Hispanics. At the Managerial and Business Professional level, Hispanics and blacks were paid 26, and 22 percent below the average, respectively. The average Manager/Business Professional worker with a bachelor's or graduate degree earned $53,944/year. However, Hispanics and Blacks with the same educational attainment were paid 48, and 38 percent below the average, whereas White Non-Hispanics were paid 6 percent above the average (Calderón-Salin, 2000).

We can conclude as a result of the data analysis that there is a minority representation in the food and agribusiness industry. However, minorities are in low level and low paying positions. Education helps but despite education, minorities are usually confined to lower tier jobs. With the exception of less skilled service and sales, minorities are paid much less than the industry average. Therefore, the data demonstrates that although minorities have established a strong presence in the food and agribusiness industry they are nevertheless, relegated to lower paying non-managerial or supervisory positions. Education is necessary but not sufficient at this point in time to ensure their upward mobility.

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The Apple Juice Concentrate Anti-dumping Case Against China: An Estimate of Change in Washington's Revenues

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Abstract

Increasing volumes of apple juice concentrate imports from China into the U.S. began in the mid 90s as a result of low Chinese prices. In 1999, the U.S. Apple Association launched a complaint with the US International Trade Commission (USITC) regarding the Chinese price strategy. During the course of investigation, the U.S. Apple Association requested that the Department of Agricultural Economics at Washington State University analyze the impact on the total value of juice apples utilized in Washington during the span of the USITC investigation.

To determine the magnitude of the effect of the USITC investigation, not only on finished apple juice prices but also on the Washington raw product price, an inverse demand for finished product and an input demand function for raw product was developed and parametrically estimated. Results from a derived demand analysis for juice apples revealed that a decrease in Chinese apple juice price reduced the prices paid by the processing sector by approximately 0.07 percent. However, throughout the course of the investigation process, juice apple prices increased significantly, resulting in an increase in the value of the juice apples purchased by processors of approximately USS 35,831,024 million dollars (April 1999 through May 2000).

Introduction

According to import statistics compiled by U.S Customs Service, the average import price in the 1997 marketing crop year decreased 50 percent relative to the 1995 marketing year. It appears that juice concentrate firms in the People's Republic of China (PRC), who in the mid 90 s began to significantly increase the volume of apple juice concentrate sold to the U.S, were attempting to improve market share by selling below production cost. The low concentrate prices were affecting growers and processors in the U.S. who were challenged to remain competitive in their own domestic market.

In 1999, the U.S. Apple Association filed a complaint with the U.S. International Trade Commission (USITC) regarding the Chinese price strategy. During the course of investigation, international concentrate prices improved significantly. During that same period, the U.S. Apple Association requested that the Department of Agricultural Economics at Washington State University analyze the economic impact of the complaint initiative on the Washington industry. Data limitations prevented analysis on a national basis. The issues to be addressed include:

(1) Identify the association between the international price of concentrate and local juice apple prices.

(2) Provide a measure of the change in total value of juice apples utilized during the span of the USITC investigation.

This paper overview the events and presents the findings on the preceding issues.

Review of Events

The USITC instituted an investigation effective June 7, 1999 in response to a petition by several apple processors across the U.S. to investigate unfair trade practices relating to non-frozen concentrate imports. Dumping of Chinese Apple juice imports having a brix of 40 or greater, whether or not the juice contains sugar or any other sweetening, has been the subject of recent USITC investigation.

The Washington apple industry was concerned about the dramatic decrease in the farm-gate value of apples in the last five years due to low average prices across all markets (fresh, juice, and other processed non-juice products). In the juice sector, the price for raw product in August 1997 ($21.65 a ton) was approximately 89% below the price paid in August 1995 ($200.00 a ton). Figure 1 displays the historical trend in juice apple prices paid by the processors in the state of Washington.

In the early 1990s China exported only small quantities of apple juice to the United States. Chinese exports of juice concentrate to the U.S. began to increase after October 94 (Figure 2). Other countries such as Chile, Argentina, and Hungary began increasing exports of non-frozen concentrated apple juice (NFCAJ) to the U.S during this time as well.

