 | 1.0945 | 1.0957 | 1.1106 | 1.1045 | 1.0814 | 1.0619 | 1.0908 | 1.0204 | 1.0465 | 1.0594 | 1.0289 | 1.0109 | 0.9951 | 1.0000 | 1.0162 | 1.0450 | 1.0576 |
| 18 | 1.0904 | 1.1084 | 1.0888 | 1.0747 | 1.0760 | 1.0909 | 1.0852 | 1.0627 | 1.0436 | 1.0723 | 1.0029 | 1.0289 | 1.0418 | 1.0119 | 0.9944 | 0.9789 | 0.9839 | 1.0000 | 1.0286 | 1.0412 |
| 19 | 1.0581 | 1.0757 | 1.0568 | 1.0432 | 1.0446 | 1.0592 | 1.0538 | 1.0321 | 1.0136 | 1.0416 | 0.9744 | 0.9997 | 1.0124 | 0.9834 | 0.9665 | 0.9515 | 0.9564 | 0.9721 | 1.0000 | 1.0124 |
| 20 | 1.0422 | 1.0600 | 1.0410 | 1.0277 | 1.0290 | 1.0440 | 1.0390 | 1.0178 | 0.9990 | 1.0275 | 0.9594 | 0.9855 | 0.9987 | 0.9698 | 0.9532 | 0.9385 | 0.9437 | 0.9595 | 0.9874 | 1.0000 |

Table A.6. Comparison Ratios of Bundles $\Phi_{ij}$ and $\Phi_{ii}$ for Whole Milk, Lowfat Milk, and Other Beverages, Adjusted, 1967-1986.

| | $\Gamma_{ij/ii}=(\Phi_{ij}/\Phi_{ii})$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ij | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 | 1.0000 | 1.0086 | 1.0300 | 1.0162 | 1.0266 | 1.0481 | 1.0224 | 0.9459 | 0.9725 | 0.9185 | 0.7771 | 0.7441 | 0.7791 | 0.8244 | 0.8643 | 0.9010 | 0.9128 | 0.9291 | 0.9365 | 0.9190 |
| 2 | 0.9916 | 1.0000 | 1.0213 | 1.0076 | 1.0179 | 1.0390 | 1.0134 | 0.9376 | 0.9641 | 0.9102 | 0.7708 | 0.7377 | 0.7721 | 0.8171 | 0.8566 | 0.8929 | 0.9045 | 0.9205 | 0.9277 | 0.9102 |
| 3 | 0.9704 | 0.9788 | 1.0000 | 0.9868 | 0.9971 | 1.0180 | 0.9931 | 0.9188 | 0.9451 | 0.8924 | 0.7559 | 0.7235 | 0.7573 | 0.8018 | 0.8407 | 0.8765 | 0.8879 | 0.9038 | 0.9110 | 0.8940 |
| 4 | 0.9822 | 0.9915 | 1.0131 | 1.0000 | 1.0107 | 1.0328 | 1.0083 | 0.9331 | 0.9597 | 0.9071 | 0.7667 | 0.7349 | 0.7703 | 0.8157 | 0.8557 | 0.8925 | 0.9045 | 0.9212 | 0.9292 | 0.9126 |
| 5 | 0.9714 | 0.9807 | 1.0023 | 0.9893 | 1.0000 | 1.0221 | 0.9979 | 0.9236 | 0.9500 | 0.8980 | 0.7589 | 0.7276 | 0.7628 | 0.8078 | 0.8476 | 0.8841 | 0.8961 | 0.9127 | 0.9208 | 0.9045 |
| 6 | 0.9507 | 0.9597 | 0.9808 | 0.9681 | 0.9786 | 1.0000 | 0.9763 | 0.9035 | 0.9295 | 0.8784 | 0.7428 | 0.7119 | 0.7461 | 0.7902 | 0.8291 | 0.8647 | 0.8764 | 0.8925 | 0.9003 | 0.8843 |
| 7 | 0.9731 | 0.9824 | 1.0044 | 0.9915 | 1.0023 | 1.0243 | 1.0000 | 0.9255 | 0.9525 | 0.9000 | 0.7617 | 0.7297 | 0.7647 | 0.8102 | 0.8501 | 0.8867 | 0.8986 | 0.9152 | 0.9231 | 0.9067 |
| 8 | 1.0506 | 1.0607 | 1.0847 | 1.0708 | 1.0827 | 1.1065 | 1.0805 | 1.0000 | 1.0294 | 0.9727 | 0.8235 | 0.7889 | 0.8267 | 0.8761 | 0.9194 | 0.9590 | 0.9719 | 0.9899 | 0.9987 | 0.9810 |
| 9 | 1.0149 | 1.0262 | 1.0496 | 1.0366 | 1.0486 | 1.0735 | 1.0494 | 0.9717 | 1.0000 | 0.9466 | 0.7981 | 0.7667 | 0.8055 | 0.8538 | 0.8966 | 0.9360 | 0.9494 | 0.9680 | 0.9777 | 0.9618 |
| 10 | 1.0664 | 1.0795 | 1.1040 | 1.0906 | 1.1035 | 1.1312 | 1.1068 | 1.0254 | 1.0546 | 1.0000 | 0.8395 | 0.8087 | 0.8514 | 0.9024 | 0.9481 | 0.9904 | 1.0054 | 1.0258 | 1.0372 | 1.0214 |
| 11 | 1.2648 | 1.2853 | 1.3141 | 1.2993 | 1.3157 | 1.3550 | 1.3296 | 1.2333 | 1.2664 | 1.2072 | 1.0000 | 0.9715 | 1.0300 | 1.0912 | 1.1486 | 1.2019 | 1.2232 | 1.2511 | 1.2691 | 1.2540 |
| 12 | 1.2997 | 1.3214 | 1.3510 | 1.3360 | 1.3530 | 1.3942 | 1.3687 | 1.2698 | 1.3035 | 1.2435 | 1.0281 | 1.0000 | 1.0612 | 1.1242 | 1.1836 | 1.2389 | 1.2612 | 1.2905 | 1.3097 | 1.2946 |
| 13 | 1.2342 | 1.2534 | 1.2806 | 1.2658 | 1.2813 | 1.3188 | 1.2936 | 1.1997 | 1.2310 | 1.1733 | 0.9713 | 0.9435 | 1.0000 | 1.0586 | 1.1138 | 1.1653 | 1.1857 | 1.2124 | 1.2295 | 1.2142 |
| 14 | 1.1681 | 1.1863 | 1.2115 | 1.1974 | 1.2118 | 1.2473 | 1.2232 | 1.1345 | 1.1636 | 1.1092 | 0.9174 | 0.8915 | 0.9450 | 1.0000 | 1.0520 | 1.1005 | 1.1198 | 1.1450 | 1.1611 | 1.1466 |
| 15 | 1.1027 | 1.1204 | 1.1454 | 1.1324 | 1.1466 | 1.1807 | 1.1584 | 1.0745 | 1.1032 | 1.0516 | 0.8710 | 0.8461 | 0.8970 | 0.9501 | 1.0000 | 1.0464 | 1.0648 | 1.0891 | 1.1047 | 1.0914 |
| 16 | 1.0506 | 1.0679 | 1.0919 | 1.0797 | 1.0934 | 1.1263 | 1.1054 | 1.0254 | 1.0529 | 1.0040 | 0.8311 | 0.8078 | 0.8567 | 0.9077 | 0.9555 | 1.0000 | 1.0178 | 1.0412 | 1.0564 | 1.0440 |
| 17 | 1.0311 | 1.0482 | 1.0718 | 1.0598 | 1.0733 | 1.1058 | 1.0854 | 1.0070 | 1.0339 | 0.9860 | 0.8160 | 0.7932 | 0.8415 | 0.8916 | 0.9386 | 0.9824 | 1.0000 | 1.0231 | 1.0381 | 1.0261 |
| 18 | 1.0051 | 1.0220 | 1.0452 | 1.0336 | 1.0470 | 1.0790 | 1.0593 | 0.9828 | 1.0092 | 0.9627 | 0.7964 | 0.7745 | 0.8219 | 0.8710 | 0.9171 | 0.9600 | 0.9773 | 1.0000 | 1.0149 | 1.0034 |
| 19 | 0.9882 | 1.0050 | 1.0280 | 1.0168 | 1.0300 | 1.0617 | 1.0425 | 0.9672 | 0.9934 | 0.9477 | 0.7840 | 0.7625 | 0.8093 | 0.8578 | 0.9033 | 0.9456 | 0.9627 | 0.9852 | 1.0000 | 0.9888 |
| 20 | 0.9965 | 1.0139 | 1.0368 | 1.0255 | 1.0388 | 1.0714 | 1.0523 | 0.9765 | 1.0025 | 0.9571 | 0.7899 | 0.7693 | 0.8173 | 0.8660 | 0.9121 | 0.9550 | 0.9726 | 0.9956 | 1.0110 | 1.0000 |

Table A.7. Comparison Ratios of Bundles $\Phi_{ij}$ and $\Phi_{ii}$ for Lowfat Milk, Juices, and Other Beverages, Unadjusted, 1967-1986.

| | $\Gamma_{ij/ii}=(\Phi_{ij}/\Phi_{ii})$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| i \ j | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 | 1.0000 | 1.0323 | 1.0315 | 1.0590 | 1.1012 | 1.1627 | 1.1872 | 1.2017 | 1.2288 | 1.2881 | 1.2371 | 1.2556 | 1.2971 | 1.2930 | 1.2755 | 1.2836 | 1.3264 | 1.3178 | 1.3911 | 1.4500 |
| 2 | 0.9705 | 1.0000 | 0.9993 | 1.0286 | 1.0718 | 1.1327 | 1.1563 | 1.1719 | 1.2014 | 1.2583 | 1.2113 | 1.2253 | 1.2657 | 1.2629 | 1.2448 | 1.2539 | 1.2978 | 1.2848 | 1.3572 | 1.4157 |
| 3 | 0.9712 | 1.0005 | 1.0000 | 1.0299 | 1.0738 | 1.1351 | 1.1588 | 1.1749 | 1.2052 | 1.2621 | 1.2158 | 1.2291 | 1.2696 | 1.2672 | 1.2489 | 1.2583 | 1.3027 | 1.2889 | 1.3617 | 1.4207 |
| 4 | 0.9448 | 0.9754 | 0.9745 | 1.0000 | 1.0394 | 1.0971 | 1.1201 | 1.1334 | 1.1583 | 1.2144 | 1.1655 | 1.1837 | 1.2228 | 1.2186 | 1.2023 | 1.2096 | 1.2496 | 1.2422 | 1.3111 | 1.3663 |
| 5 | 0.9087 | 0.9375 | 0.9365 | 0.9616 | 1.0000 | 1.0557 | 1.0777 | 1.0909 | 1.1155 | 1.1691 | 1.1225 | 1.1390 | 1.1766 | 1.1727 | 1.1567 | 1.1641 | 1.2031 | 1.1947 | 1.2611 | 1.3145 |
| 6 | 0.8586 | 0.8850 | 0.8842 | 0.9092 | 0.9466 | 1.0000 | 1.0207 | 1.0340 | 1.0589 | 1.1093 | 1.0666 | 1.0802 | 1.1159 | 1.1129 | 1.0971 | 1.1048 | 1.1428 | 1.1326 | 1.1961 | 1.2473 |
| 7 | 0.8396 | 0.8666 | 0.8664 | 0.8905 | 0.9269 | 0.9791 | 1.0000 | 1.0128 | 1.0370 | 1.0868 | 1.0454 | 1.0599 | 1.0949 | 1.0921 | 1.0774 | 1.0846 | 1.1212 | 1.1131 | 1.1753 | 1.2255 |
| 8 | 0.8296 | 0.8581 | 0.8586 | 0.8808 | 0.9156 | 0.9668 | 0.9881 | 1.0000 | 1.0222 | 1.0723 | 1.0306 | 1.0479 | 1.0825 | 1.0794 | 1.0659 | 1.0723 | 1.1069 | 1.1026 | 1.1636 | 1.2128 |
| 9 | 0.8219 | 0.8492 | 0.8479 | 0.8684 | 0.9011 | 0.9503 | 0.9701 | 0.9806 | 1.0000 | 1.0489 | 1.0043 | 1.0222 | 1.0560 | 1.0513 | 1.0376 | 1.0433 | 1.0767 | 1.0725 | 1.1313 | 1.1783 |
| 10 | 0.7966 | 0.8237 | 0.8210 | 0.8379 | 0.8665 | 0.9120 | 0.9303 | 0.9383 | 0.9527 | 1.0000 | 0.9524 | 0.9734 | 1.0057 | 0.9989 | 0.9864 | 0.9903 | 1.0203 | 1.0199 | 1.0746 | 1.1178 |
| 11 | 0.8771 | 0.9047 | 0.8968 | 0.9107 | 0.9369 | 0.9826 | 0.9990 | 1.0040 | 1.0119 | 1.0620 | 1.0000 | 1.0263 | 1.0606 | 1.0483 | 1.0338 | 1.0360 | 1.0660 | 1.0670 | 1.1225 | 1.1647 |
| 12 | 0.8545 | 0.8785 | 0.8699 | 0.8860 | 0.9134 | 0.9589 | 0.9738 | 0.9800 | 0.9906 | 1.0381 | 0.9791 | 1.0000 | 1.0334 | 1.0221 | 1.0062 | 1.0097 | 1.0414 | 1.0364 | 1.0913 | 1.1332 |
| 13 | 0.8256 | 0.8485 | 0.8403 | 0.8563 | 0.8832 | 0.9273 | 0.9418 | 0.9481 | 0.9588 | 1.0047 | 0.9481 | 0.9677 | 1.0000 | 0.9893 | 0.9737 | 0.9773 | 1.0084 | 1.0028 | 1.0561 | 1.0968 |
| 14 | 0.8405 | 0.8646 | 0.8559 | 0.8706 | 0.8965 | 0.9405 | 0.9552 | 0.9605 | 0.9693 | 1.0162 | 0.9569 | 0.9790 | 1.0118 | 1.0000 | 0.9848 | 0.9876 | 1.0178 | 1.0147 | 1.0680 | 1.1085 |
| 15 | 0.8437 | 0.8668 | 0.8588 | 0.8760 | 0.9044 | 0.9501 | 0.9650 | 0.9721 | 0.9843 | 1.0311 | 0.9745 | 0.9933 | 1.0265 | 1.0162 | 1.0000 | 1.0041 | 1.0365 | 1.0297 | 1.0848 | 1.1270 |
| 16 | 0.8414 | 0.8647 | 0.8565 | 0.8734 | 0.9014 | 0.9468 | 0.9617 | 0.9685 | 0.9803 | 1.0270 | 0.9702 | 0.9895 | 1.0225 | 1.0121 | 0.9961 | 1.0000 | 1.0321 | 1.0258 | 1.0805 | 1.1225 |
| 17 | 0.8171 | 0.8399 | 0.8320 | 0.8479 | 0.8747 | 0.9185 | 0.9330 | 0.9393 | 0.9501 | 0.9956 | 0.9400 | 0.9594 | 0.9914 | 0.9810 | 0.9657 | 0.9693 | 1.0000 | 0.9947 | 1.0476 | 1.0881 |
| 18 | 0.8202 | 0.8415 | 0.8334 | 0.8511 | 0.8794 | 0.9242 | 0.9384 | 0.9458 | 0.9587 | 1.0037 | 0.9493 | 0.9658 | 0.9981 | 0.9883 | 0.9719 | 0.9764 | 1.0089 | 1.0000 | 1.0539 | 1.0953 |
| 19 | 0.7772 | 0.7974 | 0.7897 | 0.8067 | 0.8338 | 0.8764 | 0.8899 | 0.8970 | 0.9096 | 0.9522 | 0.9010 | 0.9163 | 0.9469 | 0.9378 | 0.9222 | 0.9266 | 0.9576 | 0.9488 | 1.0000 | 1.0394 |
| 20 | 0.7579 | 0.7791 | 0.7711 | 0.7849 | 0.8088 | 0.8487 | 0.8617 | 0.8669 | 0.8755 | 0.9175 | 0.8644 | 0.8834 | 0.9129 | 0.9025 | 0.8884 | 0.8913 | 0.9190 | 0.9150 | 0.9633 | 1.0000 |

Table A.8. Comparison Ratios of Bundles $\Phi_{ij}$ and $\Phi_{ii}$ for Lowfat Milk, Juices, and Other Beverages, Adjusted, 1967-1986.

