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Quality, Quantity, and Nutritional Impacts of Rice Price Changes in Vietnam

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Summary. — Asian governments intervene in the world rice market to protect domestic consumers. Whether consumers are nutritionally vulnerable depends on the elasticity of calories with respect to rice prices. Common demand models applied to household survey and market price data ignore quality substitution and force all adjustment onto the quantity (calorie) margin. This paper uses data from Vietnam on market prices, food quantity and quality. A 10% increase in the relative price of rice reduces household calorie consumption by less than 2% but this elasticity would be wrongly estimated to be more than twice as large if quality substitution is ignored.

Key words — demand, nutrition, rice, prices, Vietnam, Asia

1. INTRODUCTION

Rice is arguably the world's most important crop, with nearly one-half of the population eating it as a staple. But the world market is thin, with only 7% of rice crossing borders. [1] A thin market and "beggar thy neighbor" policies of major traders create big fluctuations in world rice prices. For example, world prices trebled within four months in early 2008, due partly to export bans by the second and third largest rice exporters (Vietnam and India), panic buying by the Philippines (the largest importer), and resulting hoarding by small traders and households as talk of a price spiral induced a real price spiral (Timmer, 2009). These events are aptly described by Slayton (2009) as "Asian governments carelessly setting the world rice market on fire" and are illustrated in Figure 1, which charts the course of world rice prices in 2007/08.

The export bans by Vietnam and India that helped drive up world prices, reflect political goals of protecting local consumers from rice price inflation. [2] Yet despite trying to reduce local prices the opposite occurred. In Ho Chi Minh City, buyers reacted to news of prices in the April import tender of the Philippines' National Food Authority being almost $500 per ton higher than in the March tender by buying all available rice, and local prices doubled as rice disappeared from city markets over two days (Slayton, 2009). This rapid inflation eventually eased but longer term damage is likely. Volatile prices discourage governments from relying on the world rice market, making the thinner market even more unstable (Timmer, 2009). Withdrawal from trade lets political goals of rice self-sufficiency (rather than food security) persist, slowing farmers' diversification away from rice growing. Yet despite the short-run price increases in 2007/08, the long-term trend is for rice prices to decline by more than prices of other staples. [3] Thus Asian farmers may be locked into producing a crop with declining prospects rather than diversifying into higher valued crops that might better help them escape from poverty. [4]

Asian governments may intervene in rice markets due to a belief that consumers are nutritionally vulnerable to rice price rises. Despite two decades of rapid economic growth, the depth of hunger in India and Vietnam is hardly changed, [5] and average calorie consumption is falling (Deaton & Drèze, 2009). Recent evidence of a large, negative, elasticity of calories with respect to rice prices in Vietnam (Gibson & Rozelle, 2011) may affirm this potential concern of policy makers. But this evidence is from a demand specification that ignores quality responses to price rises, forcing all adjustment onto the quantity margin (and hence onto calories). Yet as McKelvey (2011) shows, quality substitution in response to price changes is very important, and if ignored, may bias quantity demand elasticities even if market prices are perfectly observed.

In light of these findings, we revisit the elasticity of calories with respect to rice prices in Vietnam. We use new household survey and market price data, along with a demand model that allows quality substitution as prices change, to estimate an eight-food demand system. The own- and cross-price elasticities of quantity demanded with respect to rice prices are weighted by each food's share of total calories to derive the elasticity of calories with respect to rice prices. We find that, *ceteris paribus*, a 10% increase in the relative price of rice reduces calories available to households by less than 2%. [6] We would wrongly claim this elasticity to be more than twice as large if quality substitution is ignored. In other words, households in Vietnam have considerable scope for protecting calorie consumption in the face of higher rice prices by downgrading the quality of the foods that they consume.

Such coping by downgrading quality need not harm nutrition because aspects of quality that consumers pay more per unit weight (or indeed, per calorie) for are largely independent of nutrition. This has been explained by Behrman, Deolalikar,

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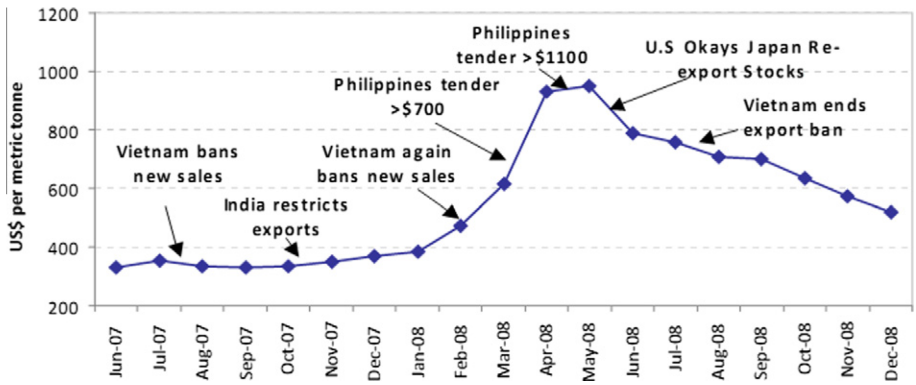