In May 2000, After a 15-month investigation, the USITC ruled that the domestic price of NFCAJ in the U.S. had declined due to low Chinese import prices and therefore, the industry was materially injured. Tariffs of up to 52 % are now assessed on Chinese NFCAJ. While China has not been the only country exporting apple juice concentrate into the U.S. at low prices, it was the entry of China into the market that appeared to force prices down (Warner). Product from Chile, Argentina, or Hungary are not subjected to the tariff imposed on the Chinese. Yet, these countries received a warning from the USITC.

In the U.S., domestic prices did not stabilize until 1999, in the months preceding the filing of the petition of investigation (USITC, May 2000, p14.). Figure 3 shows the domestic price for finished product during the last five years (1994-1999).

Currently, China is appealing the USITC ruling. Since China is not yet a member of the World Trade Organization, they cannot appeal the decision through that organization.

Methodology

To determine if there was a relationship between the Chinese import price and the NFCAJ domestic price in the last five years, an inverse demand model for apple juice together with an input demand function for raw product (juice apples) was used to analyze the magnitude of the effect of the USITC ruling not only on apple juice prices but also on the Washington raw product price. Monthly observations from September 1992 through December 1999 were used in the study. The following section discusses the development of both models.

An Inverse Input Demand Function for Raw Apples

Assuming firms in the processing sector produce only one output (juice concentrate) a supply function is proxied empirically by:

$$(1) \quad QS_t = f(AJP_t, AJIMP_t, PPG_t, repair_t, C_t, v_t),$$

where

QS_t = Total quantity supplied of apple juice in domestic markets at time t;

AJP_t = FOB apple juice price in time t and measured in price per carton of 12/24 oz bottles of juice;

$AJIMP_t$ = Apple juice concentrate weighted import price in gallons SSE at time t;

