Quantity Aggregation and Quality Price Adjustment; Problems with Measuring Indonesian Food Demand

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ABSTRACT

One Asian country which is predicted to provide excellent opportunities for New Zealand exporters is Indonesia.

To measure Indonesian demand responses requires the use of cross-sectional survey data. However, the use of such data produces aggregation errors, caused by quality effects, in the measurement of commodity price and quantity elasticities. Such aggregation errors produce biased elasticity estimates. The bias in the estimation of price elasticities is compounded by errors of measurement in measured quantities and expenditures.

Adapting the theoretical model of Houthakker (1952) and Theil (1952), Deaton (1988) developed a methodology which accounts for both aggregation and measurement error. Using Deaton's methodology, the demand for five commodities - rice, meat, fruit, vegetables, and milk products - were computed.

The expenditure elasticities are ordered much as would be expected, with rice and vegetables close to zero, and meat, fruit and milk products all having elasticities greater than one. Comparing the expenditure elasticities with respect to total expenditure with those of previous studies, the quantity elasticities are decreasing with time as expected. Thus while meat, fruit, and milk products are still considered luxury items, they will increasingly be within the average Indonesian consumer's reach in the near future. Also, the quality of foodstuffs consumed is increasing with incomes. The effects of quality, and measurement error especially, produced dubious price elasticity estimates. After adjusting for these influences, the price elasticity estimates are, with the exception of milk products, negative, although the rice price elasticity is larger than predicted. Meanwhile. the effects of quality in the estimation of quantity elasticities is relatively minor.

While the model produced satisfactory results, it was considered that further exploration of the methodology was required, particularly with regard to the use of food expenditure.

In the absence of data on total expenditure, Deaton (1988) assumed that food expenditure was a theoretically acceptable alternative explanatory variable. To measure if this was so, elasticities using both food and total expenditure were calculated. Although no formal non-nested tests were used, differences in the price elasticities between the two models casts doubt on the use of food expenditure in place of total expenditure.

Nevertheless, estimation of a 'food share' elasticity provides a method for moving from food expenditure elasticities to total expenditure elasticities, with a proxy value for this elasticity providing encouraging results. Yet the estimation of such an elasticity requires information on total expenditure, providing limited empirical value for the researcher with just food expenditure data, and only a theoretical curiosity for the researcher with information on both.

Other methodological problems included a larger than expected rice price elasticity and the estimation of biased OLS parameter estimates through the use of zero expenditures in the model. Consequently, without further exploration of these issues, the procedure should only be applied cautiously.

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TABLE OF CONTENTS

LIST OF TABLES

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND.

In 1992 the World Bank reported that countries in East and South East Asia, such as China, Japan, South Korea, Singapore and Thailand, were distinguished as countries with remarkable GNP growth per capita. Between 1965 and 1973, the growth of GNP per capita in these countries averaged 4.8 percent. In 1990 this rose to 5.3 percent, the highest growth rate in the world. In comparison, most OECD countries averaged a per capita growth rate of between 1.5 to 1.6 percent. The rapid industrial growth in these Asian countries is the major contributing factor to this per capita GNP growth.

A consequence of this rise in incomes is its effect on diet. Food demand patterns change with the nation's level of economic development. Asian income growth over the past three decades has resulted in dramatic transformations in diet (Mitchell and Ingco, 1993). As incomes increased, consumers in these countries had access to a wider variety of food.

Urbanisation has also been an important development within Asia, with large cities experiencing tremendous physical and population growth. Huang and David (1993) noted that this population movement to urban centres increases the demand for 'convenience' foods.

As such, these changes have resulted in a shift away from the traditional rice diet to a more western diet of bread, red meat, and dairy products. These changes in consumption patterns provide an opportunity for New Zealand agricultural exporters.

However, Tradenz (1993) predicted the economic performance of China to slow, while forecasts for Japan were not promising either. Consequently, there is an emphasis on New Zealand exporters to find new markets within Asia.

Another country which is predicted to follow in the footsteps of Singapore and South Korea is Indonesia. Agricultural and manufacturing development has led to an average per capita GNP growth rate[1] of about 4.1 percent for the period 1976-1990. The high annual growth of GNP per capita, a large population base and a relatively rapid population growth, especially in its urban centres, makes Indonesia a desirable destination for agricultural products. In addition, with the exception of cereal goods, the growth in agricultural production is still low (Hakim, 1994). As a result, Indonesian agricultural producers, in the short run at least, will not be able to respond to the predicted changes in consumption patterns.