Figure 1. *Movements in world rice price (Thai 100% B) and government interventions. Source: Slayton (2009).*

and Wolfe (1988, p. 308) for undernourished consumers: "... at the margin they concentrate on food attributes other than nutrients – taste, appearance, odor, degree of processing, variety, status – that are not necessarily highly positively correlated with nutritive value". If higher quality (more costly) foods are not more nutritious, there is scope to economize; the well known fact that nutritionally balanced diets designed by linear-programing are cheaper than actual diets supports this notion. A Vietnam example is that in urban areas, high quality rice is 45% dearer than low quality rice (Gibson & Kim, 2012), with the attributes attracting a price premium being color (whiter is dearer), fragrance, and stickiness rather than any difference in calories, protein, micronutrients, or impurities, condition of kernels, or proportion of broken grains (both have less than 15% broken).

This coping response does depend on a wide range of different quality varieties being available in the marketplace. Currently the government of Vietnam is attempting to raise the quality of marketed rice, mainly in terms of post-harvest handling rather than by dictating which particular varieties are grown. [7] This initiative appears to be directed at increasing rice export revenues, although simultaneously Vietnam is raising its market share and may soon overtake Thailand as the largest exporter. If lower quality rice is diverted from exports onto the domestic market it may help with household coping. But it is also possible that a floor is placed under the quality distribution by removing low quality rice from the market, for example by diverting it into use for pig, poultry, or cattle feed. In this case, the coping response of households would be undermined by limiting the range of qualities that they can choose from, pushing more adjustment onto the quantity margin. But as long as a range of qualities are available in the local market, Vietnamese households appear to be less nutritionally vulnerable to rice prices than found by Gibson and Rozelle (2011), weakening a potential justification for the government of Vietnam to periodically ban rice exports. Since Vietnam is the second largest rice exporter and one of the instigators of world rice market instability, this is of broad interest.

The results also may be of interest to economists who apply demand models to household survey data, since they corroborate McKelvey's (2011) finding of large quality substitution. In contrast, previous studies (e.g., Deaton, 1997; Gibson & Rozelle, 2011) find measurement error to be the bigger problem when unit values (expenditures divided by prices) from household surveys are used as a proxy for price in demand studies. One implication of quality substitution being important is that if demand parameters are to be estimated from budget share models, as has been popular at least since Deaton and Muellbauer (1980), it will be necessary for surveys to simultaneously collect price and quality data (with unit values as one available indicator of quality). Hence our findings can inform data collection strategies, since most household surveys currently do not collect both market prices and unit values.

The rest of the paper is as follows. Section 2 describes the demand specifications that we use, which rely both on unit values, as a measure of quality, and on market prices. This discussion draws heavily from methods proposed by McKelvey (2011) and Deaton (1990). Section 3 describes the survey data, and explains how the market prices and unit values were collected. Section 4 contains the main results, with comparisons among the elasticities from the alternative procedures, while Section 5 has the conclusions.

2. DEMAND SPECIFICATION AND ESTIMATION METHODS

Since the seminal work of Deaton and Muellbauer (1980), applied demand studies mostly use budget share models, for analytic convenience and improved estimation. When the data are from a household survey, the dependent variable is w_{Gi}, the share of the budget devoted to food group G by household i. The typical variables that theory suggests would explain budget shares are the logarithm of total expenditure, $\ln x$, the logarithm of prices for foods in group H, $\ln p_H$, and a set of household characteristics and conditioning variables (e.g., demographics, education, labor market status, and expenditures on non-food goods) that are captured in the vector $\mathbf{z}$:

$$w_{Gi} = \alpha_G^0 + \beta_G^0 \ln x_i + \sum_{H=1}^{N} \theta_{GH} \ln p_H + \gamma_G^0 \cdot \mathbf{z}_i + u_{Gi}^0 \tag{1}$$

One departure from textbook theory when using household survey data is to allow for consumers choosing both quantity and quality. Thus, expenditure on group G represents price, quantity, *and* quality, and can be defined as the product of the unit value (v_G, average expenditure per unit) and total quantity, $v_G Q_G$. So, differentiating the budget share with respect to ln x and ln p_H does not give the usual expenditure and price elasticities. Instead, a second equation is needed to model quality choice (based on the unit values, v_{Gi}):

$$\ln v_{Gi} = \alpha_G^1 + \beta_G^1 \ln x_i + \sum_{H=1}^{N} \psi_{GH} \ln p_H + \gamma_G^1 \cdot \mathbf{z}_i + u_{Gi}^1 \tag{2}$$

The variables are as defined for Eqn. (1), with superscripts 0 and 1 used to distinguish parameters on the same variables in each equation, and u_{Gi}^0 and u_{Gi}^1 are idiosyncratic errors. Noting that $w_G = v_G Q_G / x$, a log-differentiation of Eqn. (1) gives [8]: