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The evolution of foreign wine demand in China*

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We estimate source-differentiated wine demand in China using the absolute price version of the Rotterdam demand system. Within the last decade, China has gone from obscurity to an important participant in global wine trade. The continual growth of Chinese wine imports suggests that a one-time structural shift approach may not fully capture how consumption patterns or demand preferences have changed over time. Thus, a rolling or moving regression procedure is used to account for continual adjustments in import demand patterns and to evaluate overall parameter instability. Our results confirm that Chinese consumers hold French wine in high regard and that French wine demand has consistently increased over the last decade, more than any other exporting source. Consumers in China have gone from allocating about 1/3 to over 1/2 of every dollar to French wine and the expenditure elasticity for French wine mostly increased while the market was expanding. Although Australian wine has a very solid standing in the Chinese market, results suggest that its market share will likely remain unchanged. Marginal budget share and expenditure elasticity estimates indicate that Australia will continue to account for about 20 per cent of the foreign wine market in China.

Key words: China, demand analysis, imports, rolling regression, Rotterdam model, wine.

1. Introduction

While there is a long-standing tradition of grain-based alcohol consumption in China, the increase in per capita income, combined with an increase in Western influence, expatriates, educated young professionals and government campaigns to promote healthier lifestyles, has led to an expansion of wine consumption (Sun 2009). Consequently, China has emerged as a major player in global wine trade and is an important destination market for major exporting countries (Mitry *et al.* 2009). According to the UN Comtrade database, China ranked 51st in the world in 2000 with bottled wine imports of only $4.9 million, significantly less than major importers such as the

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United Kingdom ($2.1 billion), United States ($1.9 billion) and Germany ($1.1 billion).[1] By 2011, China's imports increased to $1.3 billion, making it the 5th largest bottled wine importer in the world. In 2002, China accounted for <1 per cent of wine from any exporting country; by 2010, however, it accounted for 8 per cent of Australian exports, 7 per cent of French exports and 4 per cent of U.S. exports.

A number of factors have contributed to the increase in wine consumption and hence wine imports in recent years. The average wine consumer in China tends to be college educated, and in 2011, nearly six million people graduated from universities and colleges, up from just one million in 2001 (China Economic Information Network 2012). The average wine consumer also comprises a relatively wealthy part of a growing middle and upper income class. Education and income growth coupled with an overall change in consumer behaviour, growing health awareness and an increasing demand for a modern lifestyle suggest a persistent change in Chinese wine demand over the last decade. While these factors have likely affected both domestic and imported wine, our focus in this study is the foreign wine market. In particular, we focus on how fundamental demand relationships (i.e. the responsiveness of wine imports to prices and income) have structurally changed over time.

The significant growth in Chinese wine imports raises the following questions. Is there a greater preference for wine from particular countries due to the changes in the overall economy? Are these changes reflected by wine consumers becoming more or less sensitive to income and import prices? Has wine consumption evolved such that Chinese consumers behave like consumers in major importing countries such as the United States and United Kingdom? As the Chinese economy grows and incomes rise, which exporting countries are likely to benefit as more income is allocated to foreign wine?

We examine Chinese wine demand in a source-differentiated framework (product heterogeneity due to the country of origin) using the absolute price version of the Rotterdam demand system (Theil and Clements 1987). Given the considerable changes in the Chinese market over the last decade, it is likely that wine consumption patterns have also changed. What has taken place in the Chinese economy has been continual, and it is expected that the wine demand estimates have changed accordingly. Thus, we use a rolling or moving regression procedure to account for continual adjustments in the import demand parameters (Brown *et al.* 1975; Zivot and Wang 2006). Estimating the demand system over a rolling window of a fixed size through the sample allows for capturing structural shifts that occurred during the sample period and evaluating overall parameter instability.

[1] Bottled wine is defined according to the Harmonized Commodity Description and Coding System (HS) classification 220,421, *wine of fresh grapes (excluding sparkling wine) in containers ≤2 L.*

2. Literature review

Wine demand has been extensively studied in economics. Gallet (2007) conducted a meta-analysis of wine demand estimates and surveyed well over 100 studies. However, past research mostly focused on aggregate wine demand relative to the demand for other alcohol products such as beer and spirits. For example, see Moosa and Baxter (2002). Although country of origin is critical to wine sales, few studies have considered how the product origin/exporting source affects demand. A search of the literature resulted in only three studies that considered source differentiation when estimating wine demand. These include Seale *et al.* (2003), Carew *et al.* (2004) and Muhammad (2011). These studies focused on the United States, Canada and United Kingdom, respectively, which are well-established markets with fairly consistent imports. China is unique in that it has gone from obscurity to an important participant in global wine trade within a relatively short-time period. Seale *et al.* (2003) examined US wine demand during a period (1990–1999) when imports grew by 129 per cent, and Muhammad (2011) examined UK wine demand during a period (1995–2009) when imports grew 113 per cent. While these increases are by no means trivial, wine imports in China have increased by over 26,000 per cent during the period 2000–2011, which cannot be explained by prices and income alone and suggest a fundamental change in attitudes and demand for wine. Muhammad (2011) is the only study to consider structural change and parameter instability; however, the focus of his analysis was a discrete structural shift due to an increasing share of New World imports in the United Kingdom. The continual growth of Chinese wine imports suggests that a one-time structural shift approach may not fully capture how demand has changed over the last decade. Chinese wine consumption patterns may actually be converging to what has been observed in established markets, or a new market with preferences very different from Western countries could be emerging.