| | $\Gamma_{ij/ii}=(\Phi_{ij}/\Phi_{ii})$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ij | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 | 1.0000 | 1.0058 | 1.0217 | 0.9916 | 1.0080 | 1.0432 | 1.0193 | 0.9429 | 0.9347 | 0.8113 | 0.4893 | 0.3885 | 0.4672 | 0.5488 | 0.6083 | 0.6705 | 0.6980 | 0.6935 | 0.7074 | 0.6742 |
| 2 | 0.9961 | 1.0000 | 1.0159 | 0.9885 | 1.0072 | 1.0436 | 1.0196 | 0.9450 | 0.9402 | 0.8166 | 0.4983 | 0.3939 | 0.4724 | 0.5549 | 0.6129 | 0.6762 | 0.7060 | 0.6967 | 0.7119 | 0.6802 |
| 3 | 0.9805 | 0.9841 | 1.0000 | 0.9736 | 0.9926 | 1.0288 | 1.0053 | 0.9324 | 0.9284 | 0.8067 | 0.4942 | 0.3906 | 0.4680 | 0.5496 | 0.6065 | 0.6691 | 0.6990 | 0.6890 | 0.7043 | 0.6736 |
| 4 | 1.0091 | 1.0152 | 1.0310 | 1.0000 | 1.0161 | 1.0512 | 1.0270 | 0.9495 | 0.9405 | 0.8160 | 0.4903 | 0.3893 | 0.4686 | 0.5506 | 0.6108 | 0.6733 | 0.7006 | 0.6968 | 0.7104 | 0.6766 |
| 5 | 0.9928 | 0.9981 | 1.0135 | 0.9837 | 1.0000 | 1.0349 | 1.0108 | 0.9350 | 0.9268 | 0.8040 | 0.4841 | 0.3836 | 0.4616 | 0.5424 | 0.6012 | 0.6631 | 0.6906 | 0.6854 | 0.6991 | 0.6660 |
| 6 | 0.9567 | 0.9609 | 0.9759 | 0.9486 | 0.9656 | 1.0000 | 0.9768 | 0.9046 | 0.8986 | 0.7800 | 0.4732 | 0.3741 | 0.4494 | 0.5281 | 0.5841 | 0.6444 | 0.6723 | 0.6648 | 0.6787 | 0.6477 |
| 7 | 0.9773 | 0.9829 | 0.9991 | 0.9706 | 0.9878 | 1.0230 | 1.0000 | 0.9261 | 0.9197 | 0.7991 | 0.4860 | 0.3864 | 0.4634 | 0.5440 | 0.6019 | 0.6632 | 0.6910 | 0.6855 | 0.6998 | 0.6683 |
| 8 | 1.0564 | 1.0648 | 1.0830 | 1.0503 | 1.0674 | 1.1048 | 1.0809 | 1.0000 | 0.9910 | 0.8618 | 0.5224 | 0.4184 | 0.5017 | 0.5883 | 0.6524 | 0.7176 | 0.7457 | 0.7444 | 0.7594 | 0.7248 |
| 9 | 1.0838 | 1.0912 | 1.1075 | 1.0721 | 1.0873 | 1.1237 | 1.0973 | 1.0127 | 1.0000 | 0.8664 | 0.5139 | 0.4082 | 0.4931 | 0.5798 | 0.6451 | 0.7112 | 0.7388 | 0.7377 | 0.7509 | 0.7131 |
| 10 | 1.2844 | 1.2942 | 1.3113 | 1.2643 | 1.2774 | 1.3171 | 1.2844 | 1.1806 | 1.1584 | 1.0000 | 0.5751 | 0.4558 | 0.5556 | 0.6548 | 0.7333 | 0.8092 | 0.8380 | 0.8425 | 0.8545 | 0.8059 |
| 11 | 2.5486 | 2.5614 | 2.5810 | 2.4743 | 2.4846 | 2.5506 | 2.4750 | 2.2578 | 2.1910 | 1.8709 | 1.0000 | 0.7723 | 0.9667 | 1.1494 | 1.3033 | 1.4476 | 1.4960 | 1.5092 | 1.5191 | 1.4073 |
| 12 | 3.2979 | 3.3033 | 3.3254 | 3.1970 | 3.2179 | 3.3069 | 3.2051 | 2.9292 | 2.8534 | 2.4342 | 1.3128 | 1.0000 | 1.2516 | 1.4907 | 1.6828 | 1.8747 | 1.9470 | 1.9412 | 1.9572 | 1.8154 |
| 13 | 2.6225 | 2.6259 | 2.6436 | 2.5429 | 2.5609 | 2.6324 | 2.5514 | 2.3330 | 2.2745 | 1.9409 | 1.0507 | 0.7998 | 1.0000 | 1.1909 | 1.3431 | 1.4964 | 1.5551 | 1.5480 | 1.5616 | 1.4496 |
| 14 | 2.2440 | 2.2492 | 2.2635 | 2.1730 | 2.1844 | 2.2431 | 2.1736 | 1.9839 | 1.9283 | 1.6434 | 0.8768 | 0.6683 | 0.8391 | 1.0000 | 1.1319 | 1.2609 | 1.3075 | 1.3082 | 1.3172 | 1.2188 |
| 15 | 1.9308 | 1.9326 | 1.9464 | 1.8743 | 1.8895 | 1.9435 | 1.8843 | 1.7249 | 1.6847 | 1.4390 | 0.7862 | 0.5990 | 0.7467 | 0.8885 | 1.0000 | 1.1139 | 1.1588 | 1.1509 | 1.1622 | 1.0813 |
| 16 | 1.7381 | 1.7402 | 1.7525 | 1.6869 | 1.7000 | 1.7482 | 1.6949 | 1.5509 | 1.5139 | 1.2928 | 0.7045 | 0.5370 | 0.6698 | 0.7972 | 0.8978 | 1.0000 | 1.0398 | 1.0339 | 1.0437 | 0.9704 |
| 17 | 1.6792 | 1.6818 | 1.6936 | 1.6293 | 1.6410 | 1.6871 | 1.6356 | 1.4959 | 1.4589 | 1.2455 | 0.6762 | 0.5157 | 0.6440 | 0.7665 | 0.8642 | 0.9624 | 1.0000 | 0.9959 | 1.0049 | 0.9335 |
| 18 | 1.6808 | 1.6802 | 1.6915 | 1.6308 | 1.6456 | 1.6933 | 1.6411 | 1.5033 | 1.4706 | 1.2557 | 0.6886 | 0.5220 | 0.6505 | 0.7746 | 0.8703 | 0.9705 | 1.0115 | 1.0000 | 1.0106 | 0.9407 |
| 19 | 1.6584 | 1.6576 | 1.6690 | 1.6095 | 1.6246 | 1.6720 | 1.6205 | 1.4850 | 1.4533 | 1.2412 | 0.6824 | 0.5173 | 0.6443 | 0.7670 | 0.8612 | 0.9603 | 1.0012 | 0.9892 | 1.0000 | 0.9314 |
| 20 | 1.8390 | 1.8419 | 1.8533 | 1.7806 | 1.7911 | 1.8398 | 1.7824 | 1.6277 | 1.5837 | 1.3497 | 0.7224 | 0.5490 | 0.6891 | 0.8214 | 0.9286 | 1.0351 | 1.0746 | 1.0722 | 1.0801 | 1.0000 |

Table A.9. Comparison Ratios of Bundles $\Phi_{ij}$ and $\Phi_{ii}$ for Whole Milk, Juices, and Other Beverages, Unadjusted, 1967-1986.

| | $\Gamma_{ij}=(\Phi_{ij}/\Phi_{ii})$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ij | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 | 1.0000 | 0.9909 | 0.9625 | 0.9556 | 0.9590 | 0.9644 | 0.9430 | 0.9214 | 0.9113 | 0.9177 | 0.8636 | 0.8541 | 0.8563 | 0.8276 | 0.7993 | 0.7877 | 0.7983 | 0.7776 | 0.7955 | 0.7981 |
| 2 | 1.0101 | 1.0000 | 0.9714 | 0.9659 | 0.9705 | 0.9769 | 0.9552 | 0.9343 | 0.9259 | 0.9321 | 0.8788 | 0.8671 | 0.8696 | 0.8412 | 0.8120 | 0.8011 | 0.8131 | 0.7897 | 0.8086 | 0.8120 |
| 3 | 1.0399 | 1.0294 | 1.0000 | 0.9947 | 0.9999 | 1.0068 | 0.9846 | 0.9633 | 0.9552 | 0.9617 | 0.9069 | 0.8945 | 0.8972 | 0.8682 | 0.8380 | 0.8269 | 0.8397 | 0.8150 | 0.8348 | 0.8386 |
| 4 | 1.0454 | 1.0365 | 1.0069 | 1.0000 | 1.0038 | 1.0102 | 0.9884 | 0.9662 | 0.9557 | 0.9633 | 0.9059 | 0.8968 | 0.8998 | 0.8698 | 0.8404 | 0.8285 | 0.8399 | 0.8187 | 0.8381 | 0.8414 |
| 5 | 1.0403 | 1.0313 | 1.0020 | 0.9957 | 1.0000 | 1.0070 | 0.9854 | 0.9638 | 0.9540 | 0.9617 | 0.9048 | 0.8953 | 0.8986 | 0.8690 | 0.8395 | 0.8281 | 0.8400 | 0.8181 | 0.8379 | 0.8417 |
| 6 | 1.0318 | 1.0223 | 0.9932 | 0.9877 | 0.9927 | 1.0000 | 0.9785 | 0.9576 | 0.9488 | 0.9563 | 0.9007 | 0.8900 | 0.8933 | 0.8643 | 0.8347 | 0.8237 | 0.8363 | 0.8131 | 0.8331 | 0.8373 |
| 7 | 1.0571 | 1.0475 | 1.0176 | 1.0112 | 1.0156 | 1.0223 | 1.0000 | 0.9779 | 0.9682 | 0.9754 | 0.9183 | 0.9078 | 0.9107 | 0.8807 | 0.8506 | 0.8389 | 0.8510 | 0.8281 | 0.8479 | 0.8514 |
| 8 | 1.0865 | 1.0771 | 1.0463 | 1.0382 | 1.0413 | 1.0470 | 1.0238 | 1.0000 | 0.9883 | 0.9955 | 0.9360 | 0.9268 | 0.9292 | 0.8976 | 0.8672 | 0.8544 | 0.8654 | 0.8440 | 0.8632 | 0.8657 |
| 9 | 1.0891 | 1.0814 | 1.0508 | 1.0436 | 1.0477 | 1.0557 | 1.0342 | 1.0115 | 1.0000 | 1.0098 | 0.9479 | 0.9409 | 0.9454 | 0.9140 | 0.8839 | 0.8717 | 0.8839 | 0.8634 | 0.8847 | 0.8893 |
| 10 | 1.0746 | 1.0694 | 1.0393 | 1.0314 | 1.0348 | 1.0435 | 1.0236 | 1.0012 | 0.9880 | 1.0000 | 0.9356 | 0.9328 | 0.9386 | 0.9070 | 0.8783 | 0.8660 | 0.8776 | 0.8608 | 0.8825 | 0.8876 |
| 11 | 1.1202 | 1.1207 | 1.0901 | 1.0838 | 1.0894 | 1.1047 | 1.0891 | 1.0688 | 1.0546 | 1.0752 | 1.0000 | 1.0055 | 1.0176 | 0.9848 | 0.9565 | 0.9452 | 0.9602 | 0.9468 | 0.9752 | 0.9861 |
| 12 | 1.0966 | 1.0963 | 1.0667 | 1.0639 | 1.0725 | 1.0904 | 1.0762 | 1.0588 | 1.0485 | 1.0698 | 0.9972 | 1.0000 | 1.0135 | 0.9828 | 0.9541 | 0.9449 | 0.9629 | 0.9454 | 0.9762 | 0.9897 |
| 13 | 1.0880 | 1.0869 | 1.0574 | 1.0543 | 1.0626 | 1.0795 | 1.0647 | 1.0470 | 1.0369 | 1.0568 | 0.9860 | 0.9875 | 1.0000 | 0.9696 | 0.9409 | 0.9315 | 0.9490 | 0.9310 | 0.9607 | 0.9733 |
| 14 | 1.1274 | 1.1272 | 1.0966 | 1.0920 | 1.0994 | 1.1162 | 1.1009 | 1.0817 | 1.0695 | 1.0904 | 1.0158 | 1.0194 | 1.0322 | 1.0000 | 0.9709 | 0.9605 | 0.9774 | 0.9612 | 0.9912 | 1.0035 |
| 15 | 1.1521 | 1.1506 | 1.1195 | 1.1171 | 1.1266 | 1.1451 | 1.1296 | 1.1114 | 1.1017 | 1.1229 | 1.0484 | 1.0491 | 1.0626 | 1.0307 | 1.0000 | 0.9905 | 1.0099 | 0.9896 | 1.0216 | 1.0356 |
| 16 | 1.1614 | 1.1603 | 1.1289 | 1.1264 | 1.1360 | 1.1549 | 1.1394 | 1.1212 | 1.1112 | 1.1329 | 1.0573 | 1.0586 | 1.0725 | 1.0404 | 1.0095 | 1.0000 | 1.0195 | 0.9995 | 1.0320 | 1.0463 |
| 17 | 1.1401 | 1.1394 | 1.1085 | 1.1057 | 1.1148 | 1.1333 | 1.1183 | 1.1002 | 1.0899 | 1.1115 | 1.0367 | 1.0388 | 1.0525 | 1.0207 | 0.9907 | 0.9812 | 1.0000 | 0.9812 | 1.0130 | 1.0269 |
| 18 | 1.1499 | 1.1484 | 1.1175 | 1.1169 | 1.1281 | 1.1485 | 1.1337 | 1.1171 | 1.1092 | 1.1313 | 1.0570 | 1.0569 | 1.0716 | 1.0405 | 1.0094 | 1.0010 | 1.0222 | 1.0000 | 1.0338 | 1.0495 |
| 19 | 1.1105 | 1.1090 | 1.0791 | 1.0788 | 1.0899 | 1.1098 | 1.0957 | 1.0798 | 1.0724 | 1.0939 | 1.0223 | 1.0219 | 1.0362 | 1.0063 | 0.9762 | 0.9682 | 0.9889 | 0.9672 | 1.0000 | 1.0154 |
| 20 | 1.0984 | 1.0990 | 1.0694 | 1.0669 | 1.0758 | 1.0947 | 1.0812 | 1.0642 | 1.0538 | 1.0762 | 1.0024 | 1.0064 | 1.0207 | 0.9900 | 0.9615 | 0.9525 | 0.9710 | 0.9541 | 0.9857 | 1.0000 |

Table A.10. Comparison Ratios of Bundles $\Phi_{ij}$ and $\Phi_{ii}$ for Whole Milk, Juices, and Other Beverages, Adjusted, 1967-1986.

| | $\Gamma_{ij}=(\Phi_{ij}/\Phi_{ii})$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ij | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 | 1.0000 | 0.9963 | 1.0112 | 1.0099 | 1.0159 | 1.0292 | 1.0120 | 0.9575 | 0.9730 | 0.9332 | 0.7762 | 0.7060 | 0.7333 | 0.7811 | 0.8020 | 0.8353 | 0.8486 | 0.8421 | 0.8448 | 0.8450 |
| 2 | 1.0047 | 1.0000 | 1.0153 | 1.0156 | 1.0230 | 1.0374 | 1.0200 | 0.9661 | 0.9838 | 0.9433 | 0.7862 | 0.7131 | 0.7409 | 0.7901 | 0.8107 | 0.8453 | 0.8601 | 0.8509 | 0.8545 | 0.8555 |
| 3 | 0.9895 | 0.9848 | 1.0000 | 1.0007 | 1.0084 | 1.0229 | 1.0059 | 0.9530 | 0.9710 | 0.9311 | 0.7763 | 0.7038 | 0.7314 | 0.7803 | 0.8005 | 0.8349 | 0.8499 | 0.8403 | 0.8442 | 0.8455 |
| 4 | 0.9888 | 0.9858 | 1.0010 | 1.0000 | 1.0062 | 1.0202 | 1.0038 | 0.9501 | 0.9657 | 0.9269 | 0.7699 | 0.7009 | 0.7288 | 0.7767 | 0.7979 | 0.8314 | 0.8450 | 0.8390 | 0.8423 | 0.8431 |
| 5 | 0.9813 | 0.9783 | 0.9936 | 0.9933 | 1.0000 | 1.0145 | 0.9984 | 0.9454 | 0.9617 | 0.9232 | 0.7671 | 0.6979 | 0.7260 | 0.7742 | 0.7952 | 0.8291 | 0.8431 | 0.8365 | 0.8402 | 0.8415 |
| 6 | 0.9658 | 0.9622 | 0.9774 | 0.9779 | 0.9853 | 1.0000 | 0.9841 | 0.9323 | 0.9494 | 0.9112 | 0.7582 | 0.6886 | 0.7164 | 0.7643 | 0.7847 | 0.8186 | 0.8331 | 0.8251 | 0.8292 | 0.8308 |
| 7 | 0.9845 | 0.9809 | 0.9960 | 0.9957 | 1.0024 | 1.0166 | 1.0000 | 0.9468 | 0.9633 | 0.9242 | 0.7689 | 0.6988 | 0.7264 | 0.7745 | 0.7952 | 0.8290 | 0.8430 | 0.8356 | 0.8391 | 0.8401 |
| 8 | 1.0456 | 1.0423 | 1.0578 | 1.0558 | 1.0615 | 1.0752 | 1.0573 | 1.0000 | 1.0154 | 0.9741 | 0.8093 | 0.7370 | 0.7656 | 0.8152 | 0.8373 | 0.8718 | 0.8852 | 0.8795 | 0.8822 | 0.8821 |
| 9 | 1.0185 | 1.0171 | 1.0335 | 1.0327 | 1.0392 | 1.0551 | 1.0394 | 0.9841 | 1.0000 | 0.9614 | 0.7960 | 0.7267 | 0.7571 | 0.8074 | 0.8304 | 0.8658 | 0.8801 | 0.8758 | 0.8801 | 0.8820 |
| 10 | 1.0551 | 1.0563 | 1.0740 | 1.0723 | 1.0784 | 1.0958 | 1.0811 | 1.0233 | 1.0381 | 1.0000 | 0.8240 | 0.7557 | 0.7890 | 0.8414 | 0.8670 | 0.9038 | 0.9182 | 0.9175 | 0.9226 | 0.9252 |
| 11 | 1.2507 | 1.2597 | 1.2849 | 1.2856 | 1.2957 | 1.3245 | 1.3138 | 1.2464 | 1.2654 | 1.2264 | 1.0000 | 0.9247 | 0.9735 | 1.0416 | 1.0777 | 1.1268 | 1.1476 | 1.1530 | 1.1648 | 1.1745 |
| 12 | 1.3306 | 1.3395 | 1.3682 | 1.3735 | 1.3885 | 1.4233 | 1.4134 | 1.3440 | 1.3698 | 1.3284 | 1.0855 | 1.0000 | 1.0549 | 1.1318 | 1.1704 | 1.2265 | 1.2531 | 1.2537 | 1.2696 | 1.2836 |
| 13 | 1.2685 | 1.2758 | 1.3025 | 1.3072 | 1.3211 | 1.3531 | 1.3426 | 1.2763 | 1.3007 | 1.2603 | 1.0314 | 0.9490 | 1.0000 | 1.0724 | 1.1083 | 1.1610 | 1.1859 | 1.1854 | 1.1997 | 1.2121 |
| 14 | 1.1890 | 1.1969 | 1.2216 | 1.2244 | 1.2360 | 1.2651 | 1.2553 | 1.1924 | 1.2131 | 1.1758 | 0.9604 | 0.8858 | 0.9333 | 1.0000 | 1.0341 | 1.0825 | 1.1043 | 1.1065 | 1.1192 | 1.1300 |
| 15 | 1.1399 | 1.1461 | 1.1704 | 1.1756 | 1.1889 | 1.2184 | 1.2092 | 1.1501 | 1.1732 | 1.1367 | 0.9310 | 0.8557 | 0.9019 | 0.9678 | 1.0000 | 1.0481 | 1.0713 | 1.0695 | 1.0830 | 1.0948 |
| 16 | 1.0858 | 1.0922 | 1.1154 | 1.1203 | 1.1330 | 1.1613 | 1.1528 | 1.0964 | 1.1183 | 1.0839 | 0.8871 | 0.8159 | 0.8603 | 0.9231 | 0.9541 | 1.0000 | 1.0221 | 1.0210 | 1.0340 | 1.0454 |
| 17 | 1.0632 | 1.0697 | 1.0925 | 1.0970 | 1.1090 | 1.1367 | 1.1285 | 1.0731 | 1.0941 | 1.0606 | 0.8674 | 0.7984 | 0.8420 | 0.9034 | 0.9339 | 0.9786 | 1.0000 | 0.9997 | 1.0123 | 1.0234 |
| 18 | 1.0514 | 1.0572 | 1.0805 | 1.0873 | 1.1013 | 1.1305 | 1.1228 | 1.0692 | 1.0928 | 1.0595 | 0.8681 | 0.7969 | 0.8411 | 0.9039 | 0.9339 | 0.9800 | 1.0033 | 1.0000 | 1.0140 | 1.0266 |
| 19 | 1.0350 | 1.0407 | 1.0637 | 1.0707 | 1.0847 | 1.1137 | 1.1063 | 1.0537 | 1.0772 | 1.0444 | 0.8559 | 0.7854 | 0.8292 | 0.8912 | 0.9208 | 0.9664 | 0.9896 | 0.9860 | 1.0000 | 1.0126 |
| 20 | 1.0268 | 1.0346 | 1.0572 | 1.0617 | 1.0736 | 1.1015 | 1.0946 | 1.0412 | 1.0613 | 1.0301 | 0.8405 | 0.7752 | 0.8187 | 0.8788 | 0.9093 | 0.9532 | 0.9742 | 0.9754 | 0.9884 | 1.0000 |

