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VARIETY, AGRICULTURAL TRADE AND INCOME

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VARIETY, AGRICULTURAL TRADE, AND INCOME

“How can anyone govern a nation that has 246 kinds of cheese?”

Charles De Gaulle

Consumers in wealthy industrialized nations have a wide array of choices within product categories (Miljkovic, 2005). Cars come in many makes and models, with many options. Food consumption opportunities are similarly varied. As incomes rise in middle income countries, do consumers tend to demand more variety in food consumption? Some empirical and theoretical work suggests that this might be the case. Countries can diversify their production, but one way to gain access to variety is to trade for goods.

This paper looks at a sample of middle income countries to determine 1) what different measures researchers can use to gauge demand for variety, and 2) whether taste for variety increases with income according to these measures. The goal of the research is to learn the stylized facts regarding the desire for variety as reflected by diet and by trading behavior. The next section briefly discusses empirical and theoretical work on the demand for variety, whether that demand increases with income, and the demand for variety in traded goods. The following section discusses measures of variety and tests of the relationship of variety to income. The following sections discuss the results of applying those measures to countries and testing their relationship to income.

VARIETY, TRADE AND INCOME

Krugman and Helpman (1985) note that if heterogeneity of consumer preferences exists, it should give rise to the production of many different varieties of goods, and they note that the taste for variety is usually an assumption that is incorporated into the specification of a demand or utility function. Miljkovic (2005) notes that the trade literature refers to consumer welfare gained from increased access to different varieties of goods. This desire for variety, and its relationship to income, has been empirically found for food products. Behrman and Deolalikar (1989) found that the desire for different types of foods in developing countries increased as incomes rose. Additionally, as consumers' income rise, they tend to alter their demand for various food products. They increase their demand for meat and dairy products and reduce their demand for cereal products (Seale et al., 2003). Additionally, the Linder Hypothesis suggests that income per capita is an important determinant of tastes, so that countries with similar incomes have similar consumption patterns. Income appears to be an important determinant for consumption patterns

The Linder Hypothesis has been used as an explanation for the empirical observation that wealthy countries tend to trade with one another in similar goods, with the argument that countries trade in these similar goods in order to get access to variety, and that a desire for new varieties of goods increases with income (Ramezzana, 2000). Ramezzana (2000) argues that if taste for variety increases with income, we would expect to see increases in the volumes of trade with income, with trade volumes among wealthy countries rising, but we would also expect trade volumes and numbers of products traded actually decreasing with increasing disparities in income, as countries with dissimilar

incomes will have dissimilar tastes. In addition, the traditional comparative advantage argument for trade suggests that countries want access to goods that they cannot produce as cheaply (in terms of other production opportunities) domestically, so that trade is a way to gain access to a variety of goods (Miljkovic, 2005). This is particularly true for agricultural products, the production of which depends heavily on climate. Thus, whether countries are buying slightly different goods from those with similar resource endowments, or very different goods from countries with very different geographic conditions, trade is a way to gain access to variety.

MEASUREMENT OF VARIETY

Variety in consumption can be measured in a number of different ways. Many trade models, particularly general equilibrium models, use the Armington assumption, which assumes that goods produced by different countries are all slightly different. This suggests that the number of countries from which a country imports should increase as the taste for variety increases. As an attempt to begin measuring variety in trade quantitatively, Miljkovic (2005) uses this measure to look at import variety into the US and finds that the US is importing each individual good from more countries now than 30 years ago. Miljkovic focused on countries from which the US imported individual varieties of goods. We use this method to look at the number of countries from which a country imports one good, cheese, but also look at the simple number of countries from which a country imports all agricultural products.

Goods can also vary by type. Miljkovic (2005) uses the measure of HS system lines to look at import variety into the US, and finds that the US is importing many more types of goods than it did 30 years ago. He also notes that both the country measure and tariff line measure can be combined to look at types of goods produced by particular countries as varieties. In combining these measures, he finds that the number of individual varieties from different countries imported into the US has also risen dramatically. Feenstra and Kee (2004), in a paper of export variety and productivity, use the number of different products as measured by the 10 digit Harmonized System as a measurement of variety in trade.

Concentration can also be used to measure the taste for variety. Behrman and Deolalikar (1989) argued that the taste for variety increases when food expenditure shares for different categories are more evenly distributed across food categories. They used price, income and expenditure share data to estimate food indifference curves and find that as incomes rise, food indifference curves become more L-shaped, indicating a taste for variety. The industrial organization literature also measures a consumer's access to adequate choice in consumption by looking at market shares or concentration across industries. In particular, the market share of the top 4 or 10 companies, known as the Herfindahl index, is used to determine whether firms have large market shares and to determine whether consumers have access to a wide variety of goods.