Although quantitative analysis has been limited, studies have examined consumer behaviour in China to better understand the factors contributing to wine purchases. Liu and Murphy (2007) surveyed households in Guangzhou and found that consumers had little knowledge of wine, yet purchased wine for health benefits and prestige. They noted that wine knowledge based on the exporting country was limited except in the case of French wine, which consumers associated with the highest quality. Examining purchasing behaviour in the Changning district, Balestrini and Gamble (2006) found that the top four factors affecting wine purchasing decisions were quality, country of origin, brand and price. They further note that consumers considered country of origin as a quality signal. Although the limited sample size and geographical location in these studies make it difficult to generalise to all consumers, they do provide some evidence that country of origin is important to wine sales in China.

3. Background

3.1. Chinese wine market

The changing landscape of the Chinese population from rural to urban households with better access to consumption goods, in tandem with increased disposable income and the rise of the middle class, provides the foundation for continued growth in the Chinese wine market (Huang and Rozelle 1998). The urban areas of Beijing, Shanghai, Guangzhou and Shenzhen are of particular importance as there is a strong presence of expatriates, western-educated young professionals and progressive consumers who have a knowledge of and preference for foreign wine. Furthermore, there has been an increase in wine consumption by females as gender equality continues to rise in China (Mitry *et al*. 2009; Chen 2012).

Alcohol consumption in China is deeply rooted in tradition, including drinking at social banquets and business meetings as well as the purchase of alcohol as gifts during holidays (Liu and Murphy 2007). Traditionally, large quantities of alcohol are consumed during social banquets and hosts often provide high-quality food and beverages at these events to show respect and generosity towards guests as well as to signal their own wealth and social stature (Balestrini and Gamble 2006; Liu *et al*. 2008; Yu *et al*. 2009). While banquets and social functions are important, two major holidays (the Chinese New Year and the Mid-autumn Festival) account for approximately 60 per cent of annual wine sales (Knowledge@Wharton 2012).

In the past, grain-based alcohol was typically consumed, yet there has been a transition to wine as the beverage of choice for social gatherings and celebrations. Additionally, the Chinese government has actively promoted the consumption of wine over grain-based spirits since the 1980s in an effort to promote healthier drinking habits and to divert grain from alcohol to food production (Thorpe 2009). The Chinese government now serves wine at state banquets to further promote wine as a preferred beverage, and Chinese consumers are following suit (Sun 2009).

Chinese wine consumers are primarily interested in purchases that convey a level of prestige, status and respect, all of which are important components of Chinese culture. Consequently, quality wines, especially quality imported wines have become the choice of many high-end consumers. This preference for imported wine is also brand driven, often lacking emphasis on taste. Bordeaux and Burgundy wines enjoy strong recognition among Chinese consumers, and high-end consumers demand first-growth French wines, such as Lafite and Latour. Furthermore, one of the main features of the Chinese wine market, as opposed to Western markets, is the predominance of red over white wine. Approximately 90 per cent of the wine consumed in China is red. The preference for red wine is rooted in Chinese culture where red is associated with celebrations and happiness. Although red wines dominate the Chinese market, white wine demand has been increasing, which is primarily

attributed to female consumers who prefer the lighter taste of white wines (New Zealand Trade and Enterprise 2009; Knowledge@Wharton 2012).

Although the majority of wine consumption in China is domestic wine, foreign wine represents a significant opportunity for expansion. Changing lifestyles and the preferences of urban consumers, as well as the problems and challenges associated with domestic wine production and distribution are contributing factors to this potential demand (Sun 2009; Muhammad *et al.* 2012). The fraudulent labelling of domestic and bulk wines has created a lack of trust and reliability among consumers. The number of food and drink safety breaches that have recently occurred in China has further increased scrutiny of the domestic market. Coffey (2006) notes that scandals involving counterfeit wine often sold at lower prices are common in China. For instance, used wine bottles have been purchased on the underground market and refilled with either mixed cheap wines or grape juice. In October 2010, five wineries in the Changli district of Hebei province were found producing and distributing fake wine by mixing sugar water with colouring and flavouring chemicals.[2] In 2011, a famous French winemaker, *Domaines Barons de Rothschild*, exported 200,000 bottles of *Chateau Lafite Rothschild* wine to China, while media reports claimed that 600,000 bottles were traded that year (Wang and Xiao 2012). In addition to refilling used bottles, there are brand infringement problems in China where domestic suppliers mimic foreign wine labels. For instance, producers use brand names such as Lafite Family or Lafite Empire, but have no connection to the well-known French brand *Lafite*. Other fraudulent practices include mislabelling low-end varieties as high-end to command higher prices.

3.2. Trends in foreign wine demand

Chinese wine imports and market share by exporting source are reported in Table 1. The data show that imports consistently grew over the last decade, even doubling in some years. During the period 2000–2011, imports increased by over 26,000 per cent from $4.87 million to $1.27 billion. France accounts for about 45 per cent of the Chinese wine imports and has consistently been the primary supplier over the last decade. The market share of Australian wine has fluctuated at times; however, Australia has consistently been the second leading supplier (about 19 per cent over the last decade), reaching $200 million in 2011. The average market share for the remaining suppliers is 8.2 per cent (United States), 8.1 per cent (Italy), 5.3 per cent (Chile) and 4.7 per cent (Spain).

Wine prices by exporting source are reported in Table 2 and indicate that not only has the volume of wine imports increased in recent years but that Chinese consumers are purchasing more expensive imports, which is likely

[2] http://ntdtv.org/en/news_china/2010-12-31/630772304584.html

Table 1 Chinese bottled wine imports and exporter market share: 2000–2011

Year	Imports ($US million)	France	Spain	Italy	Australia	Chile	U.S.	ROW
		Market share (%)						
2000	$ 4.87	36.28	2.63	15.08	12.78	10.13	10.19	12.91
2001	4.98	48.67	4.93	8.57	16.08	1.57	11.39	8.78
2002	9.26	42.39	4.85	7.63	16.62	3.66	12.53	12.32
2003	12.89	43.39	4.46	6.75	19.34	4.01	11.74	10.31
2004	25.25	37.26	4.69	6.68	22.55	5.28	12.62	10.91
2005	39.94	37.67	4.02	7.09	22.61	6.40	8.58	13.62
2006	77.26	37.80	7.58	9.73	22.14	5.37	6.86	10.52
2007	184.13	44.93	6.76	9.71	19.80	4.61	4.67	9.53
2008	276.31	45.94	4.34	7.82	19.87	5.21	5.34	11.48
2009	377.42	47.99	3.64	5.98	21.22	6.38	5.54	9.24
2010	657.35	51.68	4.04	5.91	17.71	5.63	4.88	10.15
2011	1274.26	55.39	4.86	6.07	15.21	5.40	4.23	8.83
Average	245.33	44.12	4.73	8.09	18.83	5.31	8.21	10.72

Note: ROW is the rest of the world. Source: World Trade Atlas®, Global trade Information Services, Inc.

Table 2 Chinese bottled wine import prices by source: 2000–2011

Year	France	Australia	Spain	Italy	Chile	U.S.
			$US/L			
2000	$2.71	$2.42	$2.14	$2.23	$2.70	$1.89
2001	2.44	1.87	2.70	2.28	2.18	1.53
2002	2.55	2.46	1.82	2.40	2.37	2.62
2003	3.01	3.13	1.76	2.81	2.83	2.78
2004	3.69	4.01	2.39	4.20	2.85	3.21
2005	4.39	4.00	2.42	3.94	3.10	3.35
2006	4.24	3.73	3.26	4.07	3.34	3.19
2007	5.33	4.15	3.66	3.50	3.21	3.64
2008	5.53	4.72	3.82	4.28	3.42	3.82
2009	4.46	4.29	2.96	3.58	3.54	3.34
2010	5.01	4.90	2.79	3.46	3.52	3.49
2011	5.99	5.94	3.27	4.10	3.94	4.35
Average	4.11	3.80	2.75	3.40	3.08	3.10

Source: World Trade Atlas®, Global trade Information Services, Inc.

due to the increasing need to convey prestige and status through wine consumption. For instance, the average price of a bottle of French wine was $2.71/L in 2000, but increased to $5.99 by 2011. This appears to be the case for all major suppliers with the exception of Spain. During the same period, Australian wine increased from $2.42 to $5.94, Italian wine from $2.23 to $4.10, and U.S. wine from $1.89 to $4.35.[3]

[3] The prices reported in Table 2 are based on cost, insurance and freight (CIF) import values and may not fully reflect prices at the retail level.

4. Import demand model

Following Muhammad (2011), the absolute price version of the Rotterdam demand system is used in estimating foreign wine demand in China. We assume that wine is differentiated by exporting source where French wine, Australian wine, U.S. wine, etc., are treated as individual products that make up the product group wine. Source differentiation implies that wine from one country is an imperfect substitute for wine from another country. To limit the analysis to wine, we assume a multistage budgeting process where total expenditures are first allocated across product groups and then group expenditures are allocated across the goods within each product group. In this context, total wine demand is determined in the first stage, and conditional on total wine expenditures, the demand for wine from each source is determined in the second stage (Seale *et al.* 1992). Preferences are assumed to be independent or separable at the product group level, which implies that the utility interaction between wine and nonwine products is either zero (strong separability) or independent of the country of origin (weak separability). When using the Rotterdam model, the weak separability of product groups is sufficient for limiting analysis to goods within a product group (Theil and Clements 1987).

Our focus on imported bottled wine requires further assumptions about the separability of imported and domestic wine, as well as bottled and bulk wine. The separability of imported and domestic wines is plausible because domestic wine is often considered inferior to imports by Chinese consumers. However, the main reason for excluding domestic wine is limited data on domestic wine sales. Bulk wine is excluded due to our focus on origin-specific preferences at the final demand level. Note that bulk wine imports usually require further processing and are often blended with Chinese wine and resold under domestic labels. Given the derived nature of bulk wine demand, country of origin may not have the same effect on final consumer preferences.