Table A.11. Comparison Ratios of Bundles $\Phi_{ij}$ and $\Phi_{ii}$ for Whole Milk and Lowfat Milk, Unadjusted, 1967-1986.

| | $\Gamma_{ij/ii}=(\Phi_{ij}/\Phi_{ii})$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ij | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 | 1.0000 | 0.9960 | 0.9831 | 0.9654 | 0.9625 | 0.9527 | 0.9302 | 0.8997 | 0.8931 | 0.8865 | 0.8735 | 0.8590 | 0.8445 | 0.8231 | 0.8027 | 0.7830 | 0.7754 | 0.7758 | 0.7815 | 0.7743 |
| 2 | 1.0039 | 1.0000 | 0.9870 | 0.9693 | 0.9665 | 0.9568 | 0.9342 | 0.9036 | 0.8971 | 0.8906 | 0.8776 | 0.8631 | 0.8486 | 0.8271 | 0.8067 | 0.7869 | 0.7794 | 0.7798 | 0.7855 | 0.7784 |
| 3 | 1.0164 | 1.0128 | 1.0000 | 0.9822 | 0.9797 | 0.9701 | 0.9476 | 0.9169 | 0.9106 | 0.9042 | 0.8914 | 0.8769 | 0.8624 | 0.8409 | 0.8204 | 0.8005 | 0.7930 | 0.7936 | 0.7998 | 0.7930 |
| 4 | 1.0341 | 1.0307 | 1.0179 | 1.0000 | 0.9976 | 0.9881 | 0.9654 | 0.9343 | 0.9281 | 0.9219 | 0.9091 | 0.8944 | 0.8798 | 0.8581 | 0.8373 | 0.8171 | 0.8095 | 0.8104 | 0.8169 | 0.8102 |
| 5 | 1.0362 | 1.0329 | 1.0202 | 1.0023 | 1.0000 | 0.9906 | 0.9680 | 0.9369 | 0.9308 | 0.9248 | 0.9121 | 0.8975 | 0.8829 | 0.8612 | 0.8405 | 0.8202 | 0.8127 | 0.8137 | 0.8203 | 0.8138 |
| 6 | 1.0457 | 1.0425 | 1.0298 | 1.0117 | 1.0094 | 1.0000 | 0.9773 | 0.9459 | 0.9398 | 0.9337 | 0.9210 | 0.9063 | 0.8916 | 0.8698 | 0.8489 | 0.8284 | 0.8208 | 0.8219 | 0.8286 | 0.8221 |
| 7 | 1.0683 | 1.0653 | 1.0526 | 1.0343 | 1.0322 | 1.0229 | 1.0000 | 0.9682 | 0.9623 | 0.9563 | 0.9436 | 0.9288 | 0.9139 | 0.8918 | 0.8706 | 0.8499 | 0.8422 | 0.8435 | 0.8507 | 0.8444 |
| 8 | 1.1016 | 1.0989 | 1.0860 | 1.0673 | 1.0654 | 1.0560 | 1.0326 | 1.0000 | 0.9941 | 0.9883 | 0.9754 | 0.9602 | 0.9451 | 0.9225 | 0.9007 | 0.8794 | 0.8716 | 0.8731 | 0.8808 | 0.8745 |
| 9 | 1.1052 | 1.1028 | 1.0903 | 1.0718 | 1.0701 | 1.0611 | 1.0380 | 1.0055 | 1.0000 | 0.9945 | 0.9819 | 0.9669 | 0.9519 | 0.9296 | 0.9079 | 0.8866 | 0.8789 | 0.8807 | 0.8888 | 0.8829 |
| 10 | 1.1111 | 1.1087 | 1.0961 | 1.0776 | 1.0759 | 1.0668 | 1.0437 | 1.0111 | 1.0055 | 1.0000 | 0.9874 | 0.9724 | 0.9573 | 0.9349 | 0.9131 | 0.8916 | 0.8839 | 0.8858 | 0.8940 | 0.8881 |
| 11 | 1.1227 | 1.1206 | 1.1082 | 1.0895 | 1.0880 | 1.0791 | 1.0560 | 1.0232 | 1.0178 | 1.0125 | 1.0000 | 0.9849 | 0.9698 | 0.9473 | 0.9254 | 0.9038 | 0.8961 | 0.8982 | 0.9067 | 0.9010 |
| 12 | 1.1397 | 1.1376 | 1.1249 | 1.1060 | 1.1045 | 1.0955 | 1.0721 | 1.0388 | 1.0333 | 1.0279 | 1.0153 | 1.0000 | 0.9847 | 0.9619 | 0.9397 | 0.9177 | 0.9099 | 0.9120 | 0.9207 | 0.9150 |
| 13 | 1.1707 | 1.1672 | 1.1532 | 1.1331 | 1.1307 | 1.1203 | 1.0950 | 1.0601 | 1.0534 | 1.0468 | 1.0327 | 1.0163 | 1.0000 | 0.9757 | 0.9524 | 0.9296 | 0.9212 | 0.9225 | 0.9302 | 0.9231 |
| 14 | 1.2072 | 1.2030 | 1.1880 | 1.1669 | 1.1640 | 1.1527 | 1.1261 | 1.0897 | 1.0823 | 1.0749 | 1.0598 | 1.0426 | 1.0255 | 1.0000 | 0.9757 | 0.9520 | 0.9431 | 0.9440 | 0.9515 | 0.9435 |
| 15 | 1.2167 | 1.2141 | 1.2004 | 1.1800 | 1.1782 | 1.1683 | 1.1430 | 1.1072 | 1.1012 | 1.0951 | 1.0814 | 1.0649 | 1.0484 | 1.0238 | 1.0000 | 0.9765 | 0.9681 | 0.9701 | 0.9791 | 0.9727 |
| 16 | 1.2407 | 1.2385 | 1.2248 | 1.2043 | 1.2027 | 1.1929 | 1.1675 | 1.1313 | 1.1255 | 1.1197 | 1.1060 | 1.0894 | 1.0728 | 1.0480 | 1.0238 | 1.0000 | 0.9915 | 0.9939 | 1.0034 | 0.9973 |
| 17 | 1.2501 | 1.2480 | 1.2343 | 1.2136 | 1.2121 | 1.2024 | 1.1768 | 1.1404 | 1.1346 | 1.1288 | 1.1151 | 1.0984 | 1.0817 | 1.0568 | 1.0325 | 1.0085 | 1.0000 | 1.0024 | 1.0121 | 1.0060 |
| 18 | 1.2423 | 1.2405 | 1.2272 | 1.2068 | 1.2055 | 1.1962 | 1.1711 | 1.1351 | 1.1296 | 1.1242 | 1.1109 | 1.0944 | 1.0780 | 1.0535 | 1.0295 | 1.0057 | 0.9974 | 1.0000 | 1.0099 | 1.0042 |
| 19 | 1.2247 | 1.2233 | 1.2105 | 1.1906 | 1.1896 | 1.1806 | 1.1563 | 1.1210 | 1.1159 | 1.1108 | 1.0980 | 1.0820 | 1.0660 | 1.0420 | 1.0185 | 0.9952 | 0.9870 | 0.9899 | 1.0000 | 0.9947 |
| 20 | 1.2371 | 1.2353 | 1.2220 | 1.2018 | 1.2005 | 1.1911 | 1.1662 | 1.1303 | 1.1249 | 1.1195 | 1.1062 | 1.0898 | 1.0735 | 1.0491 | 1.0251 | 1.0015 | 0.9932 | 0.9958 | 1.0057 | 1.0000 |

Table A.12. Comparison Ratios of Bundles $\Phi_{ij}$ and $\Phi_{ii}$ for Whole Milk and Lowfat Milk, Adjusted, 1967-1986.

| | $\Gamma_{ij/ii}=(\Phi_{ij}/\Phi_{ii})$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ij | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 | 1.0000 | 1.0001 | 1.0858 | 1.1394 | 1.1830 | 1.2346 | 1.1498 | 0.9320 | 1.1782 | 1.1905 | 1.3318 | 1.3809 | 1.4254 | 1.5567 | 1.6058 | 1.7141 | 1.7609 | 1.8164 | 1.8366 | 1.8884 |
| 2 | 0.9997 | 1.0000 | 1.0862 | 1.1402 | 1.1841 | 1.2361 | 1.1513 | 0.9330 | 1.1802 | 1.1928 | 1.3348 | 1.3842 | 1.4290 | 1.5610 | 1.6103 | 1.7191 | 1.7662 | 1.8220 | 1.8424 | 1.8946 |
| 3 | 0.9177 | 0.9188 | 1.0000 | 1.0510 | 1.0925 | 1.1418 | 1.0638 | 0.8613 | 1.0924 | 1.1049 | 1.2381 | 1.2848 | 1.3271 | 1.4509 | 1.4975 | 1.5993 | 1.6436 | 1.6961 | 1.7158 | 1.7654 |
| 4 | 0.8707 | 0.8722 | 0.9507 | 1.0000 | 1.0402 | 1.0880 | 1.0140 | 0.8204 | 1.0425 | 1.0550 | 1.1833 | 1.2284 | 1.2694 | 1.3886 | 1.4337 | 1.5316 | 1.5742 | 1.6249 | 1.6442 | 1.6924 |
| 5 | 0.8353 | 0.8371 | 0.9132 | 0.9610 | 1.0000 | 1.0464 | 0.9754 | 0.7889 | 1.0035 | 1.0159 | 1.1400 | 1.1838 | 1.2236 | 1.3389 | 1.3827 | 1.4773 | 1.5186 | 1.5678 | 1.5867 | 1.6334 |
| 6 | 0.7974 | 0.7993 | 0.8722 | 0.9180 | 0.9554 | 1.0000 | 0.9322 | 0.7538 | 0.9593 | 0.9712 | 1.0901 | 1.1321 | 1.1703 | 1.2808 | 1.3227 | 1.4133 | 1.4529 | 1.5000 | 1.5182 | 1.5630 |
| 7 | 0.8502 | 0.8529 | 0.9325 | 0.9826 | 1.0235 | 1.0724 | 1.0000 | 0.8080 | 1.0307 | 1.0443 | 1.1736 | 1.2194 | 1.2612 | 1.3813 | 1.4271 | 1.5255 | 1.5686 | 1.6199 | 1.6401 | 1.6894 |
| 8 | 1.0478 | 1.0519 | 1.1518 | 1.2147 | 1.2663 | 1.3279 | 1.2385 | 1.0000 | 1.2783 | 1.2958 | 1.4576 | 1.5152 | 1.5678 | 1.7182 | 1.7757 | 1.8987 | 1.9527 | 2.0171 | 2.0429 | 2.1050 |
| 9 | 0.8122 | 0.8162 | 0.8958 | 0.9460 | 0.9871 | 1.0365 | 0.9671 | 0.7801 | 1.0000 | 1.0146 | 1.1429 | 1.1888 | 1.2308 | 1.3501 | 1.3960 | 1.4933 | 1.5362 | 1.5874 | 1.6083 | 1.6581 |
| 10 | 0.7998 | 0.8039 | 0.8824 | 0.9320 | 0.9726 | 1.0213 | 0.9530 | 0.7686 | 0.9856 | 1.0000 | 1.1266 | 1.1720 | 1.2134 | 1.3311 | 1.3764 | 1.4725 | 1.5148 | 1.5654 | 1.5860 | 1.6352 |
| 11 | 0.7047 | 0.7087 | 0.7791 | 0.8236 | 0.8601 | 0.9039 | 0.8437 | 0.6800 | 0.8735 | 0.8868 | 1.0000 | 1.0407 | 1.0779 | 1.1831 | 1.2238 | 1.3095 | 1.3473 | 1.3927 | 1.4114 | 1.4557 |
| 12 | 0.6766 | 0.6806 | 0.7482 | 0.7910 | 0.8261 | 0.8683 | 0.8104 | 0.6532 | 0.8392 | 0.8520 | 0.9608 | 1.0000 | 1.0358 | 1.1369 | 1.1760 | 1.2585 | 1.2948 | 1.3384 | 1.3565 | 1.3991 |
| 13 | 0.6773 | 0.6792 | 0.7420 | 0.7814 | 0.8137 | 0.8521 | 0.7945 | 0.6422 | 0.8184 | 0.8289 | 0.9310 | 0.9671 | 1.0000 | 1.0949 | 1.1310 | 1.2088 | 1.2428 | 1.2833 | 1.2991 | 1.3378 |
| 14 | 0.6302 | 0.6311 | 0.6873 | 0.7226 | 0.7513 | 0.7855 | 0.7320 | 0.5924 | 0.7520 | 0.7608 | 0.8528 | 0.8851 | 0.9145 | 1.0000 | 1.0323 | 1.1026 | 1.1332 | 1.1695 | 1.1832 | 1.2176 |
| 15 | 0.5808 | 0.5838 | 0.6409 | 0.6769 | 0.7064 | 0.7418 | 0.6922 | 0.5583 | 0.7159 | 0.7264 | 0.8184 | 0.8514 | 0.8815 | 0.9670 | 1.0000 | 1.0698 | 1.1005 | 1.1373 | 1.1523 | 1.1881 |
| 16 | 0.5362 | 0.5394 | 0.5933 | 0.6274 | 0.6554 | 0.6890 | 0.6431 | 0.5182 | 0.6662 | 0.6765 | 0.7631 | 0.7943 | 0.8228 | 0.9033 | 0.9344 | 1.0000 | 1.0290 | 1.0637 | 1.0781 | 1.1121 |
| 17 | 0.5197 | 0.5229 | 0.5754 | 0.6086 | 0.6359 | 0.6686 | 0.6242 | 0.5029 | 0.6468 | 0.6569 | 0.7412 | 0.7715 | 0.7993 | 0.8777 | 0.9080 | 0.9718 | 1.0000 | 1.0338 | 1.0479 | 1.0810 |
| 18 | 0.4971 | 0.5006 | 0.5518 | 0.5843 | 0.6109 | 0.6429 | 0.6004 | 0.4833 | 0.6230 | 0.6331 | 0.7150 | 0.7447 | 0.7718 | 0.8480 | 0.8777 | 0.9396 | 0.9671 | 1.0000 | 1.0139 | 1.0464 |
| 19 | 0.4845 | 0.4883 | 0.5392 | 0.5715 | 0.5980 | 0.6300 | 0.5885 | 0.4734 | 0.6115 | 0.6218 | 0.7030 | 0.7326 | 0.7596 | 0.8352 | 0.8647 | 0.9260 | 0.9532 | 0.9860 | 1.0000 | 1.0324 |
| 20 | 0.4751 | 0.4785 | 0.5274 | 0.5584 | 0.5838 | 0.6145 | 0.5738 | 0.4619 | 0.5954 | 0.6050 | 0.6833 | 0.7117 | 0.7376 | 0.8104 | 0.8388 | 0.8980 | 0.9242 | 0.9557 | 0.9690 | 1.0000 |

Table A.13. Comparison Ratios of Bundles $\Phi_{ij}$ and $\Phi_{ii}$ for Lowfat Milk and Juices, Unadjusted, 1967-1986.