We can apply these measures to trade in agricultural products as did Miljkovic (2005) and also to the dietary importance of certain foods, following Behrman and Deolalikar

(1989). We would expect that if desire for product variety is increasing, that the number of countries or categories would increase over time and the share of the major exporters or product categories would decrease over time. Additionally, we can also look at shares in the dietary mix or in consumption, to determine whether consumers look to diversify their diets as income rises. If the shares of major food consumption categories decrease over time, we would expect that diets are diversifying.

Measurement of variety within goods categories

We applied these measures mentioned above by looking at the first two variety measures:

1) the number of countries from which a country imports, and 2) the concentration or share of trade with major trading partners. We did this for two goods for agricultural imports as a whole, and for trade in cheese, as some consumers view country of origin as an important attribute for a cheese. These measures consider the Armington assumption, which thinks of country of origin as a source of variety, as Miljkovic (2005) did, and includes a measurement of concentration, as suggested by Behrman and Deolalikar (1989) and the industrial organization literature.

We also considered the third and fourth measures of variety: 3) The number of varieties of a good that a country imports, and 4) the concentration of imports in major product categories. Specifically, we consider the number of different 8 or 10 digit Harmonized System categories for which a country had positive imports over time within the 4 digit category of cheese, and the number of 6 digit fruit categories, as well as the concentration

within the top five or top three major categories for cheese and fruit. This uses the Feenstra and Kee (2004) and one of the Miljkovic (2005) measures, and again incorporates a measure of concentration.

Variety within goods was measured by looking at trade data, in particular data from the World Trade Atlas, for a sample of 28 middle income countries¹. The first year for which data are available for most countries ranges from 1995 to 2002, while the last year was usually 2004. In order to take advantage of all the information available, the data for the first year available were compared to that of 2004, and per year averages were calculated.

We used trade data, as data on domestic consumption at this level of disaggregation are more difficult to obtain, and also because trade itself is generally regarded as a source of variety. The Harmonized System offers the added attraction of being somewhat consistent across countries. However, the HS codes are not standardized across countries at the 8 and 10 digit levels. Thus looking at change over time within a single country is a more accurate way of measuring variety with these data.

Measurement of variety across major categories in the diet

¹ Algeria, Argentina, Brazil, Chile, China, Colombia, Czech Republic, Estonia, Hungary, Indonesia, Latvia, Lithuania, Lithuania, Malaysia, Mexico, Peru, Philippines, Poland, Romania, Russia, South Africa, Slovakia, Slovenia, Sri Lanka, Thailand, Turkey, Ukraine, Uruguay, Venezuela

In addition to the four measures discussed above, we also measured variety across goods categories by looking at the share of calories in the diet that could be ascribed to particular food categories and the changes in those shares over time. In particular, variety was measured by looking at the shares of calories in the top three and top five food categories over time to see if those had changed. This is a much simpler approach than Behrman and Deolalikar's use of budget shares to explicitly map the curvature of indifference curves; the approach simply attempts to capture the fundamental principal behind their measurement of variety, noted above. In addition, we looked at the share of grain calories from the country's major grain, and the share of meat calories from the country's major meat over time. Data were taken from FAO food balance sheets, and compared for the years 1992 and 2002.

In total, we measured 1) Number of importing partners for total agricultural imports and for cheese, 2) concentration of trade with top five importing partners for agricultural imports and for cheese, 3) Number of varieties of fruit and number of varieties of cheese imported, 4) concentration of imports among top five varieties of fruit and top three varieties for cheese, 5) dietary share of top three food categories, 6) grain calorie share of top grain, and 7) meat calorie share of top meat.

Correlation with income

While the above mentioned measures capture changes in variety in diet and trade across time, determining whether the changes in variety are associated with increases in income requires further tests. The countries examined are all middle income countries, but each has experienced larger or smaller increases in income over the period selected. In addition, it is possible that the increase in taste for variety is associated with a particular threshold level of income, rather than having a simple linear relationship with it.

Simple OLS regressions will be used to look at the relationship between the various measures of variety and GDP growth, GDP per capita, and overall GDP. The latter variable is included to determine whether country size matters. Large countries might import more varieties of goods by virtue of their size, but conversely might also have more varieties of domestic production available, which would suggest imports of fewer varieties.