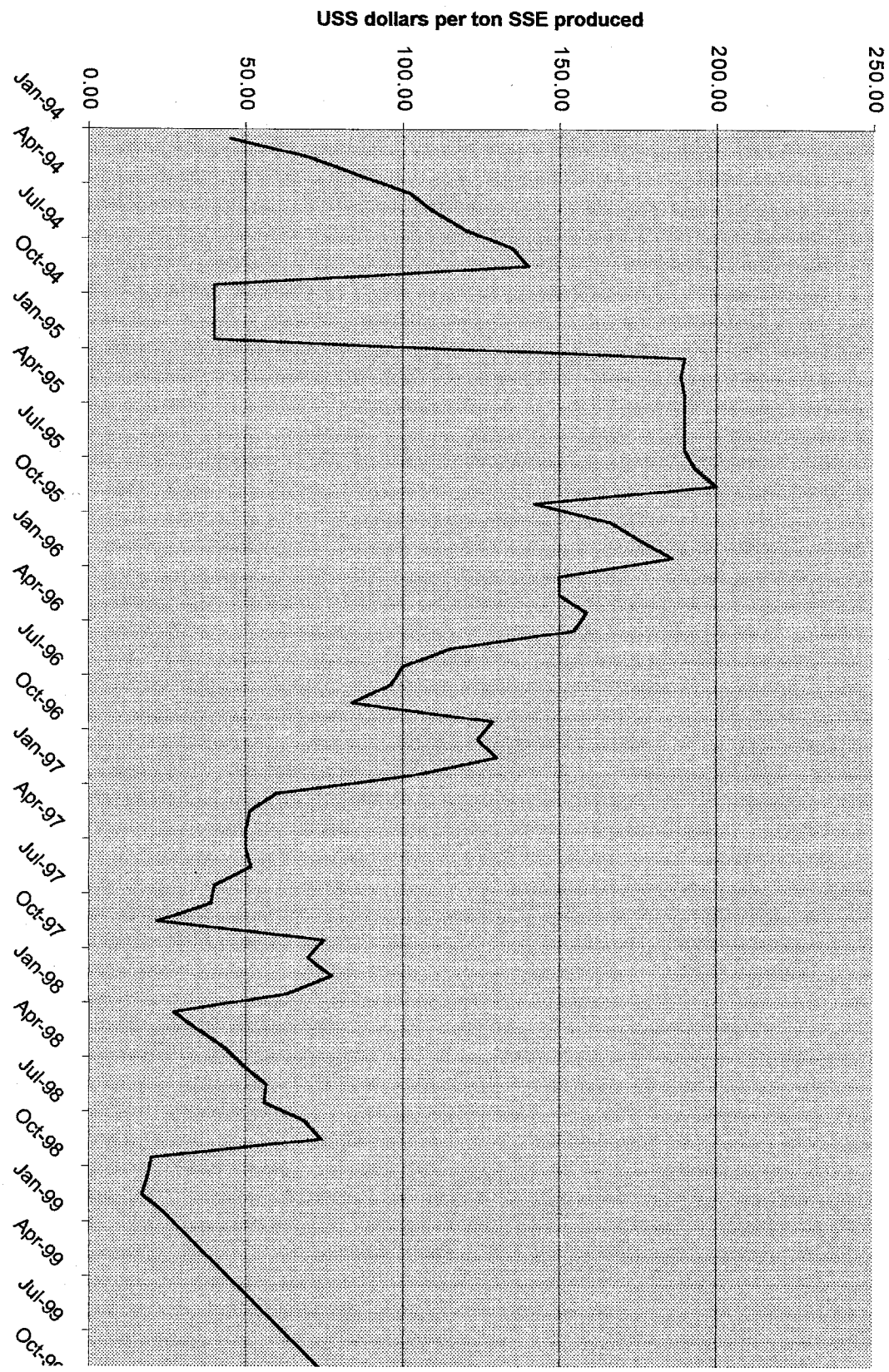

Figure 1. Prices Paid for Juice Apples in Washington.