| | $\Gamma_{ij/ii}=(\Phi_{ij}/\Phi_{ii})$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ij | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 | 1.0000 | 1.0313 | 1.0774 | 1.1786 | 1.2976 | 1.4155 | 1.4721 | 1.5411 | 1.6796 | 1.7494 | 1.8172 | 1.7594 | 1.8148 | 1.8703 | 1.8444 | 1.8878 | 1.9858 | 1.9087 | 2.0425 | 2.1658 |
| 2 | 0.9746 | 1.0000 | 1.0412 | 1.1410 | 1.2569 | 1.3709 | 1.4228 | 1.4899 | 1.6248 | 1.6900 | 1.7532 | 1.6920 | 1.7454 | 1.7980 | 1.7699 | 1.8129 | 1.9104 | 1.8278 | 1.9569 | 2.0755 |
| 3 | 0.9368 | 0.9608 | 1.0000 | 1.0960 | 1.2075 | 1.3170 | 1.3666 | 1.4310 | 1.5607 | 1.6231 | 1.6836 | 1.6243 | 1.6755 | 1.7259 | 1.6987 | 1.7401 | 1.8340 | 1.7539 | 1.8779 | 1.9917 |
| 4 | 0.8478 | 0.8749 | 0.9143 | 1.0000 | 1.1009 | 1.2009 | 1.2493 | 1.3077 | 1.4252 | 1.4846 | 1.5423 | 1.4938 | 1.5409 | 1.5881 | 1.5664 | 1.6031 | 1.6860 | 1.6214 | 1.7349 | 1.8396 |
| 5 | 0.7720 | 0.7950 | 0.8298 | 0.9082 | 1.0000 | 1.0909 | 1.1338 | 1.1870 | 1.2940 | 1.3472 | 1.3989 | 1.3533 | 1.3959 | 1.4384 | 1.4178 | 1.4515 | 1.5275 | 1.4664 | 1.5694 | 1.6642 |
| 6 | 0.7100 | 0.7293 | 0.7598 | 0.8324 | 0.9168 | 1.0000 | 1.0383 | 1.0872 | 1.1855 | 1.2334 | 1.2799 | 1.2361 | 1.2751 | 1.3136 | 1.2936 | 1.3248 | 1.3955 | 1.3365 | 1.4308 | 1.5174 |
| 7 | 0.6796 | 0.7007 | 0.7318 | 0.8007 | 0.8815 | 0.9617 | 1.0000 | 1.0468 | 1.1410 | 1.1883 | 1.2342 | 1.1948 | 1.2324 | 1.2701 | 1.2523 | 1.2819 | 1.3486 | 1.2959 | 1.3867 | 1.4705 |
| 8 | 0.6428 | 0.6670 | 0.6994 | 0.7636 | 0.8401 | 0.9167 | 0.9556 | 1.0000 | 1.0892 | 1.1362 | 1.1820 | 1.1488 | 1.1849 | 1.2217 | 1.2073 | 1.2346 | 1.2961 | 1.2524 | 1.3393 | 1.4199 |
| 9 | 0.5929 | 0.6132 | 0.6418 | 0.7014 | 0.7719 | 0.8422 | 0.8769 | 0.9178 | 1.0000 | 1.0423 | 1.0834 | 1.0508 | 1.0839 | 1.1173 | 1.1029 | 1.1284 | 1.1858 | 1.1426 | 1.2224 | 1.2960 |
| 10 | 0.5659 | 0.5871 | 0.6156 | 0.6721 | 0.7395 | 0.8068 | 0.8411 | 0.8801 | 0.9587 | 1.0000 | 1.0402 | 1.0108 | 1.0426 | 1.0750 | 1.0622 | 1.0862 | 1.1405 | 1.1018 | 1.1783 | 1.2492 |
| 11 | 0.5546 | 0.5697 | 0.5937 | 0.6503 | 0.7163 | 0.7813 | 0.8112 | 0.8494 | 0.9262 | 0.9637 | 1.0000 | 0.9658 | 0.9963 | 1.0264 | 1.0108 | 1.0352 | 1.0904 | 1.0444 | 1.1180 | 1.1857 |
| 12 | 0.5941 | 0.6025 | 0.6225 | 0.6849 | 0.7556 | 0.8238 | 0.8509 | 0.8916 | 0.9737 | 1.0096 | 1.0441 | 1.0000 | 1.0317 | 1.0617 | 1.0407 | 1.0680 | 1.1300 | 1.0693 | 1.1463 | 1.2163 |
| 13 | 0.5775 | 0.5850 | 0.6040 | 0.6648 | 0.7335 | 0.7996 | 0.8256 | 0.8652 | 0.9449 | 0.9794 | 1.0127 | 0.9693 | 1.0000 | 1.0290 | 1.0082 | 1.0348 | 1.0954 | 1.0355 | 1.1102 | 1.1780 |
| 14 | 0.5566 | 0.5656 | 0.5851 | 0.6433 | 0.7095 | 0.7736 | 0.7997 | 0.8379 | 0.9148 | 0.9490 | 0.9820 | 0.9418 | 0.9716 | 1.0000 | 0.9809 | 1.0063 | 1.0641 | 1.0088 | 1.0812 | 1.1471 |
| 15 | 0.5739 | 0.5810 | 0.5996 | 0.6601 | 0.7284 | 0.7941 | 0.8196 | 0.8590 | 0.9382 | 0.9723 | 1.0052 | 0.9616 | 0.9921 | 1.0208 | 1.0000 | 1.0265 | 1.0868 | 1.0268 | 1.1009 | 1.1682 |
| 16 | 0.5579 | 0.5652 | 0.5836 | 0.6423 | 0.7087 | 0.7726 | 0.7977 | 0.8360 | 0.9130 | 0.9464 | 0.9786 | 0.9366 | 0.9663 | 0.9943 | 0.9743 | 1.0000 | 1.0585 | 1.0007 | 1.0729 | 1.1384 |
| 17 | 0.5257 | 0.5331 | 0.5508 | 0.6061 | 0.6686 | 0.7289 | 0.7529 | 0.7890 | 0.8616 | 0.8933 | 0.9239 | 0.8849 | 0.9130 | 0.9395 | 0.9210 | 0.9451 | 1.0000 | 0.9464 | 1.0145 | 1.0764 |
| 18 | 0.5675 | 0.5721 | 0.5888 | 0.6491 | 0.7166 | 0.7812 | 0.8049 | 0.8437 | 0.9220 | 0.9544 | 0.9856 | 0.9402 | 0.9701 | 0.9977 | 0.9758 | 1.0023 | 1.0629 | 1.0000 | 1.0727 | 1.1385 |
| 19 | 0.5294 | 0.5336 | 0.5491 | 0.6054 | 0.6683 | 0.7285 | 0.7506 | 0.7868 | 0.8598 | 0.8900 | 0.9190 | 0.8766 | 0.9045 | 0.9302 | 0.9097 | 0.9345 | 0.9910 | 0.9322 | 1.0000 | 1.0613 |
| 20 | 0.4897 | 0.4962 | 0.5125 | 0.5640 | 0.6222 | 0.6784 | 0.7005 | 0.7341 | 0.8016 | 0.8310 | 0.8593 | 0.8226 | 0.8487 | 0.8733 | 0.8558 | 0.8783 | 0.9296 | 0.8791 | 0.9424 | 1.0000 |

Table A.14. Comparison Ratios of Bundles $\Phi_{ij}$ and $\Phi_{ii}$ for Lowfat Milk and Juices, Adjusted, 1967-1986.

| | $\Gamma_{ij/ii}=(\Phi_{ij}/\Phi_{ii})$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ij | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 | 1.0000 | 0.9370 | 0.9404 | 1.0123 | 0.9982 | 0.9782 | 0.9671 | 0.9201 | 0.9781 | 1.0295 | 0.9388 | 0.7256 | 0.7970 | 0.9930 | 0.8850 | 0.9689 | 1.0203 | 0.9697 | 0.9704 | 1.1685 |
| 2 | 1.0733 | 1.0000 | 0.9995 | 1.0780 | 1.0628 | 1.0404 | 1.0249 | 0.9743 | 1.0364 | 1.0885 | 0.9879 | 0.7538 | 0.8297 | 1.0384 | 0.9195 | 1.0102 | 1.0676 | 1.0050 | 1.0044 | 1.2152 |
| 3 | 1.0748 | 1.0009 | 1.0000 | 1.0787 | 1.0635 | 1.0409 | 1.0250 | 0.9743 | 1.0365 | 1.0884 | 0.9874 | 0.7523 | 0.8283 | 1.0371 | 0.9177 | 1.0087 | 1.0663 | 1.0029 | 1.0021 | 1.2130 |
| 4 | 0.9870 | 0.9254 | 0.9292 | 1.0000 | 0.9861 | 0.9665 | 0.9559 | 0.9095 | 0.9668 | 1.0179 | 0.9286 | 0.7187 | 0.7893 | 0.9829 | 0.8766 | 0.9593 | 1.0098 | 0.9607 | 0.9615 | 1.1572 |
| 5 | 1.0040 | 0.9393 | 0.9416 | 1.0141 | 1.0000 | 0.9797 | 0.9676 | 0.9204 | 0.9786 | 1.0294 | 0.9375 | 0.7221 | 0.7936 | 0.9899 | 0.8808 | 0.9651 | 1.0173 | 0.9644 | 0.9647 | 1.1631 |
| 6 | 1.0296 | 0.9605 | 0.9609 | 1.0358 | 1.0213 | 1.0000 | 0.9858 | 0.9373 | 0.9970 | 1.0476 | 0.9517 | 0.7282 | 0.8012 | 1.0017 | 0.8883 | 0.9752 | 1.0298 | 0.9715 | 0.9711 | 1.1737 |
| 7 | 1.0348 | 0.9693 | 0.9725 | 1.0470 | 1.0324 | 1.0117 | 1.0000 | 0.9513 | 1.0114 | 1.0644 | 0.9703 | 0.7494 | 0.8233 | 1.0259 | 0.9141 | 1.0008 | 1.0542 | 1.0013 | 1.0020 | 1.2068 |
| 8 | 1.0698 | 1.0091 | 1.0175 | 1.0929 | 1.0779 | 1.0578 | 1.0502 | 1.0000 | 1.0623 | 1.1209 | 1.0276 | 0.8060 | 0.8832 | 1.0948 | 0.9829 | 1.0716 | 1.1242 | 1.0798 | 1.0821 | 1.2962 |
| 9 | 1.0152 | 0.9542 | 0.9597 | 1.0321 | 1.0178 | 0.9981 | 0.9887 | 0.9410 | 1.0000 | 1.0538 | 0.9633 | 0.7497 | 0.8225 | 1.0223 | 0.9144 | 0.9990 | 1.0502 | 1.0031 | 1.0045 | 1.2065 |
| 10 | 0.9550 | 0.9006 | 0.9079 | 0.9753 | 0.9619 | 0.9439 | 0.9370 | 0.8922 | 0.9478 | 1.0000 | 0.9165 | 0.7185 | 0.7873 | 0.9762 | 0.8762 | 0.9554 | 1.0024 | 0.9624 | 0.9645 | 1.1555 |
| 11 | 1.0814 | 1.0089 | 1.0094 | 1.0881 | 1.0729 | 1.0505 | 1.0357 | 0.9848 | 1.0474 | 1.1006 | 1.0000 | 0.7653 | 0.8420 | 1.0526 | 0.9335 | 1.0248 | 1.0821 | 1.0210 | 1.0206 | 1.2334 |
| 12 | 1.5401 | 1.4165 | 1.4026 | 1.5192 | 1.4975 | 1.4619 | 1.4278 | 1.3549 | 1.4435 | 1.5083 | 1.3537 | 1.0000 | 1.1068 | 1.4008 | 1.2201 | 1.3531 | 1.4422 | 1.3257 | 1.3202 | 1.6168 |
| 13 | 1.4007 | 1.2868 | 1.2731 | 1.3795 | 1.3598 | 1.3271 | 1.2952 | 1.2288 | 1.3093 | 1.3675 | 1.2261 | 0.9030 | 1.0000 | 1.2669 | 1.1018 | 1.2229 | 1.3045 | 1.1965 | 1.1911 | 1.4604 |
| 14 | 1.0879 | 1.0028 | 0.9945 | 1.0764 | 1.0611 | 1.0363 | 1.0136 | 0.9622 | 1.0248 | 1.0717 | 0.9637 | 0.7160 | 0.7917 | 1.0000 | 0.8735 | 0.9671 | 1.0293 | 0.9501 | 0.9468 | 1.1570 |
| 15 | 1.2770 | 1.1723 | 1.1592 | 1.2564 | 1.2384 | 1.2085 | 1.1788 | 1.1183 | 1.1917 | 1.2443 | 1.1149 | 0.8196 | 0.9079 | 1.1510 | 1.0000 | 1.1105 | 1.1853 | 1.0855 | 1.0805 | 1.3257 |
| 16 | 1.1449 | 1.0519 | 1.0408 | 1.1277 | 1.1116 | 1.0849 | 1.0588 | 1.0046 | 1.0704 | 1.1180 | 1.0024 | 0.7384 | 0.8177 | 1.0359 | 0.9010 | 1.0000 | 1.0667 | 0.9784 | 0.9741 | 1.1942 |
| 17 | 1.0675 | 0.9819 | 0.9724 | 1.0532 | 1.0381 | 1.0134 | 0.9899 | 0.9393 | 1.0007 | 1.0457 | 0.9385 | 0.6935 | 0.7675 | 0.9713 | 0.8461 | 0.9382 | 1.0000 | 0.9193 | 0.9156 | 1.1212 |
| 18 | 1.2150 | 1.1102 | 1.0941 | 1.1877 | 1.1706 | 1.1411 | 1.1096 | 1.0519 | 1.1216 | 1.1688 | 1.0428 | 0.7568 | 0.8402 | 1.0700 | 0.9235 | 1.0294 | 1.1025 | 1.0000 | 0.9939 | 1.2256 |
| 19 | 1.2241 | 1.1183 | 1.1019 | 1.1962 | 1.1790 | 1.1493 | 1.1174 | 1.0593 | 1.1295 | 1.1769 | 1.0498 | 0.7615 | 0.8455 | 1.0770 | 0.9293 | 1.0360 | 1.1097 | 1.0062 | 1.0000 | 1.2333 |
| 20 | 0.9572 | 0.8797 | 0.8705 | 0.9432 | 0.9297 | 0.9074 | 0.8858 | 0.8404 | 0.8955 | 0.9353 | 0.8389 | 0.6184 | 0.6847 | 0.8672 | 0.7545 | 0.8372 | 0.8929 | 0.8194 | 0.8159 | 1.0000 |

Table A.15. Comparison Ratios of Bundles $\Phi_{ij}$ and $\Phi_{ii}$ for Whole Milk and Juice, Unadjusted, 1967-1986.