Let q and p denote the quantity and price of bottled wine, and i and j denote the country of origin or production source, and n denote the number of source countries. Following Theil (1980) and Theil and Clements (1987), the demand for wine from the ith exporting source is specified as follows:

$$\bar{w}_{it}\Delta q_{it} = \theta_i \Delta Q_t + \sum_{j=1}^{n} \pi_{ij}\Delta p_{jt} + \varepsilon_{it}. \tag{1}$$

Δ is the log-change operator where $\Delta q_t = \ln q_t - \ln q_{t-1}$ and $\Delta p_t = \ln p_t - \ln p_{t-1}$. $\bar{w}_{it} = 0.5(w_{it} + w_{it-1})$ is the conditional budget share averaged over the periods t and $t-1$ where $w_{it} = p_{it}q_{it}/\sum_{i=1}^{n} p_{it}q_{it}$. θ_i is the ith marginal budget share (expenditure effect), and is defined as $\theta_i = \partial(p_i q_i)/\partial \sum_{i=1}^{n} p_i q_i$. ΔQ_t is the Divisia volume index where $\Delta Q_t = \sum_{i=1}^{n} \bar{w}_{it}(\ln q_{it} - \ln q_{it-1})$, which is a measure of the change in

aggregate wine expenditures in real terms.[4] π_{ij} is the Slutsky price coefficient or relative price effect, which measures the impact of the price of import j on the quantity of import i. ε_{it} is the error term assumed random and normally distributed.

The Rotterdam model requires that the following restrictions be met in order to conform to theoretical considerations: $\sum_i \theta_i = 1$ and $\sum_i \pi_{ij} = 0$ (adding up); $\sum_j \pi_{ij} = 0$ (homogeneity) and $\pi_{ij} = \pi_{ji}$ (symmetry). The Slutsky price matrix $\Pi = [\pi_{ij}]$ should also be negative semidefinite, which implies that an import should be nonincreasing in its price.

From Equation (1), we can derive the conditional expenditure elasticity $\eta_i = \theta_i/\bar{w}_i$, which relates percentage changes in imports from a particular source to percentage changes in total wine expenditures. We can also derive the compensated price elasticity $\eta_{ij}^c = \pi_{ij}/\bar{w}_i$ and uncompensated price elasticity $\eta_{ij} = \pi_{ij}/\bar{w}_i - \theta_i\bar{w}_j/\bar{w}_i$, both are measures of how prices in country j affect imports from country i (Seale *et al.* 1992).

5. Data and estimation

We obtained China Customs data on wine imports (quantities, values and prices) from the World Trade Atlas® database, Global Trade Information Services, Inc. Imports are defined according to the Harmonized Commodity Description and Coding System (HS) classification 220,421, *wine of fresh grapes (excluding sparkling wine) in containers* < 2 *L*. Quantities are measured in litres, while values and prices are in U.S. dollars and include product cost, insurance and freight (CIF). The data are monthly and span the period January 2002–December 2011. We considered this period because monthly imports were zero prior to 2002 for some sources, which is problematic when estimating a log-differenced model. To account for the competition across supplying countries, we disaggregate imports by country of origin: France, Italy, Spain, Australia, Chile, United States and *the rest of the world* (ROW). ROW is an aggregation of the exporting countries not specified. The annual market share and price for each source are reported in Tables 1 and 2, respectively.

We estimated the import demand system represented by equation (1) using the nonlinear least squares (LSQ) procedure in TSP (version 5.0), which uses the generalised Gauss–Newton method (Hall and Cummins 2005). Due to the adding-up property, the system is singular and requires that an equation be deleted before estimation. The ROW equation was deleted for this purpose; however, as noted by Barten (1969), estimates are invariant to the chosen deleted equation.

[4] When using monthly data, some studies have used the 12th difference instead of the one-period difference to remove seasonality from the data (e.g. Seale *et al.* 2003). However, we explicitly test for seasonal variations using monthly binary variables. A likelihood ratio test indicated that these binary variables could be excluded from the model.

The import demand system was first estimated using the entire data period and then estimated over a rolling subset of the data to assess how the parameter estimates and standard errors changed over time. For the rolling regression procedure, we started with a segment of successive observations of 48 months (January 2002–December 2006) and then rolled this segment forward in time by adding and dropping an observation for each estimation.[5] We then graphed the resulting coefficients and confidence bands against time to determine whether or not there has been structural change in the demand parameters and elasticities.

6. Empirical results

6.1. Full-sample estimates

The estimates using the full sample are reported in Table 3. Since the rolling regression results indicate that some estimates were unstable, the full-sample estimates should be taken with caution and are reported for comparison purposes. The marginal budget share (θ_i) indicates a positive and significant relationship between the Divisia index and wine imports from each source. Note that the marginal share is relatively large for France (0.478) and Australia (0.195), which is to be expected since they are, respectively, the largest and second largest supplier of wine to China, but significantly smaller for the remaining countries: ROW (0.079), United States (0.073), Italy (0.069), Spain (0.066) and Chile (0.041). These estimates indicate that for every dollar increase in total foreign wine expenditures, about \$0.48 was spent on French wine and \$0.20 on Australian wine, while only \$0.04–0.08 went to wine from each of the remaining sources.

