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**Using Pictures to Test the Composite Commodity Theorem: Evidence from Vietnam
(Short Title: "Testing Hicksian Separability Over Space")**

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Testing Hicksian Separability Over Space

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Abstract

If relative prices of goods within a commodity group are constant, Hicksian separability lets the price of a single good represent the group price level. This is relied on by designers of price questionnaires used in household surveys and by methods of estimating demand systems from household survey data. A survey from Vietnam with multiple specifications from within the same food groups clearly shows that within-group relative prices are not constant over space.

Introduction

Hicksian separability requires relative prices of elementary goods within a commodity group to be constant, allowing the price of a single representative good to proxy for the group price level. While rejected in time series, this is widely relied upon in micro work. Household surveys using a price questionnaire, such as LSMS surveys, typically choose a single representative specification from each group to be priced in local markets.

Hicksian separability also is relied on when “unit values” (group expenditures divided by group quantities) are used to estimate demand systems on household survey data. Prices of each elementary good in a group must move in fixed proportions across locations if unit values are to proxy for group price levels (Deaton, 1988). Yet apart from a discussion by McKelvey (2011) of a single food group in a small locality, this key assumption of unit-value based demand estimation remains unexamined.

Data

We use the 2010 Vietnam Household Living Standards Survey (VHLSS) and market prices gathered from a spatial cost of living survey fielded at the same time. For six food groups (rice, pork, fish, chicken, beef, and fats) prices of two specifications were observed in up to 1588 different markets. Price surveyors were equipped with detailed pictures of each specification to ensure that the prices they obtained were for the same item in all locations (example below).

Pork Rump



Pork Belly



Methods and Results

Household surveys report expenditures on food groups G rather than on elementary goods g . Therefore let p_G be an (observable) group price index of (unobservable) elementary prices $p_g, g=1, \dots, n$ and p_G are aggregation errors, such that the log elementary prices equal the log group price index plus the error, $\ln p_g = \ln p_G + \rho_g$. If these errors are constant across market locations, Hicksian separability holds, while if ρ_g varies over space but is independent of p_G then the stochastic Hicksian separability of Lewbel (1996) holds.

If aggregation errors vary over space, a simple test is to examine the price of one elementary good relative to another. The map at right does this for rice.

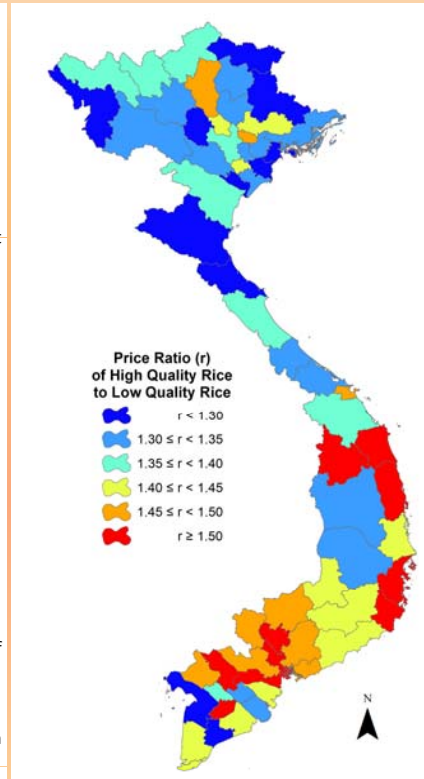
On average, high quality rice is 40% dearer than low quality rice but the price premium ranges from 19% to 83% and is lower in the north (averaging 33%), than in the south (averaging 47%).

In Vietnam, the marketed surplus of rice flows from south to north. It costs the same to ship high quality rice and low quality rice, so adding a per unit transport cost should make high quality rice relatively cheaper in the north, as shown by the map. This is the Alchian-Allen effect of “shipping the good apples out” (Borcharding and Silberberg, 1978). Unless transport costs are *ad valorem*, relative prices of high quality and low quality goods shipped from a common production point are unlikely to be constant over space, violating Hicksian separability.

To extend the test shown by the map we estimate:

$$\ln p_{g,j} = \sum_k \alpha_k + \beta_1 D + \sum_k \beta_2 D \times \alpha_k + u_{g,j}$$

where $p_{g,j}$ is price of the elementary good ($g=1,2$) in the j^{th} market, $D=1$ if the specification is for the first elementary good and zero otherwise, α_k is a fixed effect for region k (showing the percentage difference in price compared with the base region), and $u_{g,j}$ is a pure random error. If we reject $\beta_2=0$ for all k it shows that regional price differences are sensitive to which of the two elementary goods is used to proxy for the group price level. In fact, the table below shows that for all six food groups, the areal fixed effects are sensitive to the choice of elementary good, in violation of Hicksian separability.



Demand Estimates

Apart from spatial deflators, price surveys also are used for demand estimation. We therefore use a LA-AIDS model to relate household budget shares to household income, demographics and prices. The residuals should include any errors from aggregating elementary good prices into a group price index. For five food groups (all but beef), there are statistically significant relationships between the residuals and the prices of the constituent elementary goods, violating stochastic Hicksian separability.

Furthermore, if we use prices of both elementary goods at once, in place of the group price index, both prices are statistically significant in budget share equations for four food groups (all but beef and fish). If relative prices of elementary goods within a commodity group were constant, such a regression could not be estimated because of collinearity between the prices of the two elementary goods.

Also, we reject the equality of the coefficients on the prices of the two elementary goods in the budget share equations (except for beef). Estimates of own-price elasticity of demand for a food group are sensitive to the choice of which elementary good from within the group has its price used as a proxy for the group-level price index, contrary to what Hicksian separability would allow. As a practical matter, these differences in elasticities affect the ranking of food groups in terms of their attractiveness for tax increases.

Conclusion

Hicksian separability is widely relied on in micro work. Data from Vietnam are inconsistent with this restriction, since within-group relative prices vary over space. This should be expected (the Alchian-Allen effect), despite survey designers and unit-value demand models relying on an assumed absence of such effects. Few surveys price multiple goods within each group so Hicksian separability is usually not examined. Our results imply more effort is needed to gather price data that are spatially and commodity-wise disaggregated.

Sensitivity of Areal Group-Level Price Fixed Effects to Choice of Elementary Good

Food Group	Specification of Elementary Good:		Sample size	F-test ($\beta_2=0$ for all k areas)	
	First	Second		$k=63$ provinces	$k=639$ districts
Rice	Low quality (e.g IR50404)	High quality (e.g Bac Huong)	2594	18.5	20.1
Pork	Rump	Belly	3146	20.6	31.1
Beef	Brisket	Rib	2914	60.8	187.1
Chicken	Fresh, battery-raised	Live, free-range	2304	44.8	45.9
Fish	Carp	Fresh-water shrimp	2058	80.0	459.4
Fats	Lard	Neptune cooking oil (500ml)	2784	94.2	763.1

Note: All F-test values are statistically significant at $p < 0.01$ level, and are based on robust variance-covariance matrices.

References

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Further Information

The full working paper that this poster is based on is available at: <http://ideas.repec.org/p/wai/econwp/13-07.html>