| | $\Gamma_{ij/ii}=(\Phi_{ij}/\Phi_{ii})$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ii \ ij | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 | 1.0000 | 0.9694 | 0.9391 | 0.9337 | 0.9370 | 0.9285 | 0.8918 | 0.8658 | 0.8657 | 0.8476 | 0.8230 | 0.7791 | 0.7648 | 0.7389 | 0.7029 | 0.6904 | 0.6989 | 0.6541 | 0.6593 | 0.6497 |
| 2 | 1.0321 | 1.0000 | 0.9689 | 0.9655 | 0.9709 | 0.9639 | 0.9267 | 0.9014 | 0.9036 | 0.8856 | 0.8609 | 0.8139 | 0.8002 | 0.7744 | 0.7365 | 0.7248 | 0.7356 | 0.6866 | 0.6938 | 0.6857 |
| 3 | 1.0653 | 1.0321 | 1.0000 | 0.9971 | 1.0033 | 0.9967 | 0.9584 | 0.9328 | 0.9358 | 0.9174 | 0.8921 | 0.8431 | 0.8292 | 0.8028 | 0.7635 | 0.7518 | 0.7636 | 0.7122 | 0.7202 | 0.7122 |
| 4 | 1.0705 | 1.0377 | 1.0053 | 1.0000 | 1.0040 | 0.9954 | 0.9562 | 0.9288 | 0.9292 | 0.9101 | 0.8838 | 0.8365 | 0.8214 | 0.7939 | 0.7552 | 0.7421 | 0.7516 | 0.7031 | 0.7091 | 0.6992 |
| 5 | 1.0644 | 1.0315 | 0.9994 | 0.9951 | 1.0000 | 0.9922 | 0.9536 | 0.9270 | 0.9285 | 0.9097 | 0.8839 | 0.8361 | 0.8216 | 0.7946 | 0.7558 | 0.7434 | 0.7538 | 0.7042 | 0.7110 | 0.7020 |
| 6 | 1.0694 | 1.0361 | 1.0039 | 1.0008 | 1.0068 | 1.0000 | 0.9615 | 0.9357 | 0.9385 | 0.9199 | 0.8945 | 0.8455 | 0.8314 | 0.8049 | 0.7655 | 0.7536 | 0.7652 | 0.7139 | 0.7217 | 0.7136 |
| 7 | 1.1164 | 1.0819 | 1.0482 | 1.0437 | 1.0488 | 1.0405 | 1.0000 | 0.9721 | 0.9736 | 0.9539 | 0.9268 | 0.8767 | 0.8614 | 0.8332 | 0.7925 | 0.7794 | 0.7903 | 0.7383 | 0.7454 | 0.7359 |
| 8 | 1.1588 | 1.1236 | 1.0883 | 1.0812 | 1.0842 | 1.0735 | 1.0308 | 1.0000 | 0.9989 | 0.9777 | 0.9488 | 0.8987 | 0.8817 | 0.8513 | 0.8098 | 0.7949 | 0.8038 | 0.7531 | 0.7584 | 0.7465 |
| 9 | 1.1502 | 1.1148 | 1.0800 | 1.0747 | 1.0794 | 1.0703 | 1.0284 | 0.9992 | 1.0000 | 0.9795 | 0.9514 | 0.9003 | 0.8843 | 0.8549 | 0.8131 | 0.7993 | 0.8098 | 0.7572 | 0.7640 | 0.7536 |
| 10 | 1.1819 | 1.1459 | 1.1100 | 1.1032 | 1.1068 | 1.0964 | 1.0530 | 1.0220 | 1.0215 | 1.0000 | 0.9707 | 0.9192 | 0.9021 | 0.8714 | 0.8289 | 0.8140 | 0.8236 | 0.7711 | 0.7770 | 0.7653 |
| 11 | 1.1859 | 1.1486 | 1.1130 | 1.1111 | 1.1191 | 1.1129 | 1.0706 | 1.0432 | 1.0478 | 1.0278 | 1.0000 | 0.9444 | 0.9296 | 0.9008 | 0.8566 | 0.8443 | 0.8587 | 0.7998 | 0.8098 | 0.8020 |
| 12 | 1.2128 | 1.1730 | 1.1372 | 1.1428 | 1.1578 | 1.1579 | 1.1168 | 1.0942 | 1.1070 | 1.0887 | 1.0628 | 1.0000 | 0.9883 | 0.9621 | 0.9146 | 0.9061 | 0.9280 | 0.8581 | 0.8745 | 0.8728 |
| 13 | 1.2334 | 1.1931 | 1.1566 | 1.1613 | 1.1757 | 1.1749 | 1.1328 | 1.1091 | 1.1210 | 1.1021 | 1.0754 | 1.0124 | 1.0000 | 0.9729 | 0.9249 | 0.9157 | 0.9371 | 0.8673 | 0.8832 | 0.8805 |
| 14 | 1.2869 | 1.2455 | 1.2072 | 1.2093 | 1.2218 | 1.2186 | 1.1739 | 1.1471 | 1.1565 | 1.1360 | 1.1072 | 1.0437 | 1.0294 | 1.0000 | 0.9508 | 0.9397 | 0.9593 | 0.8900 | 0.9043 | 0.8992 |
| 15 | 1.3209 | 1.2773 | 1.2385 | 1.2453 | 1.2623 | 1.2631 | 1.2185 | 1.1945 | 1.2092 | 1.1896 | 1.1616 | 1.0926 | 1.0802 | 1.0520 | 1.0000 | 0.9911 | 1.0158 | 0.9386 | 0.9572 | 0.9559 |
| 16 | 1.3325 | 1.2885 | 1.2493 | 1.2562 | 1.2735 | 1.2743 | 1.2293 | 1.2050 | 1.2199 | 1.2001 | 1.1719 | 1.1023 | 1.0898 | 1.0613 | 1.0089 | 1.0000 | 1.0249 | 0.9470 | 0.9658 | 0.9645 |
| 17 | 1.3053 | 1.2623 | 1.2239 | 1.2300 | 1.2464 | 1.2467 | 1.2024 | 1.1782 | 1.1922 | 1.1726 | 1.1448 | 1.0771 | 1.0645 | 1.0364 | 0.9852 | 0.9762 | 1.0000 | 0.9245 | 0.9423 | 0.9406 |
| 18 | 1.3735 | 1.3271 | 1.2871 | 1.2986 | 1.3205 | 1.3252 | 1.2800 | 1.2583 | 1.2784 | 1.2594 | 1.2318 | 1.1565 | 1.1456 | 1.1182 | 1.0628 | 1.0560 | 1.0861 | 1.0000 | 1.0231 | 1.0254 |
| 19 | 1.3371 | 1.2918 | 1.2529 | 1.2648 | 1.2867 | 1.2918 | 1.2480 | 1.2274 | 1.2477 | 1.2293 | 1.2026 | 1.1288 | 1.1185 | 1.0922 | 1.0380 | 1.0318 | 1.0616 | 0.9770 | 1.0000 | 1.0028 |
| 20 | 1.3775 | 1.3319 | 1.2914 | 1.2990 | 1.3172 | 1.3184 | 1.2720 | 1.2473 | 1.2631 | 1.2428 | 1.2137 | 1.1414 | 1.1287 | 1.0995 | 1.0451 | 1.0362 | 1.0623 | 0.9813 | 1.0010 | 1.0000 |

Table A.16. Comparison Ratios of Bundles $\Phi_{ij}$ and $\Phi_{ii}$ for Whole Milk and Juice, Adjusted, 1967-1986.

| | $\Gamma_{ij/ii}=(\Phi_{ij}/\Phi_{ii})$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ii / ij | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 | 1.0000 | 0.9709 | 1.0338 | 1.1090 | 1.1214 | 1.1301 | 1.1024 | 0.9986 | 1.1420 | 1.1871 | 1.1818 | 1.0643 | 1.0768 | 1.2117 | 1.2019 | 1.2791 | 1.3097 | 1.2967 | 1.2901 | 1.3914 |
| 2 | 1.0310 | 1.0000 | 1.0700 | 1.1564 | 1.1740 | 1.1880 | 1.1611 | 1.0536 | 1.2139 | 1.2650 | 1.2621 | 1.1335 | 1.1499 | 1.2992 | 1.2890 | 1.3758 | 1.4131 | 1.3952 | 1.3917 | 1.5056 |
| 3 | 0.9625 | 0.9332 | 1.0000 | 1.0831 | 1.1009 | 1.1153 | 1.0908 | 0.9902 | 1.1433 | 1.1923 | 1.1903 | 1.0682 | 1.0845 | 1.2267 | 1.2172 | 1.3001 | 1.3366 | 1.3186 | 1.3163 | 1.4253 |
| 4 | 0.8994 | 0.8730 | 0.9306 | 1.0000 | 1.0121 | 1.0210 | 0.9964 | 0.9029 | 1.0344 | 1.0759 | 1.0716 | 0.9645 | 0.9764 | 1.0998 | 1.0910 | 1.1618 | 1.1905 | 1.1779 | 1.1726 | 1.2656 |
| 5 | 0.8827 | 0.8565 | 0.9149 | 0.9863 | 1.0000 | 1.0105 | 0.9871 | 0.8951 | 1.0288 | 1.0712 | 1.0680 | 0.9600 | 0.9730 | 1.0979 | 1.0892 | 1.1614 | 1.1917 | 1.1777 | 1.1737 | 1.2685 |
| 6 | 0.8645 | 0.8383 | 0.8979 | 0.9718 | 0.9874 | 1.0000 | 0.9778 | 0.8875 | 1.0241 | 1.0678 | 1.0658 | 0.9567 | 0.9710 | 1.0980 | 1.0894 | 1.1634 | 1.1957 | 1.1799 | 1.1776 | 1.2748 |
| 7 | 0.8947 | 0.8681 | 0.9272 | 0.9994 | 1.0132 | 1.0238 | 1.0000 | 0.9068 | 1.0421 | 1.0850 | 1.0817 | 0.9724 | 0.9855 | 1.1119 | 1.1031 | 1.1762 | 1.2068 | 1.1926 | 1.1886 | 1.2845 |
| 8 | 1.0100 | 0.9810 | 1.0426 | 1.1154 | 1.1263 | 1.1333 | 1.1047 | 1.0000 | 1.1404 | 1.1843 | 1.1781 | 1.0621 | 1.0734 | 1.2060 | 1.1962 | 1.2716 | 1.3005 | 1.2890 | 1.2811 | 1.3800 |
| 9 | 0.8658 | 0.8403 | 0.8963 | 0.9642 | 0.9764 | 0.9855 | 0.9620 | 0.8720 | 1.0000 | 1.0405 | 1.0367 | 0.9327 | 0.9446 | 1.0645 | 1.0560 | 1.1251 | 1.1534 | 1.1407 | 1.1360 | 1.2266 |
| 10 | 0.8465 | 0.8220 | 0.8746 | 0.9372 | 0.9472 | 0.9540 | 0.9303 | 0.8425 | 0.9624 | 1.0000 | 0.9952 | 0.8967 | 0.9068 | 1.0198 | 1.0116 | 1.0760 | 1.1013 | 1.0908 | 1.0848 | 1.1694 |
| 11 | 0.7934 | 0.7688 | 0.8261 | 0.8984 | 0.9151 | 0.9292 | 0.9097 | 0.8266 | 0.9581 | 1.0005 | 1.0000 | 0.8961 | 0.9110 | 1.0327 | 1.0248 | 1.0962 | 1.1287 | 1.1120 | 1.1115 | 1.2055 |
| 12 | 0.8000 | 0.7725 | 0.8441 | 0.9407 | 0.9703 | 0.9977 | 0.9828 | 0.8977 | 1.0634 | 1.1187 | 1.1249 | 1.0000 | 1.0246 | 1.1747 | 1.1664 | 1.2575 | 1.3057 | 1.2767 | 1.2852 | 1.4054 |
| 13 | 0.7923 | 0.7655 | 0.8345 | 0.9268 | 0.9543 | 0.9796 | 0.9642 | 0.8801 | 1.0396 | 1.0926 | 1.0979 | 0.9769 | 1.0000 | 1.1448 | 1.1366 | 1.2242 | 1.2698 | 1.2428 | 1.2499 | 1.3655 |
| 14 | 0.7222 | 0.6987 | 0.7570 | 0.8335 | 0.8544 | 0.8732 | 0.8576 | 0.7813 | 0.9159 | 0.9601 | 0.9627 | 0.8590 | 0.8769 | 1.0000 | 0.9926 | 1.0663 | 1.1028 | 1.0821 | 1.0857 | 1.1827 |
| 15 | 0.6780 | 0.6544 | 0.7163 | 0.8002 | 0.8264 | 0.8508 | 0.8386 | 0.7663 | 0.9097 | 0.9575 | 0.9635 | 0.8558 | 0.8775 | 1.0071 | 1.0000 | 1.0789 | 1.1211 | 1.0954 | 1.1034 | 1.2076 |
| 16 | 0.6280 | 0.6062 | 0.6636 | 0.7414 | 0.7657 | 0.7883 | 0.7770 | 0.7101 | 0.8430 | 0.8874 | 0.8929 | 0.7931 | 0.8133 | 0.9334 | 0.9268 | 1.0000 | 1.0391 | 1.0153 | 1.0228 | 1.1193 |
| 17 | 0.6108 | 0.5898 | 0.6447 | 0.7188 | 0.7417 | 0.7629 | 0.7516 | 0.6866 | 0.8137 | 0.8561 | 0.8611 | 0.7653 | 0.7843 | 0.8994 | 0.8930 | 0.9630 | 1.0000 | 0.9776 | 0.9843 | 1.0766 |
| 18 | 0.5764 | 0.5552 | 0.6139 | 0.6956 | 0.7236 | 0.7502 | 0.7419 | 0.6799 | 0.8164 | 0.8626 | 0.8706 | 0.7702 | 0.7929 | 0.9151 | 0.9090 | 0.9845 | 1.0271 | 1.0000 | 1.0108 | 1.1105 |
| 19 | 0.5639 | 0.5430 | 0.6014 | 0.6830 | 0.7111 | 0.7381 | 0.7303 | 0.6695 | 0.8053 | 0.8513 | 0.8597 | 0.7601 | 0.7829 | 0.9043 | 0.8983 | 0.9735 | 1.0162 | 0.9889 | 1.0000 | 1.0993 |
| 20 | 0.5570 | 0.5376 | 0.5890 | 0.6589 | 0.6809 | 0.7015 | 0.6917 | 0.6323 | 0.7514 | 0.7913 | 0.7964 | 0.7072 | 0.7254 | 0.8330 | 0.8271 | 0.8928 | 0.9280 | 0.9065 | 0.9134 | 1.0000 |

Table A.17. Comparison Ratios of Bundles $\Phi_{ij}$ and $\Phi_{ii}$ for Butter, Margarine, and Salad and Cooking Oils, Unadjusted, 1967-1986.

| | $\Gamma_{ij/ii} = (\Phi_{ij}/\Phi_{ii})$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ij | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 | 1.0000 | 1.0425 | 1.0457 | 1.0593 | 1.0409 | 1.0631 | 1.0593 | 1.0358 | 1.0399 | 1.0755 | 1.0434 | 1.0741 | 1.1065 | 1.1221 | 1.1242 | 1.1317 | 1.1806 | 1.1576 | 1.2539 | 1.2463 |
| 2 | 0.9591 | 1.0000 | 1.0027 | 1.0155 | 0.9978 | 1.0188 | 1.0150 | 0.9923 | 0.9964 | 1.0301 | 0.9994 | 1.0287 | 1.0597 | 1.0747 | 1.0763 | 1.0836 | 1.1308 | 1.1088 | 1.2007 | 1.1932 |
| 3 | 0.9564 | 0.9973 | 1.0000 | 1.0128 | 0.9951 | 1.0160 | 1.0121 | 0.9895 | 0.9936 | 1.0270 | 0.9965 | 1.0258 | 1.0569 | 1.0718 | 1.0734 | 1.0808 | 1.1281 | 1.1061 | 1.1979 | 1.1901 |
| 4 | 0.9426 | 0.9825 | 0.9864 | 1.0000 | 0.9827 | 1.0045 | 1.0014 | 0.9795 | 0.9830 | 1.0178 | 0.9871 | 1.0166 | 1.0478 | 1.0629 | 1.0658 | 1.0730 | 1.1192 | 1.0969 | 1.1898 | 1.1826 |
| 5 | 0.9578 | 0.9978 | 1.0027 | 1.0173 | 1.0000 | 1.0231 | 1.0204 | 0.9986 | 1.0018 | 1.0387 | 1.0071 | 1.0373 | 1.0693 | 1.0849 | 1.0888 | 1.0959 | 1.1421 | 1.1190 | 1.2150 | 1.2084 |
| 6 | 0.9357 | 0.9747 | 0.9797 | 0.9941 | 0.9772 | 1.0000 | 0.9975 | 0.9763 | 0.9792 | 1.0157 | 0.9847 | 1.0142 | 1.0455 | 1.0608 | 1.0648 | 1.0717 | 1.1166 | 1.0940 | 1.1881 | 1.1817 |
| 7 | 0.9368 | 0.9755 | 0.9809 | 0.9957 | 0.9791 | 1.0023 | 1.0000 | 0.9791 | 0.9818 | 1.0193 | 0.9879 | 1.0174 | 1.0487 | 1.0640 | 1.0684 | 1.0751 | 1.1192 | 1.0965 | 1.1911 | 1.1854 |
| 8 | 0.9450 | 0.9824 | 0.9910 | 1.0088 | 0.9930 | 1.0197 | 1.0193 | 1.0000 | 1.0008 | 1.0448 | 1.0114 | 1.0418 | 1.0741 | 1.0904 | 1.0980 | 1.1042 | 1.1451 | 1.1209 | 1.2217 | 1.2187 |
| 9 | 0.9446 | 0.9819 | 0.9904 | 1.0081 | 0.9924 | 1.0189 | 1.0184 | 0.9991 | 1.0000 | 1.0439 | 1.0105 | 1.0407 | 1.0728 | 1.0891 | 1.0964 | 1.1026 | 1.1432 | 1.1192 | 1.2195 | 1.2166 |
| 10 | 0.9196 | 0.9576 | 0.9627 | 0.9771 | 0.9608 | 0.9834 | 0.9811 | 0.9606 | 0.9632 | 1.0000 | 0.9693 | 0.9980 | 1.0284 | 1.0434 | 1.0473 | 1.0539 | 1.0968 | 1.0747 | 1.1670 | 1.1616 |
| 11 | 0.9467 | 0.9856 | 0.9913 | 1.0066 | 0.9900 | 1.0137 | 1.0116 | 0.9908 | 0.9932 | 1.0319 | 1.0000 | 1.0298 | 1.0613 | 1.0769 | 1.0816 | 1.0883 | 1.1322 | 1.1092 | 1.2052 | 1.1999 |
| 12 | 0.9205 | 0.9584 | 0.9637 | 0.9783 | 0.9621 | 0.9849 | 0.9828 | 0.9624 | 0.9649 | 1.0021 | 0.9712 | 1.0000 | 1.0305 | 1.0456 | 1.0498 | 1.0563 | 1.0990 | 1.0768 | 1.1696 | 1.1644 |
| 13 | 0.8946 | 0.9317 | 0.9365 | 0.9504 | 0.9345 | 0.9564 | 0.9541 | 0.9340 | 0.9367 | 0.9721 | 0.9423 | 0.9703 | 1.0000 | 1.0146 | 1.0184 | 1.0249 | 1.0671 | 1.0455 | 1.1353 | 1.1298 |
| 14 | 0.8837 | 0.9207 | 0.9250 | 0.9384 | 0.9224 | 0.9436 | 0.9410 | 0.9208 | 0.9238 | 0.9577 | 0.9286 | 0.9563 | 0.9857 | 1.0000 | 1.0034 | 1.0100 | 1.0525 | 1.0313 | 1.1195 | 1.1134 |
| 15 | 0.8828 | 0.9199 | 0.9238 | 0.9369 | 0.9208 | 0.9415 | 0.9387 | 0.9184 | 0.9215 | 0.9546 | 0.9258 | 0.9534 | 0.9827 | 0.9969 | 1.0000 | 1.0066 | 1.0496 | 1.0286 | 1.1161 | 1.1096 |
| 16 | 0.8735 | 0.9102 | 0.9146 | 0.9280 | 0.9120 | 0.9331 | 0.9306 | 0.9105 | 0.9135 | 0.9468 | 0.9181 | 0.9459 | 0.9754 | 0.9896 | 0.9934 | 1.0000 | 1.0429 | 1.0217 | 1.1097 | 1.1031 |
| 17 | 0.8409 | 0.8763 | 0.8800 | 0.8924 | 0.8770 | 0.8968 | 0.8941 | 0.8746 | 0.8777 | 0.9091 | 0.8816 | 0.9081 | 0.9360 | 0.9495 | 0.9525 | 0.9588 | 1.0000 | 0.9799 | 1.0633 | 1.0570 |
| 18 | 0.8546 | 0.8903 | 0.8949 | 0.9082 | 0.8927 | 0.9136 | 0.9114 | 0.8920 | 0.8947 | 0.9280 | 0.8997 | 0.9268 | 0.9555 | 0.9694 | 0.9733 | 0.9796 | 1.0208 | 1.0000 | 1.0862 | 1.0804 |
| 19 | 0.7873 | 0.8201 | 0.8243 | 0.8366 | 0.8224 | 0.8417 | 0.8396 | 0.8219 | 0.8243 | 0.8552 | 0.8290 | 0.8539 | 0.8802 | 0.8930 | 0.8965 | 0.9023 | 0.9398 | 0.9207 | 1.0000 | 0.9949 |
| 20 | 0.7942 | 0.8274 | 0.8313 | 0.8432 | 0.8289 | 0.8479 | 0.8456 | 0.8276 | 0.8302 | 0.8607 | 0.8345 | 0.8593 | 0.8856 | 0.8984 | 0.9014 | 0.9073 | 0.9453 | 0.9263 | 1.0053 | 1.0000 |