The expenditure elasticities (η_i), which measure the responsiveness of wine imports by source to a percentage change in total foreign wine expenditures, are not statistically different from one. ROW is the only exception although its upper bound is very close to one. This suggests that there is a degree of expenditure proportionality (homothetic preferences) in the Chinese wine market, which indicates that the average budget share for each source may not vary with the level of total expenditures.

The conditional own-price estimates (π_{ii}) are presented along the diagonal in Table 3. All are negative and significant at the 0.01 level, sufficiently ensuring that the Slutsky matrix is negative semidefinite. These estimates are best understood when converted to elasticities. The uncompensated own-price elasticities indicate that Chinese consumers are particularly sensitive to U.S. wine prices (−2.023), twice their responsiveness to Chilean (−1.104) and Italian (−1.011) wine prices, and 2–3 times their

[5] Given the entire data period (January 2002−December 2011), rolling segments of 48 months resulted in 72 successive estimation runs.

Table 3 Conditional demand estimates for chinese wine imports (full-sample estimates)

	Own-price elasticity (η_{ij})	Expend elasticity (η_i)	Marginal share (θ_i)	Slutsky price effects (π_{ij})						
				France	Italy	Spain	Australia	Chile	U.S.	ROW
France	−0.813	1.080	0.478	−0.149	0.015	−0.012	0.042	0.053	0.067	−0.017
	(0.100)**	(0.052)**	(0.023)**	(0.044)**	(0.019)	(0.014)	(0.025)	(0.015)	(0.021)**	(0.018)
Italy	−1.011	0.943	0.069		−0.069	0.025	−0.050	0.007	0.029	0.043
	(0.220)**	(0.188)**	(0.014)**		(0.016)**	(0.009)**	(0.014)**	(0.009)	(0.012)*	(0.011)**
Spain	−0.720	1.363	0.066			−0.032	0.023	−0.014	0.011	−0.002
	(0.191)**	(0.237)**	(0.012)**			(0.009)**	(0.011) *	(0.006)*	(0.010)	(0.008)
Australia	−0.667	0.988	0.195				−0.093	0.006	0.026	0.045
	(0.128)**	(0.086)**	(0.017)**				(0.024)**	(0.011)	(0.015)	(0.013)**
Chile	−1.104	0.771	0.041					−0.057	0.009	−0.004
	(0.194)**	(0.172)**	(0.009)**					(0.010)**	(0.008)	(0.008)
U.S.	−2.023	0.925	0.073						−0.153	0.011
	(0.264)**	(0.261)**	(0.020)**						(0.021)**	(0.011)
ROW	−0.789	0.735	0.079							−0.076
	(0.127)**	(0.116)**	(0.012)**							(0.014)**

Notes: ** and * denote significance at the 0.01 and 0.05 level, respectively. Asymptotic standard errors are in parentheses; the own-price elasticity is the uncompensated elasticity; homogeneity and symmetry are imposed on the price effects; ROW is the rest of the world; the equation R^2 for France, Italy, Spain, Australia, Chile, U.S. and ROW is 0.81, 0.43, 0.29, 0.29, 0.27, 0.34 and 0.38, respectively. System R^2 = 0.904. The procedure for deriving the system R^2 is from Seale *et al.* (1992).

responsiveness to French (−0.813), Spanish (−0.720) and Australian (−0.667) wine prices.[6]

From the cross-price estimates (off-diagonal elements π_{ij}), we get an indication of how Chinese consumers substitute wine from one exporting source for another. Results show a significant competitive relationship (substitutes) between French wine and imports from Chile (0.053) and the United States (0.067). Interestingly, there is no significant price competition between France and the other European countries. However, we do find significant price competition between Italian and Spanish wine (0.025), as well as between Italian and U.S. wine (0.029), and Italian and ROW wine (0.043). There is also significant competition between Australia and Spain (0.023), and ROW (0.045). Additionally, there are two complementary relationships: Italian and Australian wine (−0.050), and Spanish and Chilean wine (−0.014).

6.2. Rolling regression estimates

Since our primary concern is how demand patterns changed over the last decade as shown by the responsiveness of wine imports by source to prices and total expenditures, we highlight three source-specific factors: the marginal budget share, expenditure elasticity and uncompensated own-price elasticity (Figures 1–3). Note that time on the horizontal axis is the last observation of the rolling sample starting with December 2006. Our results show persistent changes in consumer behaviour towards foreign wine purchases, particularly in how Chinese consumers allocated expenditures to wine from each exporting source. Results indicate that Chinese wine consumption patterns have not been constant and illustrate the importance of considering a series of estimates over time to understand consumer behaviour.

The marginal budget share estimates (Figure 1) indicate that the responsiveness of wine imports by source to total wine expenditures has significantly changed for all sources except Australia. Overall, the marginal budget share increased for French and Italian imports, remained relatively stable for Australian imports and decreased for imports of Spanish, Chilean and U.S. wine. The estimates for French wine indicate that for every dollar increase in total foreign wine expenditures, Chinese consumers spent on average \$0.34 on French wine during the earlier periods of the sample; however, this increased steadily to a high of \$0.56 during the later time period. The marginal budget share for Italian imports increased over the first half of the sample from almost zero (0.004) to a high of \$0.14 and then declined gradually to around \$0.09 towards the end of the sample period. The marginal budget share for Australia remained relatively stable (\$0.16–0.23), and given the confidence

[6] The elasticities are evaluated at the mean using the ANALYZ procedure in TSP, which uses the delta method to calculate the standard errors (Hall and Cummins 2005).

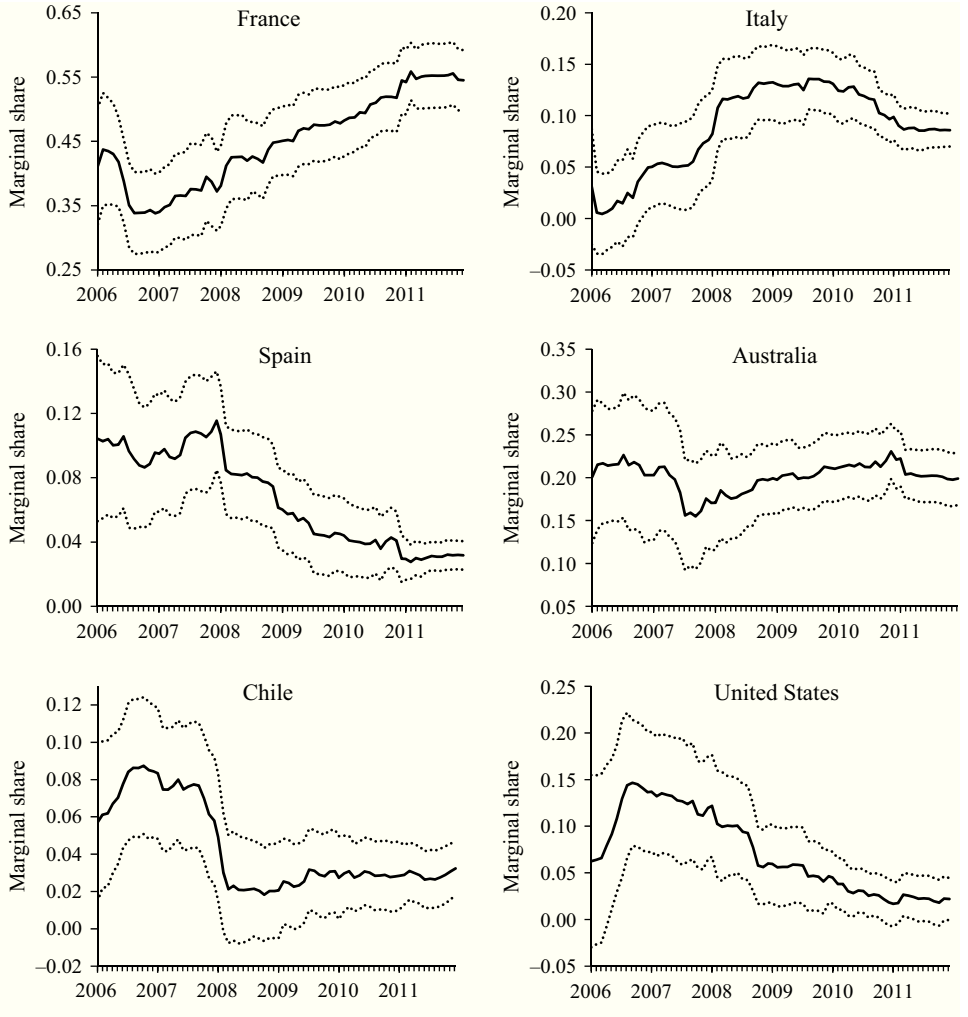

Figure 1 Rolling estimates: the effects of a dollar increase in total wine expenditures (marginal share). Each graph give the responsiveness of bottled wine imports from a particular source to a dollar increase in total bottled wine imports at a particular point in time. The solid line is the mean response, and the dotted lines are 95 per cent confidence bands.

bands, there is no period where one estimate is significantly different from another. Chinese consumers allocated an increasingly smaller share of their total wine expenditures on imports from Spain ($0.12–0.03) and the United States ($0.15–0.02). Chilean wine is the only import to experience a discrete shift where the initial marginal budget share was stable at around $0.08 and then sharply decreased to a low of around $0.03.

The expenditure elasticities (Figure 2) follow a similar pattern as the marginal share estimates in Figure 1. While the full-sample expenditure elasticities are not statistically different from one, this is not the case for the rolling estimates. Expenditure proportionality could still be argued for France and Australia given the range and relative stability of their expenditure