There is already some evidence that food consumption is changing in Indonesia. A study of Asian food consumption patterns by Mitchell and Ingco (1993) demonstrated how Indonesian food consumption had changed. The study examined changes in consumption patterns for six food groups - rice, maize, root crops, livestock products, and, fruit and vegetables, using three types of data: time series, international comparison project and household survey data. Although rice had maintained its dominant position, wheat consumption was increasing (per capita consumption of wheat increased from 1.3 kg/yr during 1961-65 to about 11 kg/yr during 1986-1990), with consumers shifting away from rice to wheat as income grew. Per capita consumption of root crops had also been declining steadily for some time (100 kg/yr in 1961-65 to 60.3 kg/yr during 1986-90). Total meat consumption was found to have risen sharply over the last two decades. Per capita meat consumption during 1961-65 was 3.7 kg/yr while between 1986-90 it was 6.2 kg/yr. Across income groups, total meat consumption increased with income, with the greatest increase in the highest income group. The same pattern was true of fruit and vegetable consumption, with increases in consumption from 42 kg/yr during 1961-65 to 55 kg/yr during 1986-90.

Data from household surveys confirm these findings. Indonesian budget shares of staple foods - rice, maize, and root crops - declined with income, while budget shares for wheat, livestock products, and fruit and vegetables increased with income. Households in urban areas were found to have lower average budget shares for rice, and higher shares for

[1] World Development Reports 1976-1990, World Bank.

livestock products. Consequently, per capita consumption of traditional foods is declining as Indonesians eat higher-valued foods. Such consumption patterns are similar to those which have occurred in more economically advanced Asian countries.

Aside from the changes in the quantity of food consumed, a rise in income will also change the quality of purchases. Theil (1976) said that consumers will react to income increases by not only buying more, but also by buying better quality. It was hypothesised that rising per capita income will lead to an upgrade in the quality of purchases as richer consumers buy higher-valued and more highly-processed food products. As a result, expenditure may increase while the quantity purchased remains the same. It can be assumed, therefore, that differences in price between various brands of coffee, types of meat, kinds of cheeses, etc., are indicative of differences in quality (Theil, 1976). Moreover, this quality choice may itself reflect the influence of prices as consumers respond to price changes by altering both the quantity and quality, or more precisely the composition of their purchases within the group.

The estimation of demand using cross-sectional survey data reflects these quality considerations through the heterogeneous aggregation of household demand level data. Consumers buy 'goods', which, for instance, are different meat products, not the composite commodity itself. Because consumers choose both the quantity and quality of their purchases, grouping such goods into commodities produces aggregation errors, which are basically the consumer choice for quality. Thus, in conducting a commodity demand analysis, this aggregation, or quality choice, will affect a commodity's price and quantity measurements and could produce deceptive results. Because Indonesian demand responses can only be estimated using cross-sectional survey data, aggregation errors present an important research issue.

Some way must be found to aggregate measures of demand for these goods into meaningful composite commodities with corresponding meaningful price measures. But in addition, the proposed methodology should also provide the means to measure changes in the quality of purchases so as to provide a richer analysis.

Deaton (1987; 1988; 1990) recognised the problems associated with quality choice in estimating price elasticities from household survey data. In his papers, Deaton addressed some of the theoretical and econometric problems which can arise in the estimation of price and income elasticities data when the researcher is given data on expenditures and physical quantities of purchases of non-homogenous commodities. The methodology also measures quality choice. However, Deaton did not recognise the problems associated with quantity aggregation. Nevertheless, Deaton's methodology does allows for a theoretically rigorous definition of aggregate composite commodities. Nelson (1990, 1991) showed that Deaton's assumption of constant relative prices serves as a natural extension to the Hick's composite commodity definition, thereby solving the quantity aggregation problem.

1.2 OBJECTIVES.

This research will attempt to provide information on Indonesian food consumption patterns by estimating a set of theoretically robust price and income elasticities. The 1990 SUSENAS expenditure survey will be used to estimate elasticities for a group of commodities whose consumption patterns have changed in recent times and which are likely to be of interest to New Zealand agricultural exporters. However, the study will also provide a more penetrating analysis of demand by trying to ascertain what proportion of a rise in income is allocated to increasing the quality of food purchases.

1.3 THESIS OUTLINE.

The structure of this study is as follows. In chapter two, the theory of demand is outlined, including the *a priori* restrictions which can be imposed or tested for on a system of demand equations. Chapter three introduces the ideas behind the methodology used in the study. Further, we introduce potential problems in the use of food expenditure in the methodology and introduce Hicks' composite commodity theorem to control for aggregation errors in the model. The chapter also provides a brief literature review of Indonesian food demand. Chapter four describes the data used in the empirical analysis; 5,708 observations on urban households in urban Java from the 1990 SUSENAS National Economic Survey. Chapter five presents regression results and elasticities. In this chapter, the effects of measurement error and aggregation error will be analysed. The use of food expenditure in place of total expenditure will also be examined, as will the bias

caused by the use of a simple regression of quantity on unit value conditioned by households making purchases. To investigate changes in Indonesian food demand over the past decade, the results of this study will be compared to those of previous Indonesian food demand studies. The implications for New Zealand agricultural exporters will also be reported. Chapter six concludes the study with suggested refinements to the methodology to resolve some of the problems encountered.