Table A.18. Comparison Ratios of Bundles $\Phi_{ij}$ and $\Phi_{ii}$ for Butter, Margarine, and Salad and Cooking Oils, Adjusted, 1967-1986.

| | $\Gamma_{ij/ii} = (\Phi_{ij}/\Phi_{ii})$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ij | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 | 1.0000 | 1.0587 | 1.1078 | 1.0523 | 1.0049 | 1.0273 | 0.9866 | 0.6104 | 0.6335 | 0.8917 | 0.8529 | 0.8319 | 0.8535 | 0.9294 | 1.0081 | 1.0064 | 1.0846 | 1.0141 | 1.0278 | 1.1039 |
| 2 | 0.9444 | 1.0000 | 1.0460 | 0.9933 | 0.9485 | 0.9693 | 0.9308 | 0.5754 | 0.5973 | 0.8406 | 0.8041 | 0.7842 | 0.8045 | 0.8761 | 0.9501 | 0.9485 | 1.0227 | 0.9563 | 0.9687 | 1.0403 |
| 3 | 0.9028 | 0.9560 | 1.0000 | 0.9496 | 0.9067 | 0.9267 | 0.8898 | 0.5500 | 0.5710 | 0.8034 | 0.7686 | 0.7496 | 0.7691 | 0.8376 | 0.9084 | 0.9069 | 0.9780 | 0.9145 | 0.9265 | 0.9948 |
| 4 | 0.9488 | 1.0043 | 1.0519 | 1.0000 | 0.9550 | 0.9773 | 0.9392 | 0.5822 | 0.6037 | 0.8501 | 0.8130 | 0.7936 | 0.8147 | 0.8871 | 0.9630 | 0.9614 | 1.0358 | 0.9682 | 0.9834 | 1.0557 |
| 5 | 0.9919 | 1.0494 | 1.1002 | 1.0468 | 1.0000 | 1.0243 | 0.9850 | 0.6122 | 0.6342 | 0.8937 | 0.8543 | 0.8343 | 0.8567 | 0.9327 | 1.0131 | 1.0112 | 1.0881 | 1.0171 | 1.0346 | 1.1110 |
| 6 | 0.9679 | 1.0239 | 1.0736 | 1.0217 | 0.9761 | 1.0000 | 0.9617 | 0.5980 | 0.6194 | 0.8730 | 0.8344 | 0.8149 | 0.8369 | 0.9111 | 0.9897 | 0.9878 | 1.0626 | 0.9932 | 1.0106 | 1.0853 |
| 7 | 1.0048 | 1.0626 | 1.1147 | 1.0612 | 1.0141 | 1.0394 | 1.0000 | 0.6228 | 0.6445 | 0.9090 | 0.8687 | 0.8483 | 0.8710 | 0.9481 | 1.0301 | 1.0280 | 1.1046 | 1.0325 | 1.0511 | 1.1293 |
| 8 | 1.5800 | 1.6679 | 1.7556 | 1.6763 | 1.6041 | 1.6498 | 1.5909 | 1.0000 | 1.0310 | 1.4585 | 1.3917 | 1.3607 | 1.3977 | 1.5207 | 1.6554 | 1.6509 | 1.7652 | 1.6494 | 1.6879 | 1.8160 |
| 9 | 1.5334 | 1.6187 | 1.7036 | 1.6263 | 1.5564 | 1.6004 | 1.5432 | 0.9698 | 1.0000 | 1.4146 | 1.3499 | 1.3195 | 1.3550 | 1.4743 | 1.6047 | 1.6003 | 1.7108 | 1.5986 | 1.6353 | 1.7598 |
| 10 | 1.1061 | 1.1697 | 1.2267 | 1.1676 | 1.1160 | 1.1436 | 1.1001 | 0.6850 | 0.7090 | 1.0000 | 0.9556 | 0.9329 | 0.9575 | 1.0423 | 1.1322 | 1.1298 | 1.2136 | 1.1344 | 1.1542 | 1.2406 |
| 11 | 1.1543 | 1.2205 | 1.2807 | 1.2196 | 1.1657 | 1.1952 | 1.1502 | 0.7171 | 0.7418 | 1.0467 | 1.0000 | 0.9766 | 1.0026 | 1.0913 | 1.1859 | 1.1833 | 1.2706 | 1.1876 | 1.2094 | 1.2999 |
| 12 | 1.1839 | 1.2518 | 1.3132 | 1.2502 | 1.1950 | 1.2249 | 1.1785 | 0.7343 | 0.7598 | 1.0719 | 1.0242 | 1.0000 | 1.0264 | 1.1173 | 1.2138 | 1.2112 | 1.3007 | 1.2158 | 1.2374 | 1.3302 |
| 13 | 1.1558 | 1.2225 | 1.2820 | 1.2201 | 1.1659 | 1.1947 | 1.1491 | 0.7151 | 0.7403 | 1.0439 | 0.9977 | 0.9741 | 1.0000 | 1.0886 | 1.1825 | 1.1801 | 1.2684 | 1.1856 | 1.2063 | 1.2961 |
| 14 | 1.0648 | 1.1266 | 1.1808 | 1.1233 | 1.0731 | 1.0990 | 1.0567 | 0.6565 | 0.6801 | 0.9584 | 0.9162 | 0.8946 | 0.9185 | 1.0000 | 1.0860 | 1.0840 | 1.1665 | 1.0903 | 1.1087 | 1.1906 |
| 15 | 0.9831 | 1.0405 | 1.0901 | 1.0366 | 0.9901 | 1.0135 | 0.9742 | 0.6045 | 0.6266 | 0.8826 | 0.8439 | 0.8239 | 0.8459 | 0.9210 | 1.0000 | 0.9982 | 1.0750 | 1.0048 | 1.0211 | 1.0963 |
| 16 | 0.9803 | 1.0374 | 1.0876 | 1.0348 | 0.9883 | 1.0124 | 0.9735 | 0.6047 | 0.6265 | 0.8826 | 0.8438 | 0.8244 | 0.8469 | 0.9221 | 1.0017 | 1.0000 | 1.0770 | 1.0065 | 1.0244 | 1.0993 |
| 17 | 0.9144 | 0.9678 | 1.0139 | 0.9642 | 0.9208 | 0.9426 | 0.9060 | 0.5621 | 0.5827 | 0.8206 | 0.7847 | 0.7661 | 0.7867 | 0.8565 | 0.9300 | 0.9284 | 1.0000 | 0.9347 | 0.9499 | 1.0197 |
| 18 | 0.9736 | 1.0299 | 1.0800 | 1.0279 | 0.9820 | 1.0062 | 0.9678 | 0.6019 | 0.6233 | 0.8785 | 0.8397 | 0.8202 | 0.8424 | 0.9171 | 0.9964 | 0.9945 | 1.0700 | 1.0000 | 1.0179 | 1.0929 |
| 19 | 0.9572 | 1.0125 | 1.0618 | 1.0106 | 0.9656 | 0.9894 | 0.9516 | 0.5920 | 0.6130 | 0.8642 | 0.8259 | 0.8066 | 0.8283 | 0.9017 | 0.9795 | 0.9776 | 1.0513 | 0.9826 | 1.0000 | 1.0741 |
| 20 | 0.8950 | 0.9469 | 0.9924 | 0.9441 | 0.9019 | 0.9237 | 0.8881 | 0.5518 | 0.5717 | 0.8057 | 0.7701 | 0.7518 | 0.7718 | 0.8402 | 0.9124 | 0.9106 | 0.9796 | 0.9157 | 0.9309 | 1.0000 |

Table A.19. Comparison Ratios of Bundles $\Phi_{ij}$ and $\Phi_{ii}$ for Butter and Margarine, Unadjusted, 1967-1986.

| | $\Gamma_{ij/ii} = (\Phi_{ij}/\Phi_{ii})$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ij | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 | 1.0000 | 1.0497 | 1.0186 | 1.0019 | 0.9852 | 0.9726 | 0.9519 | 0.9208 | 0.9374 | 0.9327 | 0.9123 | 0.9186 | 0.9248 | 0.9289 | 0.8896 | 0.8959 | 0.9336 | 0.9336 | 0.9500 | 0.9434 |
| 2 | 0.9524 | 1.0000 | 0.9700 | 0.9539 | 0.9378 | 0.9255 | 0.9055 | 0.8756 | 0.8917 | 0.8863 | 0.8671 | 0.8733 | 0.8794 | 0.8833 | 0.8456 | 0.8518 | 0.8886 | 0.8886 | 0.9040 | 0.8971 |
| 3 | 0.9818 | 1.0311 | 1.0000 | 0.9832 | 0.9664 | 0.9535 | 0.9328 | 0.9017 | 0.9185 | 0.9124 | 0.8928 | 0.8992 | 0.9057 | 0.9096 | 0.8707 | 0.8771 | 0.9157 | 0.9157 | 0.9314 | 0.9239 |
| 4 | 0.9980 | 1.0474 | 1.0165 | 1.0000 | 0.9835 | 0.9711 | 0.9505 | 0.9196 | 0.9361 | 0.9319 | 0.9114 | 0.9175 | 0.9237 | 0.9278 | 0.8887 | 0.8949 | 0.9321 | 0.9321 | 0.9485 | 0.9423 |
| 5 | 1.0129 | 1.0620 | 1.0317 | 1.0158 | 1.0000 | 0.9885 | 0.9683 | 0.9380 | 0.9538 | 0.9526 | 0.9309 | 0.9366 | 0.9424 | 0.9467 | 0.9077 | 0.9134 | 0.9479 | 0.9479 | 0.9653 | 0.9612 |
| 6 | 1.0239 | 1.0733 | 1.0430 | 1.0272 | 1.0114 | 1.0000 | 0.9797 | 0.9494 | 0.9652 | 0.9647 | 0.9425 | 0.9481 | 0.9538 | 0.9583 | 0.9190 | 0.9247 | 0.9587 | 0.9587 | 0.9765 | 0.9728 |
| 7 | 1.0413 | 1.0904 | 1.0606 | 1.0455 | 1.0303 | 1.0199 | 1.0000 | 0.9702 | 0.9854 | 0.9880 | 0.9645 | 0.9697 | 0.9749 | 0.9796 | 0.9404 | 0.9456 | 0.9769 | 0.9769 | 0.9958 | 0.9943 |
| 8 | 1.0467 | 1.0905 | 1.0662 | 1.0557 | 1.0453 | 1.0405 | 1.0243 | 1.0000 | 1.0105 | 1.0296 | 1.0010 | 1.0033 | 1.0057 | 1.0115 | 0.9757 | 0.9781 | 0.9923 | 0.9923 | 1.0152 | 1.0253 |
| 9 | 1.0355 | 1.0788 | 1.0548 | 1.0446 | 1.0343 | 1.0296 | 1.0137 | 0.9897 | 1.0000 | 1.0192 | 0.9908 | 0.9931 | 0.9954 | 1.0011 | 0.9657 | 0.9681 | 0.9819 | 0.9819 | 1.0046 | 1.0147 |
| 10 | 1.0519 | 1.1012 | 1.0714 | 1.0564 | 1.0413 | 1.0311 | 1.0112 | 0.9814 | 0.9964 | 1.0000 | 0.9759 | 0.9811 | 0.9862 | 0.9910 | 0.9516 | 0.9567 | 0.9874 | 0.9874 | 1.0067 | 1.0057 |
| 11 | 1.0750 | 1.1249 | 1.0950 | 1.0800 | 1.0650 | 1.0550 | 1.0350 | 1.0050 | 1.0200 | 1.0250 | 1.0000 | 1.0050 | 1.0100 | 1.0150 | 0.9750 | 0.9800 | 1.0100 | 1.0100 | 1.0300 | 1.0300 |
| 12 | 1.0703 | 1.1202 | 1.0902 | 1.0752 | 1.0601 | 1.0501 | 1.0301 | 1.0001 | 1.0151 | 1.0198 | 0.9950 | 1.0000 | 1.0050 | 1.0100 | 0.9701 | 0.9751 | 1.0054 | 1.0054 | 1.0252 | 1.0249 |
| 13 | 1.0693 | 1.1200 | 1.0892 | 1.0734 | 1.0576 | 1.0466 | 1.0261 | 0.9952 | 1.0110 | 1.0130 | 0.9890 | 0.9945 | 1.0000 | 1.0048 | 0.9643 | 0.9698 | 1.0028 | 1.0028 | 1.0220 | 1.0199 |
| 14 | 1.0699 | 1.1218 | 1.0898 | 1.0731 | 1.0563 | 1.0442 | 1.0228 | 0.9908 | 1.0075 | 1.0062 | 0.9833 | 0.9893 | 0.9954 | 1.0000 | 0.9588 | 0.9649 | 1.0013 | 1.0013 | 1.0197 | 1.0153 |
| 15 | 1.1203 | 1.1753 | 1.1411 | 1.1229 | 1.1048 | 1.0913 | 1.0685 | 1.0342 | 1.0524 | 1.0489 | 1.0255 | 1.0322 | 1.0389 | 1.0436 | 1.0000 | 1.0067 | 1.0471 | 1.0471 | 1.0658 | 1.0597 |
| 16 | 1.1139 | 1.1689 | 1.1346 | 1.1164 | 1.0982 | 1.0846 | 1.0617 | 1.0275 | 1.0457 | 1.0416 | 1.0185 | 1.0253 | 1.0321 | 1.0367 | 0.9932 | 1.0000 | 1.0408 | 1.0408 | 1.0593 | 1.0528 |
| 17 | 1.0704 | 1.1232 | 1.0902 | 1.0727 | 1.0552 | 1.0421 | 1.0201 | 0.9871 | 1.0047 | 1.0006 | 0.9784 | 0.9850 | 0.9916 | 0.9960 | 0.9541 | 0.9607 | 1.0000 | 1.0000 | 1.0178 | 1.0114 |
| 18 | 1.0682 | 1.1199 | 1.0881 | 1.0715 | 1.0549 | 1.0429 | 1.0217 | 0.9899 | 1.0065 | 1.0057 | 0.9826 | 0.9886 | 0.9946 | 0.9992 | 0.9581 | 0.9641 | 1.0000 | 1.0000 | 1.0185 | 1.0144 |
| 19 | 1.0476 | 1.0978 | 1.0671 | 1.0512 | 1.0353 | 1.0241 | 1.0036 | 0.9729 | 0.9887 | 0.9893 | 0.9662 | 0.9718 | 0.9775 | 0.9821 | 0.9421 | 0.9478 | 0.9816 | 0.9816 | 1.0000 | 0.9969 |
| 20 | 1.0524 | 1.1032 | 1.0720 | 1.0557 | 1.0395 | 1.0279 | 1.0071 | 0.9759 | 0.9921 | 0.9917 | 0.9688 | 0.9746 | 0.9804 | 0.9850 | 0.9447 | 0.9505 | 0.9854 | 0.9854 | 1.0037 | 1.0000 |

Table A.20. Comparison Ratios of Bundles $\Phi_{ij}$ and $\Phi_{ii}$ for Margarine and Butter, Adjusted, 1967-1986.