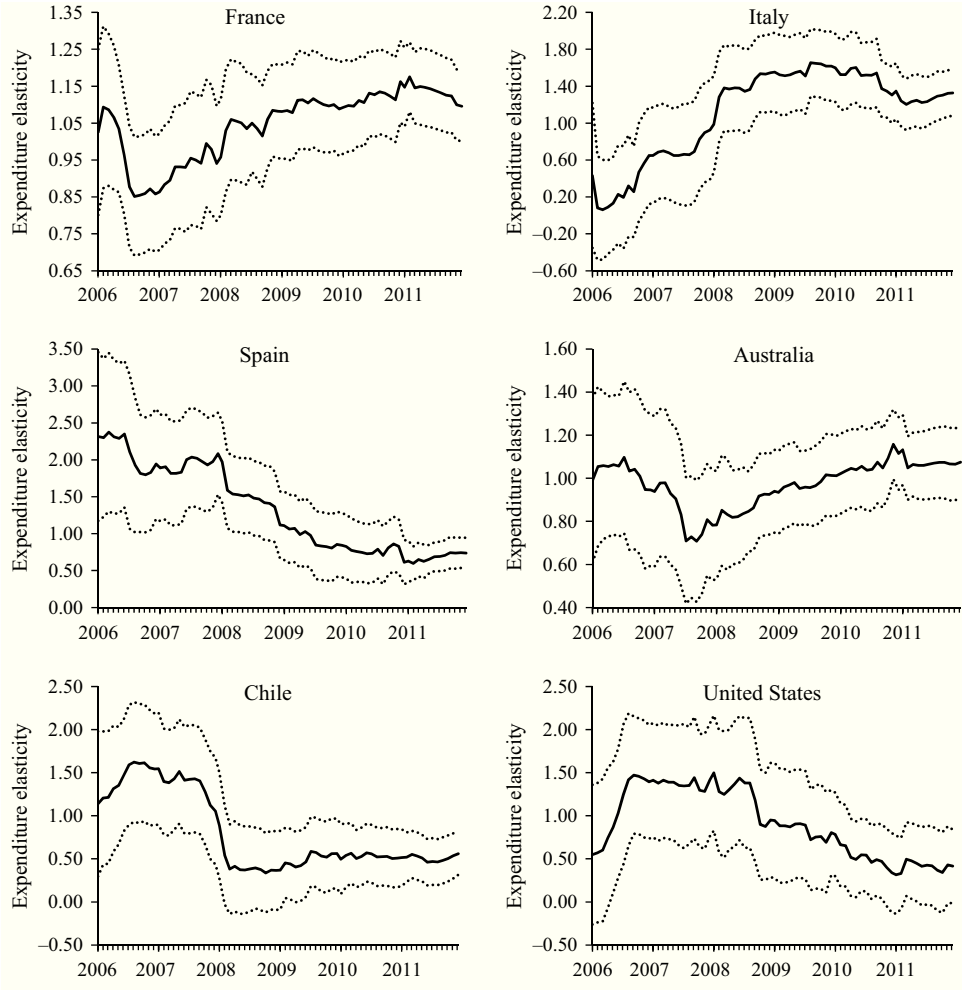

Figure 2 Rolling estimates: the effects of a percentage increase in total wine expenditures (expenditure elasticity). Each graph give the responsiveness of bottled wine imports from a particular source to a percentage increase in total expenditures on bottled wine imports at a particular point in time. The solid line is the mean response, and the dotted lines are 95 per cent confidence bands.

elasticities over time (France: 0.85–1.17; Australia: 0.71–1.16), but certainly not for the remaining sources. Overall, we find that the responsiveness of imports from Italy to percentage changes in foreign wine expenditures significantly increased over time (0.06–1.66), while the expenditure elasticities for Spain, Chile and the United States significantly decreased (Spain: 2.37–0.60; Chile: 1.61–0.34; United States: 1.50–0.32).

The uncompensated own-price elasticities and their corresponding standard errors (Figure 3) show significant departures from constancy for Spain and Italy, and to lesser degree Chile. Ignoring the periods when the own-price elasticity for Spain was insignificant, which is likely due to nonlinearities in

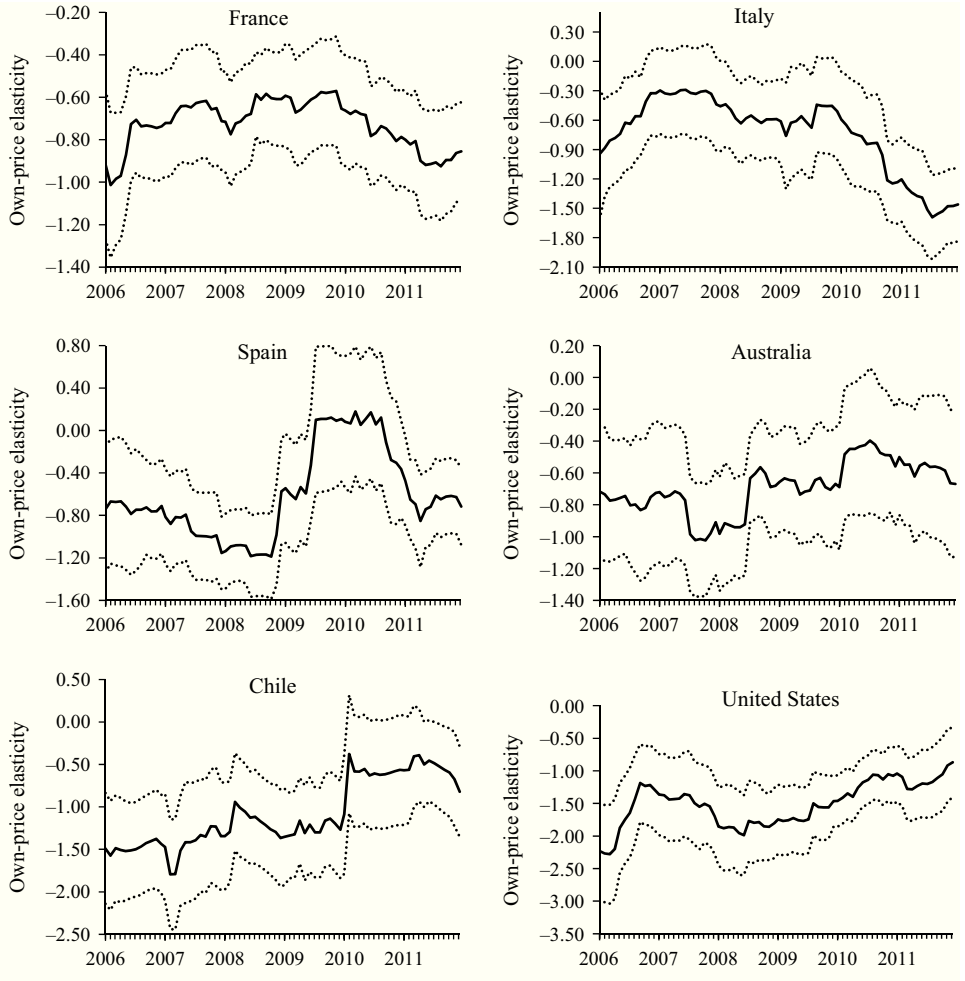

Figure 3 Rolling estimates: the effects of a percentage increase in own-price (uncompensated own-price elasticity). Each graph give the responsiveness of bottled wine imports from a particular source to a percentage increase in own-price at a particular point in time. The solid line is the mean response and the dotted lines are 95 per cent confidence bands.

the data more so than structural adjustments in how consumers responded to Spanish wine prices, parameter stability could even be argued for Spain.[7] We find that the own-price elasticity for France gradually increased over the first half of the sample from a low of −1.03 to a high of −0.57 and then decreased slightly for the remainder of the sample. More recent months show demand becoming more inelastic once again. However, it would be difficult to argue that the rolling own-price elasticities for France are significantly different from the full-sample estimate (−0.813). The same could be said of Australia (−0.667), as well as Chile (−1.104) and Spain (−0.720; excluding the period

[7] Problems associated with spurious nonlinearities are common when using a rolling regression procedure (Zanin and Marra 2012).

of insignificance). For the United States, the full-sample estimate (−2.02) is for the most part less than the rolling estimates which tended to be around −1.50 for most of the sample period. Italian wine is the only import where consumers have become significantly more sensitive to import prices over time as shown by the own-price elasticity decreasing from −0.29 during the first half of the sample period to a low of around −1.59 in more recent months.

7. Discussion and conclusion

The goal of this study was to assess how foreign wine consumption patterns in China have changed given the significant growth in imports over the last decade. Results show persistent changes in consumer behaviour towards foreign wine, particularly in how Chinese consumers allocated expenditures to each exporting source during the period 2002–2011 and suggest a greater preference for wine from traditional Old World suppliers, Italy and France. The evidence suggests that Chinese wine consumption patterns have evolved and illustrates the importance of considering a series of estimates over time rather than relying on the full-sample results to understand consumer behaviour.

The association between quality and France is particularly strong in China. According to a survey in Beijing, more than half of all consumers preferred French wine for business dinners and gifts (Yu *et al.* 2009). Our results confirm that Chinese consumers hold French wine in high regard and that consumption has increased as the foreign wine market expanded. This was evidenced by the marginal budget share and expenditure elasticity for French wine increasing and demand becoming more inelastic. Additionally, the marginal budget share and expenditure elasticity estimates indicate increased consumption of Italian wine, but unlike France, demand has become elastic in recent years. In fact, Italy was the only country with such a significant change in how Chinese consumers responded to price. Although Australia has a very solid standing in the Chinese market, results indicate that its market share relative to France will likely remain unchanged. The marginal budget share (approximately 0.2) and expenditure elasticity (approximately 1.0) were relatively stable and indicate that Australia will continue to account for about 20 per cent of the foreign wine market in China.

The pattern of wine imports in Western markets reflects the growing importance of New World countries in global wine trade. For instance, in the United Kingdom, wine imports from non-European countries have increased from about 20 per cent in 1995 to over 40 per cent in recent years, primarily driven by imports from Australia. In fact, results from Muhammad (2011) suggest a growing preference for Australian wine over French wine in the United Kingdom. Labys and Cohen (2006) note that the growth in New World trade relative to Old World trade is fairly consistent across the globe. However, the results of this study suggest that

China may be an exception since future imports will likely come from the largest and oldest wine-producing countries, Italy and France. Recall that Liu and Murphy (2007) found that consumers had little knowledge of wine based on the exporting countries except in the case of French wine. This suggests that the growing consumption of French and Italian wine is likely due to limited wine knowledge resulting in a greater preference for these Old World countries. As wine education improves, imports from New World countries could gain greater share of the market. According to Chen (2012), imports of Australian and Chilean wine have increased in recent years due to promotional activities educating importers and consumers about foreign wine. He notes that the emergence of international wine trade shows such as Interwine, which showcased over 500 international wine companies, are furthering knowledge of foreign wine in China. The evidence suggests that the Chinese wine market will continue to grow creating opportunities for both Old and New World producers. However, given the status of French wine among Chinese consumers, it appears that significant wine education and promotional activities are needed for other countries to be competitive.

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