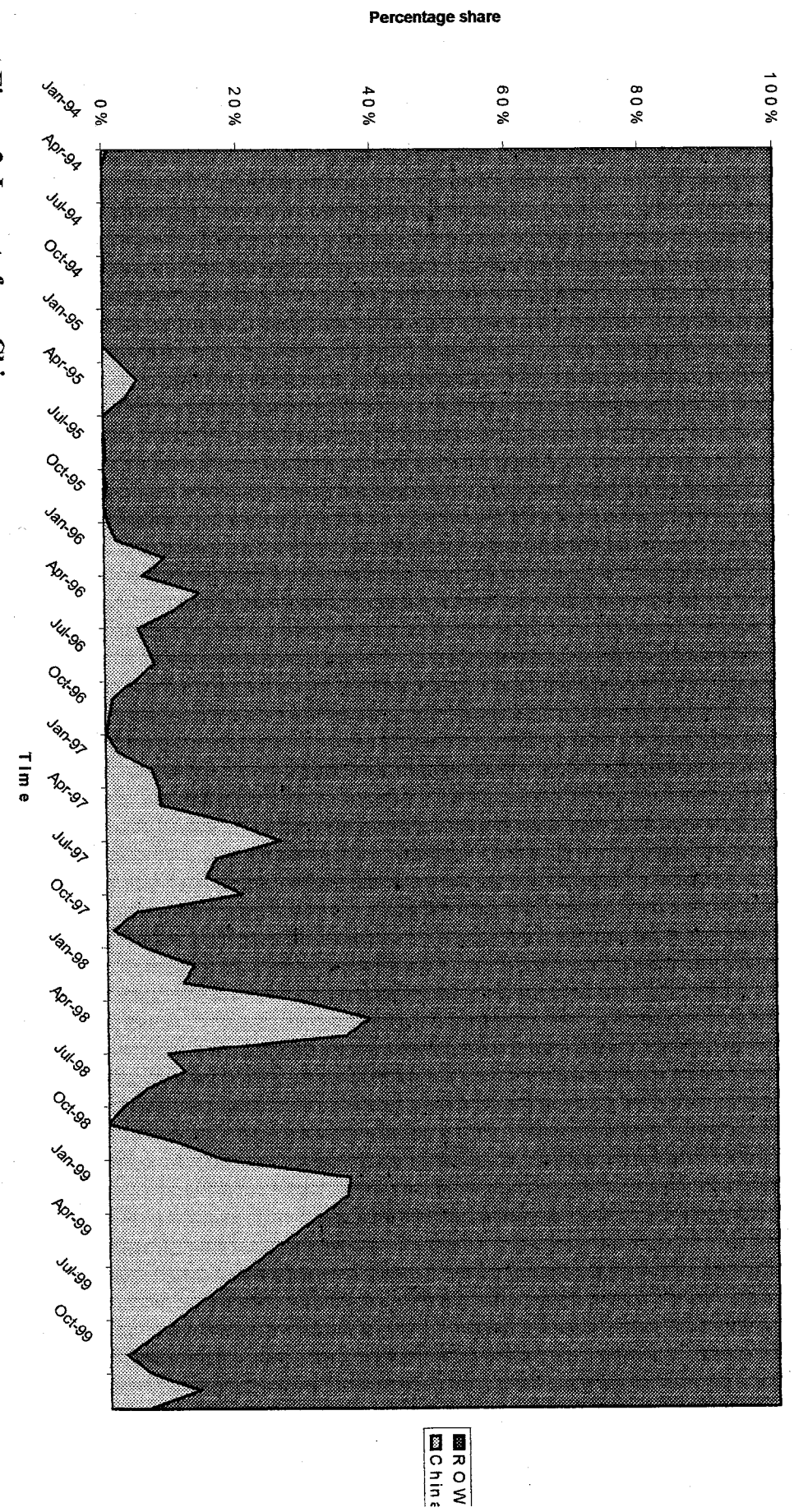

Figure 2. Imports from China.

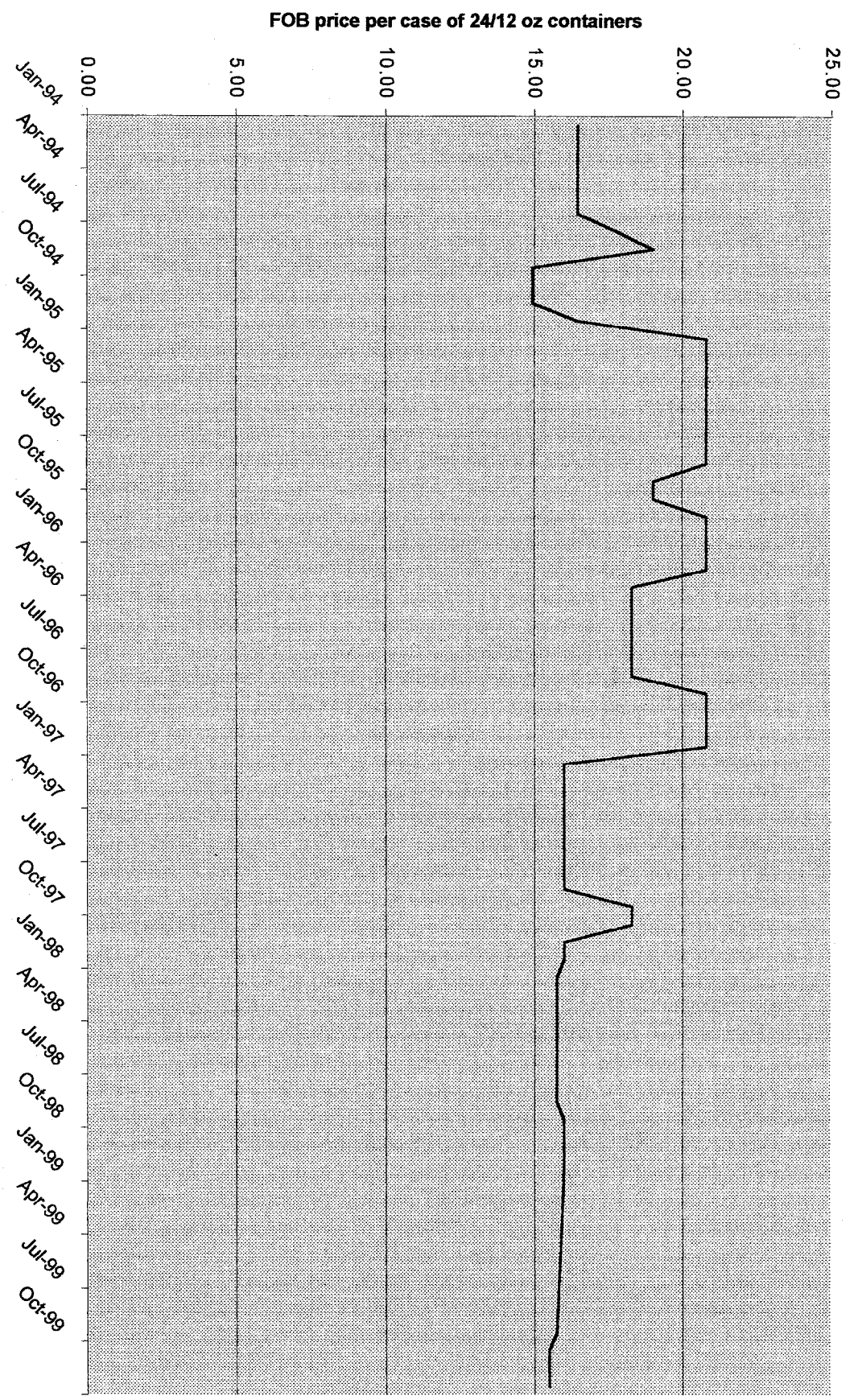

Figure 3. Finished Apple Juice Prices.

PPG_t = Price per gallon SSE of juice apples paid to growers for raw apples in period t;

$Repair_t$ = Repair cost index in time t;

C_t = Container cost index in time t;

v_t = Error term that accounts for other factors not captured by the variables.

Solving for the inverse input demand function for raw apples used in the manufacture of processed juice leads to equation 2:

$$(2) \quad PPG_t = \beta_0 + \beta_1 AJCP_t + \beta_3 repair_t + \beta_4 C_t + \beta_5 QS_t + v_t.$$

The finished product price was hypothesized to have a positive impact on the raw input price. Conversely, energy and repair costs were expected to have a negative effect on apple juice supply. The weighted import price of apple juice ($AJIMP_t$) was introduced in the model as an alternative to processing domestic raw product to produce juice blends and which, in turn, can be sold at least at zero profit margin. The weighted import price was computed as follows:

$$AJMP_t = \frac{Chinese\ imports \times Chinese\ imports\ price}{Chinese\ imports + Row\ Imports} + \frac{ROW\ imports \times ROW\ imports\ price}{Chinese\ imports + Row\ Imports}.$$

Data on the total quantity supplied of finished juice product is unavailable. Therefore quantity of raw product utilized in the production of juice was used as a proxy. The expected sign was negative. Other alternative fruit juice concentrates such as cherry or pear concentrate were not considered in the model because U.S. producers consider these alternatives as niche products not produced in high volumes. Therefore, a firm producing apple juice concentrate would not purchase a concentrator for the sole purpose of producing other concentrate (USITC, p2).

Due to the nature of the litigation process, importers were potentially exposed to the assessment of duties in excess of 50%, hence, during the litigation, purchases of Chinese concentrate declined markedly and juice apple prices increased. To include the effects of the petition and USITC litigation process, an indicator variable (DUMP) spanning the period April through December 1999 was included in Equation 2.

Another indicator variable for the 1998 marketing crop year was also included in Equation 2 to account for the fact that the 1998 crop year was very large (LRCY). A "large" crop was defined as one that exceeded at least 120 percent of the preceding year's average production. According to the Washington Agricultural Statistics Service 1999 report, total production in 1998 was 3,200,000 tons, while the volume produced in the previous year was 2,500,000 tons.

Demand for Apple Juice

U.S. aggregate inverse market demand for apple juice was proxied empirically by:

$$(3) \quad AJP_t = f(AJP_{t-1}, QDAJ_t, PS_t, Income_t, u_t),$$

where:

AJP_t = FOB apple juice price in time t and measured in price per carton of 12/24 oz bottles of juice;

AJP_{t-1} = FOB apple juice price lagged one period;

$QDAJ_t$ = per capita juice apples utilized in the production of apple juice in the state of Washington in period t measured in gallons SSE as a proxy variable for finished and marketed product;

PS_t = A vector of substitute prices (The weighted import price of apple juice ($AJIMP_t$) *measured* in gallons SSE in order to account for other substitutes not included in the model due to data limitations) in time t;

$Income_t$ = Per capita U.S. income in time t;

u_t = Error term to capture economic forces not captured by the variables.

The FOB price lagged one period is included in equation 3 under the hypothesis that prices are sticky in the short-run and therefore, the expected sign is positive. Juice apples utilized in the production of apple juice ($QDAJ$), were used as a proxy for processed and marketed juice output, the actual output level being un-

available. *QDAJ* was expected to have a negative effect on the apple juice price. On the other hand, substitutes were hypothesized to have a positive impact because an increase in the substitute price, while holding constant other variables in the model, will induce consumers to purchase greater quantities of apple juice. All prices were divided by the consumer price index for food items to impose homogeneity of degree zero conditions. Income was hypothesized to have a positive impact, where apple juice is considered to be a normal good and as income increases, while holding all other variables constant, *AJP* prices should increase.

Crop marketing year indicator variables (DD96, DD97, DD98, and DD99) were also included in equation 3. It was hypothesized that each indicator variable would have a negative sign because these variables were included in the model to account for a gradually increasing Chinese market penetration in the U.S., with subsequent expected negative impacts on *AJP* prices.

The demand function was specified as a price dependent equation under the assumption that the market price level is determined through the interaction of current demand and a given level of supply. Similarly, the inverse demand function is stated in price dependent form. The final demand function was estimated in linear form after having tested other functional forms and concluding that a linear structural form provided the best overall fit in terms of variable significance, interpretability, and prediction ability.

Final Model

The inverse market demand equation may be substituted into equation 2, so the price paid by processors (*PPG*) can be specified as follows:

$$(3)\quad PPG_t = \beta_0 + \beta_1(\gamma_0 + \gamma_1 1AJP_{t-1} + \gamma_2 QDAJ_t + \gamma_3 AJIMP_t + \gamma_4 DD95 + \gamma_5 DD96 + \gamma_6 DD97 + \gamma_7 DD98 + \gamma_8 DD99 + \gamma_{10} Income + u_t) * cpi_t + \beta_2 AJIMP_t + \beta_3 repair_t + \beta_4 C_t + \beta_5 Dump_t + \beta_6 LRCY_t + v_t,$$

where u and v are the error terms from the demand and supply equations, respectively. The signs for each of the variables included in equation 4 remain as hypothesized.

Data Sources

The estimation period was from September 1992 through December 1999 on a monthly basis. Quantities utilized in the production of apple juice were obtained from the National Apple Processing Report published by the Market News Service, AMS, USDA. Prices paid by processors for apples were obtained from the same source and averaged to monthly observations and converted to SSE juice equivalent. U.S. population estimates were obtained from the Bureau of Census. The Chinese import price data on juice concentrate prior to 1998 was based on Department of Commerce import data and obtained from the Food Institute by the U.S. Apple Association. The series was completed with data obtained from Horticultural Trade and U.S. Export Opportunities, a USDA publication. All data for the ROW import price (Chile, Hungary, and New Zealand weighted average price) were obtained from the same USDA publication. The prices of finished juice product were obtained from the Food Institute Reports. The CPI for food items was downloaded from the Bureau of Labor Statistics Internet site. Repair and container cost is a monthly interpolation of the repair and container cost indices reported by Agricultural Outlook USDA on a quarterly basis.

Estimation Procedure

Ordinary Least Squares (OLS) was used for the demand equation and the inverse input demand function for juice apples. It may argued that Two Stage Least Squares should have been used in estimating both equations in order to account for the endogeneity of the raw product price, output price, and quantity. However, when implemented and compared to the OLS estimates, the latter provided estimates with the hypothesized priori signs while the former did not. The absence of good instrumental variables may have caused 2SLS to fail.

In equation 2, different functional forms were tried. The model that provided the best fit was the semi-log functional form with the dependent variable stated in log form while the explanatory variables were expressed in linear form.

The Durbin Watson and Durbin *h* test were used to test for autocorrelation. The Durbin Watson for the inverse input demand function resulted in 1.43 indicating autocorrelation problems with a probability value of 0.001. To correct the prob-

lem, several procedures were conducted. Among them: the Cochrane-Orcutt procedure, and an inspection of the autocorrelation function (ACF) and the partial autocorrelation function using the ARIMA procedure in SAS. The ACF and PACF suggested a model of AR(4) or MA(1) for the inverse input demand function. The AR(4) is an autoregressive process of four lags and MA(1) is a moving average of order one (for details see Brockwell and Davis). The MA(1) was chosen over the Cochrane-Orcutt procedure and the AR(4) model because it generated a better fit in terms of economic sense, parsimony, and lower prediction error.

Results

Results for the inverse demand equation at the FOB level and the juice apple input demand function are shown in Table 1 and Table 2, respectively. Both equations generated high R^2 indicating goodness of fit.

Table 1. Results for the Inverse Market Demand of Apple Juice at the FOB Level.

Variable name	Mean Value	Standard Deviation	Parameter Estimate	T for H_O: Parameter = 0
Intercept			0.044*	4.329
AJP (lagged one period)	0.111	0.0163	0.556*	7.569
QDAJ in per capita terms	0.031	0.011	-0.111	-1.255
AJIMP	0.006	0.002	1.939*	2.821
DD97			-0.008*	-2.736
DD98			-0.006*	-1.804
DD99			-0.007	-1.34
AJP (dependent variable)	0.110	0.016		
Population	264 Million			
CPI for food items	151.726			
R2 = 0.83	DW=	2.385	N =56	

*Significant at the 0.05 level.

Table 2. Inverse Input Demand of Juice Apples Results.

Variable name	Mean Value	Standard Deviation	Parameter Estimate	T for H_O: Parameter = 0
Intercept			-0.468	0.646
AJP	17.138	2.369	0.046*	2.117
AJIMP	0.959	0.292	1.520*	7.499
Container cost index	391.217	20.598	-0.003*	-1.187
Repair cost	491.178	32.245	-0.003	-1.848
LRCY			-0.389*	-3.786
Dump			0.890*	7.559
Residual lagged one period	-0.0057		0.4437*	3.209
PPG in log form (Dependent variable)	-0.980	0.635		
R2 =0.885		DW=	2.018	N = 44

* Significant at the 0.05 level.

In the inverse demand equation (Table1), quantity was non-significant at the 0.10 level. If actual processed and marketed quantity would have been used instead of physical raw product as a proxy for output quantity, results may have been different in terms of significance. The income variable and the indicator variables for the years of 1995 and 1996 were also non-significant and, thus, removed from the final estimated model. One reason income was non-significant may be the lack of a sufficiently large change and/or variation in income throughout the last five years.

The rest of the parameters in the inverse demand equation had the expected sign and were highly significant. The weighted import price had a significant impact on apple juice prices. And, the indicator variable for the marketing years of 1997 and 1998 also had a significant, negative impact on apple juice prices just as hypothesized. These results are concordant with Figure 2. Chinese imports in January 1998 peaked at approximately 40% of total imports.

In the inverse input demand function (Table 2) where the raw product price is the dependent variable, all parameter estimates had the *a priori* expected sign. The proxy variable for quantity (QS_t) had the correct sign but was highly non-significant. Thus, removed from the final model. The price stickiness hypothesis in the final product price was supported by a positive and significant coefficient on AJP. The weighted import price also had a significant positive effect on the dependent variable.

The result with respect to the *DUMP* variable (the indicator variable included in the input demand function to account for the effect of the petition and USITC investigation period of time) was positive and highly significant suggesting grower prices improved as a result of the petition. The derived marginal effect of the DUMP variable was 0.311, which converted into price per ton[1] is USS 65.32 dollars.

The total quantity utilized for juice during the investigation process until the end of the period of analysis (April-December 99) was 376,509 tons. Therefore, during that period Washington processors are predicted to have paid an additional US$ 21,271,109. Forecasting through May 2000, the benefit raises to US$ 35,831,024. Total quantity utilized for juice from April 1999 through May 2000 was 548,546 tons.

The flexibility between the raw product price and the Chinese price was 0.076 indicating that an increase or a decrease in the Chinese price would increase (reduce) the price paid for juice apples in Washington by 0.076 percent.

Conclusion

In response to a request from the U.S Apple Association, the Department of Agricultural Economics at Washington State University analyzed the impact on the total value of juice apples utilized during part of the USITC investigation into alleged Chinese dumping of apples in the US market. An inverse demand for finished product and input demand function for raw product was developed and parametrically estimated to facilitate the analysis. Results from the derived input demand for juice apples revealed that a decrease in the Chinese apple juice price negatively affected the prices paid by processors in the crop marketing years of 1997 and 1998. However, prices paid by processors began to improve significantly after the petition was initiated in the spring of 1999.

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[1]The conversion factor used to convert gallons SSE into metric tons was 220/1.048 given the fact that a ton of apples contain 2,200 pounds and it takes 10.48 pounds of solid fruit to produced a gallon of juice approximately. This conversion factor was obtained from Dr. Richard Daugherty, Extension Food Scientist, Washington State University.