| | $\Gamma_{ij/ii}=(\Phi_{ij}/\Phi_{ii})$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ij | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 | 1.0000 | 1.0576 | 1.1284 | 1.1411 | 1.1344 | 1.1688 | 1.1307 | 0.9113 | 0.9147 | 1.0036 | 0.9961 | 0.9618 | 0.9887 | 1.0576 | 1.1239 | 1.1774 | 1.2042 | 1.1831 | 1.1923 | 1.2207 |
| 2 | 0.9452 | 1.0000 | 1.0663 | 1.0779 | 1.0712 | 1.1032 | 1.0670 | 0.8596 | 0.8632 | 0.9460 | 0.9392 | 0.9070 | 0.9326 | 0.9975 | 1.0597 | 1.1104 | 1.1369 | 1.1170 | 1.1255 | 1.1514 |
| 3 | 0.8865 | 0.9382 | 1.0000 | 1.0106 | 1.0041 | 1.0339 | 0.9998 | 0.8052 | 0.8088 | 0.8856 | 0.8794 | 0.8495 | 0.8735 | 0.9343 | 0.9923 | 1.0399 | 1.0656 | 1.0469 | 1.0547 | 1.0785 |
| 4 | 0.8761 | 0.9263 | 0.9887 | 1.0000 | 0.9943 | 1.0247 | 0.9914 | 0.7992 | 0.8020 | 0.8806 | 0.8739 | 0.8437 | 0.8671 | 0.9276 | 0.9859 | 1.0328 | 1.0556 | 1.0371 | 1.0453 | 1.0706 |
| 5 | 0.8784 | 0.9277 | 0.9921 | 1.0046 | 1.0000 | 1.0320 | 0.9994 | 0.8066 | 0.8083 | 0.8912 | 0.8835 | 0.8523 | 0.8754 | 0.9366 | 0.9966 | 1.0433 | 1.0625 | 1.0437 | 1.0528 | 1.0809 |
| 6 | 0.8503 | 0.8977 | 0.9605 | 0.9729 | 0.9687 | 1.0000 | 0.9686 | 0.7819 | 0.7833 | 0.8646 | 0.8569 | 0.8265 | 0.8487 | 0.9081 | 0.9665 | 1.0117 | 1.0293 | 1.0112 | 1.0201 | 1.0479 |
| 7 | 0.8733 | 0.9208 | 0.9872 | 1.0012 | 0.9979 | 1.0316 | 1.0000 | 0.8083 | 0.8086 | 0.8962 | 0.8873 | 0.8553 | 0.8776 | 0.9392 | 1.0007 | 1.0467 | 1.0611 | 1.0423 | 1.0523 | 1.0836 |
| 8 | 1.0450 | 1.0948 | 1.1860 | 1.2103 | 1.2131 | 1.2631 | 1.2296 | 1.0000 | 0.9935 | 1.1241 | 1.1074 | 1.0635 | 1.0872 | 1.1650 | 1.2478 | 1.3010 | 1.2948 | 1.2714 | 1.2883 | 1.3427 |
| 9 | 1.0515 | 1.1015 | 1.1933 | 1.2179 | 1.2209 | 1.2713 | 1.2376 | 1.0067 | 1.0000 | 1.1318 | 1.1149 | 1.0707 | 1.0945 | 1.1728 | 1.2562 | 1.3097 | 1.3031 | 1.2796 | 1.2967 | 1.3516 |
| 10 | 0.9720 | 1.0246 | 1.0990 | 1.1149 | 1.1116 | 1.1496 | 1.1146 | 0.9013 | 0.9013 | 1.0000 | 0.9898 | 0.9539 | 0.9786 | 1.0474 | 1.1162 | 1.1674 | 1.1823 | 1.1613 | 1.1727 | 1.2083 |
| 11 | 0.9786 | 1.0310 | 1.1068 | 1.1234 | 1.1206 | 1.1596 | 1.1247 | 0.9099 | 0.9094 | 1.0107 | 1.0000 | 0.9634 | 0.9880 | 1.0576 | 1.1276 | 1.1790 | 1.1922 | 1.1710 | 1.1829 | 1.2200 |
| 12 | 1.0166 | 1.0712 | 1.1497 | 1.1668 | 1.1637 | 1.2040 | 1.1677 | 0.9445 | 0.9442 | 1.0489 | 1.0379 | 1.0000 | 1.0257 | 1.0979 | 1.1704 | 1.2238 | 1.2380 | 1.2161 | 1.2282 | 1.2665 |
| 13 | 0.9966 | 1.0512 | 1.1264 | 1.1420 | 1.1380 | 1.1761 | 1.1399 | 0.9211 | 0.9218 | 1.0207 | 1.0108 | 0.9744 | 1.0000 | 1.0702 | 1.1400 | 1.1926 | 1.2100 | 1.1885 | 1.1997 | 1.2348 |
| 14 | 0.9379 | 0.9905 | 1.0593 | 1.0727 | 1.0677 | 1.1019 | 1.0670 | 0.8612 | 0.8630 | 0.9515 | 0.9433 | 0.9100 | 0.9346 | 1.0000 | 1.0640 | 1.1139 | 1.1344 | 1.1144 | 1.1240 | 1.1540 |
| 15 | 0.8859 | 0.9363 | 1.0001 | 1.0120 | 1.0066 | 1.0379 | 1.0045 | 0.8101 | 0.8125 | 0.8936 | 0.8864 | 0.8556 | 0.8791 | 0.9404 | 1.0000 | 1.0473 | 1.0690 | 1.0502 | 1.0588 | 1.0854 |
| 16 | 0.8471 | 0.8954 | 0.9561 | 0.9672 | 0.9619 | 0.9916 | 0.9596 | 0.7737 | 0.7762 | 0.8530 | 0.8463 | 0.8169 | 0.8395 | 0.8981 | 0.9547 | 1.0000 | 1.0214 | 1.0034 | 1.0116 | 1.0365 |
| 17 | 0.8294 | 0.8768 | 0.9361 | 0.9470 | 0.9418 | 0.9708 | 0.9394 | 0.7574 | 0.7599 | 0.8349 | 0.8284 | 0.7997 | 0.8218 | 0.8791 | 0.9346 | 0.9789 | 1.0000 | 0.9824 | 0.9903 | 1.0147 |
| 18 | 0.8412 | 0.8882 | 0.9501 | 0.9623 | 0.9580 | 0.9889 | 0.9577 | 0.7731 | 0.7746 | 0.8546 | 0.8470 | 0.8171 | 0.8391 | 0.8978 | 0.9554 | 1.0001 | 1.0180 | 1.0000 | 1.0088 | 1.0361 |
| 19 | 0.8324 | 0.8784 | 0.9404 | 0.9530 | 0.9491 | 0.9803 | 0.9497 | 0.7670 | 0.7681 | 0.8489 | 0.8410 | 0.8110 | 0.8326 | 0.8910 | 0.9486 | 0.9927 | 1.0088 | 0.9910 | 1.0000 | 1.0281 |
| 20 | 0.8113 | 0.8565 | 0.9164 | 0.9283 | 0.9243 | 0.9542 | 0.9242 | 0.7462 | 0.7475 | 0.8251 | 0.8177 | 0.7887 | 0.8099 | 0.8666 | 0.9223 | 0.9654 | 0.9822 | 0.9648 | 0.9734 | 1.0000 |

Table A.21. Comparison Ratios of Bundles $\Phi_{ij}$ and $\Phi_{ii}$ for Butter and Salad and Cooking Oils, Unadjusted, 1967-1986.

| | $\Gamma_{ij/ii} = (\Phi_{ij}/\Phi_{ii})$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ij | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 | 1.0000 | 1.0467 | 1.0505 | 1.0648 | 1.0414 | 1.0642 | 1.0596 | 1.0319 | 1.0385 | 1.0651 | 1.0358 | 1.0737 | 1.1136 | 1.1304 | 1.1362 | 1.1469 | 1.2149 | 1.1876 | 1.2945 | 1.2752 |
| 2 | 0.9552 | 1.0000 | 1.0032 | 1.0166 | 0.9942 | 1.0156 | 1.0111 | 0.9844 | 0.9909 | 1.0157 | 0.9879 | 1.0240 | 1.0620 | 1.0779 | 1.0831 | 1.0933 | 1.1585 | 1.1327 | 1.2341 | 1.2154 |
| 3 | 0.9522 | 0.9968 | 1.0000 | 1.0134 | 0.9910 | 1.0123 | 1.0078 | 0.9813 | 0.9877 | 1.0125 | 0.9847 | 1.0207 | 1.0586 | 1.0745 | 1.0796 | 1.0898 | 1.1548 | 1.1290 | 1.2301 | 1.2115 |
| 4 | 0.9378 | 0.9811 | 0.9856 | 1.0000 | 0.9783 | 1.0007 | 0.9970 | 0.9715 | 0.9772 | 1.0039 | 0.9758 | 1.0117 | 1.0496 | 1.0656 | 1.0721 | 1.0820 | 1.1450 | 1.1190 | 1.2211 | 1.2036 |
| 5 | 0.9568 | 1.0006 | 1.0063 | 1.0219 | 1.0000 | 1.0239 | 1.0208 | 0.9953 | 1.0005 | 1.0296 | 1.0005 | 1.0374 | 1.0765 | 1.0931 | 1.1009 | 1.1108 | 1.1744 | 1.1473 | 1.2535 | 1.2363 |
| 6 | 0.9340 | 0.9766 | 0.9823 | 0.9978 | 0.9764 | 1.0000 | 0.9970 | 0.9722 | 0.9772 | 1.0060 | 0.9774 | 1.0136 | 1.0518 | 1.0681 | 1.0759 | 1.0855 | 1.1474 | 1.1209 | 1.2249 | 1.2083 |
| 7 | 0.9352 | 0.9776 | 0.9839 | 0.9998 | 0.9786 | 1.0027 | 1.0000 | 0.9754 | 0.9801 | 1.0098 | 0.9809 | 1.0173 | 1.0558 | 1.0722 | 1.0806 | 1.0902 | 1.1518 | 1.1250 | 1.2301 | 1.2137 |
| 8 | 0.9448 | 0.9860 | 0.9963 | 1.0158 | 0.9952 | 1.0236 | 1.0231 | 1.0000 | 1.0028 | 1.0395 | 1.0084 | 1.0465 | 1.0868 | 1.1046 | 1.1171 | 1.1263 | 1.1858 | 1.1568 | 1.2703 | 1.2562 |
| 9 | 0.9427 | 0.9838 | 0.9939 | 1.0132 | 0.9927 | 1.0209 | 1.0202 | 0.9972 | 1.0000 | 1.0364 | 1.0054 | 1.0434 | 1.0835 | 1.1013 | 1.1136 | 1.1228 | 1.1822 | 1.1534 | 1.2664 | 1.2522 |
| 10 | 0.9269 | 0.9691 | 0.9752 | 0.9907 | 0.9696 | 0.9934 | 0.9906 | 0.9661 | 0.9709 | 1.0000 | 0.9715 | 1.0075 | 1.0455 | 1.0618 | 1.0699 | 1.0794 | 1.1406 | 1.1142 | 1.2180 | 1.2016 |
| 11 | 0.9516 | 0.9946 | 1.0015 | 1.0180 | 0.9965 | 1.0214 | 1.0189 | 0.9940 | 0.9987 | 1.0296 | 1.0000 | 1.0372 | 1.0764 | 1.0933 | 1.1023 | 1.1119 | 1.1744 | 1.1469 | 1.2546 | 1.2382 |
| 12 | 0.9188 | 0.9605 | 0.9668 | 0.9825 | 0.9616 | 0.9854 | 0.9828 | 0.9587 | 0.9633 | 0.9926 | 0.9642 | 1.0000 | 1.0378 | 1.0540 | 1.0623 | 1.0717 | 1.1322 | 1.1058 | 1.2093 | 1.1933 |
| 13 | 0.8872 | 0.9276 | 0.9333 | 0.9481 | 0.9278 | 0.9504 | 0.9477 | 0.9242 | 0.9288 | 0.9565 | 0.9292 | 0.9637 | 1.0000 | 1.0156 | 1.0231 | 1.0323 | 1.0910 | 1.0657 | 1.1648 | 1.1491 |
| 14 | 0.8762 | 0.9164 | 0.9214 | 0.9355 | 0.9154 | 0.9372 | 0.9342 | 0.9107 | 0.9156 | 0.9419 | 0.9153 | 0.9491 | 0.9848 | 1.0000 | 1.0069 | 1.0160 | 1.0744 | 1.0497 | 1.1466 | 1.1307 |
| 15 | 0.8727 | 0.9129 | 0.9175 | 0.9311 | 0.9110 | 0.9322 | 0.9290 | 0.9054 | 0.9105 | 0.9359 | 0.9097 | 0.9432 | 0.9786 | 0.9936 | 1.0000 | 1.0091 | 1.0675 | 1.0432 | 1.1388 | 1.1228 |
| 16 | 0.8616 | 0.9010 | 0.9061 | 0.9201 | 0.9004 | 0.9219 | 0.9191 | 0.8960 | 0.9008 | 0.9269 | 0.9007 | 0.9340 | 0.9691 | 0.9841 | 0.9911 | 1.0000 | 1.0573 | 1.0329 | 1.1285 | 1.1130 |
| 17 | 0.8177 | 0.8554 | 0.8596 | 0.8724 | 0.8535 | 0.8733 | 0.8703 | 0.8481 | 0.8529 | 0.8767 | 0.8521 | 0.8835 | 0.9166 | 0.9307 | 0.9367 | 0.9452 | 1.0000 | 0.9772 | 1.0667 | 1.0516 |
| 18 | 0.8328 | 0.8707 | 0.8760 | 0.8898 | 0.8708 | 0.8919 | 0.8894 | 0.8673 | 0.8717 | 0.8975 | 0.8720 | 0.9042 | 0.9383 | 0.9529 | 0.9600 | 0.9686 | 1.0237 | 1.0000 | 1.0930 | 1.0781 |
| 19 | 0.7618 | 0.7965 | 0.8013 | 0.8140 | 0.7966 | 0.8160 | 0.8136 | 0.7934 | 0.7975 | 0.8211 | 0.7978 | 0.8273 | 0.8585 | 0.8719 | 0.8784 | 0.8862 | 0.9366 | 0.9149 | 1.0000 | 0.9865 |
| 20 | 0.7751 | 0.8107 | 0.8151 | 0.8275 | 0.8098 | 0.8289 | 0.8263 | 0.8055 | 0.8098 | 0.8331 | 0.8096 | 0.8395 | 0.8710 | 0.8845 | 0.8906 | 0.8986 | 0.9502 | 0.9284 | 1.0141 | 1.0000 |

Table A.22. Comparison Ratios of Bundles $\Phi_{ij}$ and $\Phi_{ii}$ for Butter and Salad and Cooking Oils, Adjusted, 1967-1986.

| | $\Gamma_{ij/ii} = (\Phi_{ij}/\Phi_{ii})$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ij | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 | 1.0000 | 1.0573 | 1.1036 | 1.0429 | 0.9969 | 1.0197 | 0.9863 | 0.6314 | 0.6586 | 0.9010 | 0.8599 | 0.8405 | 0.8538 | 0.9219 | 0.9978 | 0.9855 | 1.0732 | 1.0015 | 1.0195 | 1.1007 |
| 2 | 0.9457 | 1.0000 | 1.0435 | 0.9857 | 0.9422 | 0.9633 | 0.9316 | 0.5958 | 0.6218 | 0.8504 | 0.8117 | 0.7932 | 0.8056 | 0.8700 | 0.9414 | 0.9298 | 1.0129 | 0.9453 | 0.9617 | 1.0382 |
| 3 | 0.9063 | 0.9583 | 1.0000 | 0.9446 | 0.9029 | 0.9232 | 0.8928 | 0.5710 | 0.5959 | 0.8149 | 0.7778 | 0.7602 | 0.7720 | 0.8337 | 0.9021 | 0.8910 | 0.9707 | 0.9059 | 0.9216 | 0.9949 |
| 4 | 0.9574 | 1.0117 | 1.0573 | 1.0000 | 0.9563 | 0.9792 | 0.9478 | 0.6083 | 0.6338 | 0.8679 | 0.8280 | 0.8098 | 0.8229 | 0.8885 | 0.9624 | 0.9504 | 1.0335 | 0.9644 | 0.9837 | 1.0620 |
| 5 | 0.9992 | 1.0554 | 1.1042 | 1.0454 | 1.0000 | 1.0251 | 0.9931 | 0.6391 | 0.6651 | 0.9116 | 0.8693 | 0.8507 | 0.8648 | 0.9337 | 1.0120 | 0.9994 | 1.0853 | 1.0125 | 1.0348 | 1.1174 |
| 6 | 0.9742 | 1.0289 | 1.0766 | 1.0195 | 0.9753 | 1.0000 | 0.9689 | 0.6238 | 0.6491 | 0.8898 | 0.8485 | 0.8304 | 0.8442 | 0.9114 | 0.9880 | 0.9757 | 1.0593 | 0.9882 | 1.0103 | 1.0910 |
| 7 | 1.0036 | 1.0597 | 1.1095 | 1.0511 | 1.0057 | 1.0318 | 1.0000 | 0.6447 | 0.6704 | 0.9195 | 0.8766 | 0.8581 | 0.8726 | 0.9420 | 1.0216 | 1.0088 | 1.0945 | 1.0210 | 1.0448 | 1.1283 |
| 8 | 1.5207 | 1.6027 | 1.6850 | 1.6022 | 1.5348 | 1.5811 | 1.5365 | 1.0000 | 1.0357 | 1.4253 | 1.3569 | 1.3310 | 1.3552 | 1.4626 | 1.5903 | 1.5700 | 1.6952 | 1.5806 | 1.6287 | 1.7596 |
| 9 | 1.4694 | 1.5487 | 1.6280 | 1.5478 | 1.4826 | 1.5270 | 1.4839 | 0.9654 | 1.0000 | 1.3760 | 1.3100 | 1.2849 | 1.3083 | 1.4119 | 1.5351 | 1.5155 | 1.6367 | 1.5260 | 1.5720 | 1.6984 |
| 10 | 1.0927 | 1.1539 | 1.2079 | 1.1441 | 1.0946 | 1.1228 | 1.0881 | 0.7011 | 0.7293 | 1.0000 | 0.9534 | 0.9333 | 0.9489 | 1.0244 | 1.1108 | 1.0969 | 1.1904 | 1.1105 | 1.1360 | 1.2268 |
| 11 | 1.1424 | 1.2060 | 1.2632 | 1.1972 | 1.1456 | 1.1758 | 1.1399 | 0.7356 | 0.7646 | 1.0491 | 1.0000 | 0.9792 | 0.9958 | 1.0750 | 1.1661 | 1.1514 | 1.2487 | 1.1648 | 1.1928 | 1.2882 |
| 12 | 1.1688 | 1.2341 | 1.2922 | 1.2244 | 1.1715 | 1.2020 | 1.1650 | 0.7512 | 0.7812 | 1.0715 | 1.0214 | 1.0000 | 1.0168 | 1.0977 | 1.1906 | 1.1756 | 1.2754 | 1.1898 | 1.2177 | 1.3150 |
| 13 | 1.1527 | 1.2173 | 1.2740 | 1.2066 | 1.1544 | 1.1838 | 1.1471 | 0.7389 | 0.7687 | 1.0539 | 1.0049 | 0.9836 | 1.0000 | 1.0796 | 1.1705 | 1.1559 | 1.2547 | 1.1705 | 1.1971 | 1.2927 |
| 14 | 1.0717 | 1.1320 | 1.1840 | 1.1208 | 1.0721 | 1.0988 | 1.0642 | 0.6845 | 0.7126 | 0.9765 | 0.9313 | 0.9112 | 0.9262 | 1.0000 | 1.0838 | 1.0703 | 1.1626 | 1.0847 | 1.1081 | 1.1965 |
| 15 | 0.9922 | 1.0483 | 1.0960 | 1.0370 | 0.9917 | 1.0159 | 0.9836 | 0.6319 | 0.6581 | 0.9015 | 0.8599 | 0.8412 | 0.8549 | 0.9230 | 1.0000 | 0.9876 | 1.0734 | 1.0016 | 1.0223 | 1.1038 |
| 16 | 1.0002 | 1.0564 | 1.1052 | 1.0463 | 1.0009 | 1.0260 | 0.9938 | 0.6395 | 0.6656 | 0.9122 | 0.8699 | 0.8513 | 0.8653 | 0.9343 | 1.0126 | 1.0000 | 1.0860 | 1.0132 | 1.0354 | 1.1181 |
| 17 | 0.9246 | 0.9769 | 1.0212 | 0.9662 | 0.9240 | 0.9465 | 0.9164 | 0.5887 | 0.6131 | 0.8398 | 0.8011 | 0.7836 | 0.7964 | 0.8599 | 0.9315 | 0.9200 | 1.0000 | 0.9331 | 0.9523 | 1.0282 |
| 18 | 0.9851 | 1.0404 | 1.0888 | 1.0312 | 0.9865 | 1.0116 | 0.9802 | 0.6312 | 0.6568 | 0.9004 | 0.8585 | 0.8403 | 0.8543 | 0.9223 | 0.9999 | 0.9874 | 1.0719 | 1.0000 | 1.0226 | 1.1042 |
| 19 | 0.9631 | 1.0171 | 1.0645 | 1.0082 | 0.9645 | 0.9891 | 0.9584 | 0.6173 | 0.6422 | 0.8805 | 0.8395 | 0.8217 | 0.8354 | 0.9019 | 0.9779 | 0.9656 | 1.0482 | 0.9779 | 1.0000 | 1.0799 |
| 20 | 0.8959 | 0.9464 | 0.9898 | 0.9369 | 0.8962 | 0.9185 | 0.8896 | 0.5721 | 0.5956 | 0.8161 | 0.7784 | 0.7616 | 0.7741 | 0.8358 | 0.9058 | 0.8945 | 0.9717 | 0.9066 | 0.9261 | 1.0000 |

Table A.23. Comparison Ratios of Bundles $\Phi_{ij}$ and $\Phi_{ii}$ for Margarine and Salad and Cooking Oils, Unadjusted, 1967-1986.

| | $\Gamma_{ij/ii} = (\Phi_{ij}/\Phi_{ii})$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ij | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 | 1.0000 | 1.0348 | 1.0527 | 1.0790 | 1.0652 | 1.1023 | 1.1067 | 1.0911 | 1.0871 | 1.1503 | 1.1100 | 1.1438 | 1.1798 | 1.1995 | 1.2159 | 1.2207 | 1.2544 | 1.2254 | 1.3463 | 1.3506 |
| 2 | 0.9663 | 1.0000 | 1.0172 | 1.0427 | 1.0294 | 1.0652 | 1.0695 | 1.0544 | 1.0505 | 1.1115 | 1.0726 | 1.1053 | 1.1401 | 1.1591 | 1.1749 | 1.1796 | 1.2121 | 1.1841 | 1.3009 | 1.3050 |
| 3 | 0.9499 | 0.9830 | 1.0000 | 1.0250 | 1.0119 | 1.0472 | 1.0514 | 1.0366 | 1.0327 | 1.0927 | 1.0544 | 1.0866 | 1.1210 | 1.1397 | 1.1553 | 1.1600 | 1.1921 | 1.1646 | 1.2796 | 1.2835 |
| 4 | 0.9262 | 0.9587 | 0.9754 | 1.0000 | 0.9870 | 1.0215 | 1.0257 | 1.0111 | 1.0074 | 1.0656 | 1.0284 | 1.0602 | 1.0942 | 1.1125 | 1.1281 | 1.1328 | 1.1650 | 1.1378 | 1.2508 | 1.2541 |
| 5 | 0.9384 | 0.9713 | 0.9883 | 1.0132 | 1.0000 | 1.0350 | 1.0393 | 1.0244 | 1.0207 | 1.0797 | 1.0420 | 1.0743 | 1.1088 | 1.1273 | 1.1432 | 1.1480 | 1.1808 | 1.1532 | 1.2678 | 1.2711 |
| 6 | 0.9067 | 0.9385 | 0.9549 | 0.9790 | 0.9662 | 1.0000 | 1.0041 | 0.9898 | 0.9862 | 1.0431 | 1.0067 | 1.0379 | 1.0712 | 1.0892 | 1.1045 | 1.1091 | 1.1407 | 1.1141 | 1.2248 | 1.2280 |
| 7 | 0.9032 | 0.9348 | 0.9510 | 0.9749 | 0.9623 | 0.9959 | 1.0000 | 0.9858 | 0.9822 | 1.0391 | 1.0027 | 1.0336 | 1.0665 | 1.0843 | 1.0994 | 1.1039 | 1.1350 | 1.1086 | 1.2184 | 1.2219 |
| 8 | 0.9163 | 0.9483 | 0.9647 | 0.9890 | 0.9762 | 1.0103 | 1.0144 | 1.0000 | 0.9963 | 1.0541 | 1.0172 | 1.0484 | 1.0817 | 1.0998 | 1.1150 | 1.1195 | 1.1509 | 1.1242 | 1.2354 | 1.2390 |
| 9 | 0.9198 | 0.9519 | 0.9683 | 0.9926 | 0.9799 | 1.0140 | 1.0181 | 1.0037 | 1.0000 | 1.0581 | 1.0210 | 1.0522 | 1.0855 | 1.1035 | 1.1187 | 1.1232 | 1.1543 | 1.1276 | 1.2390 | 1.2428 |
| 10 | 0.8693 | 0.8996 | 0.9152 | 0.9381 | 0.9261 | 0.9583 | 0.9622 | 0.9486 | 0.9451 | 1.0000 | 0.9650 | 0.9944 | 1.0258 | 1.0429 | 1.0572 | 1.0615 | 1.0908 | 1.0656 | 1.1708 | 1.1744 |
| 11 | 0.9008 | 0.9323 | 0.9484 | 0.9722 | 0.9597 | 0.9932 | 0.9972 | 0.9831 | 0.9795 | 1.0363 | 1.0000 | 1.0307 | 1.0634 | 1.0811 | 1.0960 | 1.1005 | 1.1312 | 1.1050 | 1.2143 | 1.2178 |
| 12 | 0.8742 | 0.9047 | 0.9203 | 0.9433 | 0.9313 | 0.9637 | 0.9676 | 0.9539 | 0.9504 | 1.0056 | 0.9704 | 1.0000 | 1.0316 | 1.0488 | 1.0632 | 1.0674 | 1.0969 | 1.0716 | 1.1774 | 1.1810 |
| 13 | 0.8471 | 0.8767 | 0.8919 | 0.9142 | 0.9025 | 0.9339 | 0.9377 | 0.9244 | 0.9210 | 0.9744 | 0.9403 | 0.9692 | 1.0000 | 1.0167 | 1.0308 | 1.0350 | 1.0639 | 1.0392 | 1.1421 | 1.1454 |
| 14 | 0.8327 | 0.8619 | 0.8769 | 0.8990 | 0.8873 | 0.9183 | 0.9221 | 0.9089 | 0.9056 | 0.9580 | 0.9245 | 0.9531 | 0.9835 | 1.0000 | 1.0140 | 1.0182 | 1.0471 | 1.0227 | 1.1241 | 1.1272 |
| 15 | 0.8211 | 0.8498 | 0.8646 | 0.8864 | 0.8749 | 0.9055 | 0.9092 | 0.8962 | 0.8930 | 0.9446 | 0.9116 | 0.9398 | 0.9699 | 0.9862 | 1.0000 | 1.0041 | 1.0327 | 1.0086 | 1.1088 | 1.1117 |
| 16 | 0.8163 | 0.8450 | 0.8599 | 0.8818 | 0.8700 | 0.9007 | 0.9044 | 0.8913 | 0.8881 | 0.9393 | 0.9065 | 0.9350 | 0.9654 | 0.9816 | 0.9957 | 1.0000 | 1.0293 | 1.0051 | 1.1055 | 1.1078 |
| 17 | 0.7946 | 0.8225 | 0.8369 | 0.8580 | 0.8468 | 0.8765 | 0.8801 | 0.8675 | 0.8643 | 0.9142 | 0.8823 | 0.9097 | 0.9389 | 0.9547 | 0.9681 | 0.9722 | 1.0000 | 0.9766 | 1.0737 | 1.0765 |
| 18 | 0.8133 | 0.8419 | 0.8566 | 0.8783 | 0.8667 | 0.8971 | 0.9008 | 0.8879 | 0.8847 | 0.9358 | 0.9031 | 0.9312 | 0.9612 | 0.9773 | 0.9912 | 0.9953 | 1.0240 | 1.0000 | 1.0995 | 1.1022 |
| 19 | 0.7406 | 0.7666 | 0.7799 | 0.7996 | 0.7892 | 0.8168 | 0.8201 | 0.8084 | 0.8055 | 0.8521 | 0.8223 | 0.8477 | 0.8748 | 0.8895 | 0.9020 | 0.9057 | 0.9314 | 0.9097 | 1.0000 | 1.0027 |
| 20 | 0.7394 | 0.7652 | 0.7785 | 0.7981 | 0.7878 | 0.8153 | 0.8186 | 0.8070 | 0.8040 | 0.8506 | 0.8208 | 0.8461 | 0.8730 | 0.8875 | 0.8999 | 0.9035 | 0.9289 | 0.9073 | 0.9971 | 1.0000 |

Table A.24. Comparison Ratios of Bundles $\Phi_{ij}$ and $\Phi_{ii}$ for Margarine and Salad and Cooking Oils, Adjusted, 1967-1986.

| | $\Gamma_{ij/ii} = (\Phi_{ij}/\Phi_{ii})$ | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ij | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 1 | 1.0000 | 1.0653 | 1.1144 | 1.0357 | 0.9684 | 0.9884 | 0.9355 | 0.4478 | 0.4750 | 0.8329 | 0.7826 | 0.7622 | 0.7928 | 0.8863 | 0.9800 | 0.9701 | 1.0628 | 0.9699 | 0.9812 | 1.0754 |
| 2 | 0.9387 | 1.0000 | 1.0461 | 0.9722 | 0.9090 | 0.9278 | 0.8781 | 0.4203 | 0.4459 | 0.7818 | 0.7346 | 0.7155 | 0.7442 | 0.8319 | 0.9198 | 0.9105 | 0.9975 | 0.9104 | 0.9209 | 1.0094 |
| 3 | 0.8973 | 0.9559 | 1.0000 | 0.9294 | 0.8690 | 0.8869 | 0.8395 | 0.4018 | 0.4263 | 0.7473 | 0.7022 | 0.6841 | 0.7116 | 0.7955 | 0.8797 | 0.8708 | 0.9542 | 0.8708 | 0.8811 | 0.9655 |
| 4 | 0.9649 | 1.0282 | 1.0757 | 1.0000 | 0.9347 | 0.9542 | 0.9032 | 0.4322 | 0.4586 | 0.8037 | 0.7553 | 0.7362 | 0.7663 | 0.8567 | 0.9476 | 0.9382 | 1.0289 | 0.9389 | 0.9507 | 1.0410 |
| 5 | 1.0322 | 1.0999 | 1.1509 | 1.0699 | 1.0000 | 1.0209 | 0.9663 | 0.4624 | 0.4907 | 0.8598 | 0.8080 | 0.7877 | 0.8200 | 0.9167 | 1.0140 | 1.0040 | 1.1012 | 1.0048 | 1.0177 | 1.1142 |
| 6 | 1.0111 | 1.0774 | 1.1273 | 1.0480 | 0.9795 | 1.0000 | 0.9465 | 0.4529 | 0.4806 | 0.8422 | 0.7915 | 0.7716 | 0.8032 | 0.8979 | 0.9932 | 0.9834 | 1.0785 | 0.9842 | 0.9968 | 1.0913 |
| 7 | 1.0686 | 1.1385 | 1.1911 | 1.1072 | 1.0350 | 1.0565 | 1.0000 | 0.4786 | 0.5078 | 0.8900 | 0.8363 | 0.8150 | 0.8481 | 0.9481 | 1.0486 | 1.0381 | 1.1381 | 1.0386 | 1.0513 | 1.1515 |
| 8 | 2.2329 | 2.3790 | 2.4888 | 2.3133 | 2.1627 | 2.2076 | 2.0894 | 1.0000 | 1.0610 | 1.8598 | 1.7476 | 1.7028 | 1.7717 | 1.9807 | 2.1904 | 2.1684 | 2.3768 | 2.1690 | 2.1953 | 2.4049 |
| 9 | 2.1049 | 2.2424 | 2.3458 | 2.1802 | 2.0385 | 2.0806 | 1.9692 | 0.9425 | 1.0000 | 1.7531 | 1.6472 | 1.6046 | 1.6692 | 1.8660 | 2.0634 | 2.0426 | 2.2381 | 2.0426 | 2.0666 | 2.2647 |
| 10 | 1.2007 | 1.2791 | 1.3381 | 1.2436 | 1.1628 | 1.1868 | 1.1232 | 0.5376 | 0.5704 | 1.0000 | 0.9396 | 0.9153 | 0.9521 | 1.0644 | 1.1769 | 1.1650 | 1.2765 | 1.1650 | 1.1786 | 1.2916 |
| 11 | 1.2777 | 1.3613 | 1.4241 | 1.3237 | 1.2375 | 1.2632 | 1.1956 | 0.5722 | 0.6071 | 1.0642 | 1.0000 | 0.9743 | 1.0137 | 1.1332 | 1.2532 | 1.2406 | 1.3597 | 1.2409 | 1.2558 | 1.3758 |
| 12 | 1.3118 | 1.3975 | 1.4619 | 1.3587 | 1.2704 | 1.2966 | 1.2272 | 0.5874 | 0.6232 | 1.0925 | 1.0266 | 1.0000 | 1.0402 | 1.1629 | 1.2858 | 1.2728 | 1.3947 | 1.2728 | 1.2877 | 1.4112 |
| 13 | 1.2603 | 1.3427 | 1.4047 | 1.3057 | 1.2207 | 1.2460 | 1.1793 | 0.5644 | 0.5989 | 1.0497 | 0.9864 | 0.9611 | 1.0000 | 1.1179 | 1.2363 | 1.2239 | 1.3415 | 1.2243 | 1.2391 | 1.3574 |
| 14 | 1.1265 | 1.2003 | 1.2559 | 1.1674 | 1.0913 | 1.1140 | 1.0544 | 0.5046 | 0.5354 | 0.9383 | 0.8818 | 0.8594 | 0.8945 | 1.0000 | 1.1061 | 1.0951 | 1.2008 | 1.0958 | 1.1095 | 1.2150 |
| 15 | 1.0183 | 1.0850 | 1.1353 | 1.0553 | 0.9864 | 1.0070 | 0.9532 | 0.4561 | 0.4840 | 0.8482 | 0.7971 | 0.7769 | 0.8087 | 0.9041 | 1.0000 | 0.9901 | 1.0858 | 0.9908 | 1.0034 | 1.0986 |
| 16 | 1.0262 | 1.0937 | 1.1446 | 1.0642 | 0.9945 | 1.0154 | 0.9612 | 0.4599 | 0.4880 | 0.8549 | 0.8035 | 0.7837 | 0.8164 | 0.9126 | 1.0098 | 1.0000 | 1.0977 | 1.0016 | 1.0153 | 1.1106 |
| 17 | 0.9372 | 0.9987 | 1.0450 | 0.9714 | 0.9080 | 0.9270 | 0.8774 | 0.4199 | 0.4455 | 0.7807 | 0.7336 | 0.7152 | 0.7446 | 0.8324 | 0.9208 | 0.9117 | 1.0000 | 0.9125 | 0.9242 | 1.0118 |
| 18 | 1.0266 | 1.0939 | 1.1447 | 1.0641 | 0.9946 | 1.0154 | 0.9611 | 0.4599 | 0.4880 | 0.8551 | 0.8036 | 0.7835 | 0.8158 | 0.9120 | 1.0089 | 0.9990 | 1.0959 | 1.0000 | 1.0130 | 1.1088 |
| 19 | 1.0151 | 1.0816 | 1.1317 | 1.0520 | 0.9833 | 1.0038 | 0.9501 | 0.4547 | 0.4825 | 0.8455 | 0.7946 | 0.7745 | 0.8061 | 0.9012 | 0.9968 | 0.9869 | 1.0822 | 0.9875 | 1.0000 | 1.0950 |
| 20 | 0.9282 | 0.9890 | 1.0347 | 0.9617 | 0.8991 | 0.9177 | 0.8686 | 0.4157 | 0.4411 | 0.7731 | 0.7265 | 0.7079 | 0.7366 | 0.8235 | 0.9107 | 0.9016 | 0.9883 | 0.9019 | 0.9129 | 1.0000 |

# VITA

Phillip Scott Bevins was born in Richmond, Virginia on November 2, 1966. He attended primary school in Coeburn, Virginia for grades one through four. Upon completing fourth grade, he moved to Wise, Virginia where he attended elementary school and later graduated from J.J. Kelly High School in June, 1985. In September of that same year, he entered the University of Tennessee. Upon completing his freshman year, he transferred to Clinch Valley College of the University of Virginia in Wise, where in May, 1988 he received two Bachelor of Science degrees, one in Mathematics and one in Business with a concentration in Economics. In August, 1988 he returned to the University of Tennessee, and in August, 1992 received a Master of Science degree in Agricultural Economics.

Presently, he has chosen to remain at the University of Tennessee where he will complete a doctorate in Agricultural Economics.

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