RESULTS FOR VARIETY WITHIN GOODS CATEGORIES

Measured by number of importing partners

Total agricultural imports

For agricultural commodities as a whole, most countries increased their number of trading partners, although not by a large amount. The average country imports agricultural products from 125 other trading partners. On average, countries traded with .5 more countries per year across the period reviewed, which represented about a .4

percent annual increase in the number of trading partners. However, one-third of countries actually reduced their number of trading partners. Considering the increasing and decreasing groups separately, the average country that increased its trading partners did so by just under two percent per year, and those that decreased their number of trading partners had a decrease of about the same magnitude.

Cheese

The cheese results are similar to those of agricultural imports, although the magnitudes of the changes are smaller. The average country did increase the number of countries from which it imported cheese, but eleven of the 28 countries actually reduced the number of trading partners. The average country increased its number of cheese import partners by about 2.2 percent per year for the period covered. However, when the sample is divided, those that increased their number of trading partners did so by an average of just over 4 percent, with a similar percentage change, in the opposite direction, for those that decreased their number of trading partners.

Measured by concentration across importing partners

The top ten and top five partners were not necessarily the same countries from year to year, so it is possible that variety increased over time, even if they did not with the same year.

Total agricultural imports

The concentration indices actually tended to indicate more concentration of imports across trading partners. Trade in agricultural products is rather concentrated with an average of 57 percent of imports coming from the top five importing partners and 75 percent coming from the top ten countries.

Two thirds of countries actually experienced an increase in the percentage of agricultural trade that takes place exclusively with their top five and top ten trading partners. The average country increased the percentage of their total agricultural imports that come from their top five trading partners by a raw change² of .6 percent. Again, about one third of the countries decreased their percentage of trade with their top five trading partners, in keeping with the expectations.

Cheese

The concentration of cheese trade across countries grew in half of the countries and decreased in the other half. The average country increased the concentration of cheese imports with its top five importing partners by a mere .07 percent per year. Again, however, the average masks a great deal of variation. The portion of the sample that increased cheese trade concentration did so by .9 percent per year and the group that decreased concentration did so by .77 percent per year.

Regional variation

² These figures give the change in the share of the top five partners or varieties, so an annual decline in raw percentage terms, .5, e.g., could indicate that, for example, the top 5 trade share fell from 90 to 87.5 over the course of five years

There was also regional variation in the results. Eastern European countries had increasingly concentrated trade and fewer trading partners over time compared with the other regions. Asian countries and North African countries increased their trading partners by much greater percentages. Eastern European agricultural imports from the EU during this time grew faster than agricultural imports from other countries.

Measured by types of goods

Fruit

Countries didn't seem to import more different types of fruits and nuts. The actual number of categories of fruit with non-zero imports, an average of 48 in 2004, varied less across countries. Only nine countries increased the number of 6 digit HS categories in which they had non-zero imports. Fourteen countries reduced the number of categories in which they had non-zero imports, and several countries had no change whatsoever. The average country increased the categories in which they imported by .1 categories or .4 percent per year, a barely noticeable amount.

Cheese

The results here were highly variable, but they probably also indicate a great deal of variation in the importance of cheese in total agricultural imports. The average country imported 25 varieties of cheese, but the range was from 5 to 47. Since 8 and 10 digit HS cheese categories were used, and since these are not standardized across countries, the

results should probably be approached with some caution. Some countries didn't classify cheese beyond the 6 digit level, and some countries began breaking down cheese imports from the 6 digit to the 8 or 10 digit level during the period in question, resulting in a discrete increase in numbers of cheese varieties that might reflect changes in customs practices rather than demand. However, the differentiation might have become more important as a result of demand, leading the countries to begin collecting the data. Thus these countries were included in the sample. Some research indicates that even in countries without high base levels of dairy product consumption, dairy imports rise with income (Song and Sumner, 1999).

Just over half of countries increased the number of cheese categories they imported, about seven experienced no change and 6 decreased the number of cheese categories. On average, the number of cheese categories increased by just under 2 percent per year.

Measured by concentration across types of goods

Fruit

The concentration data indicated much more expected results, with the average country decreasing the percentage of imports in the top five imported fruits/nuts by 0.5 percent per year . (The average concentration of imports in the top five categories was around 70 percent). Most countries experienced a decrease in concentration, with about one third experiencing an increase. These are still fairly modest changes.

Cheese

In contrast to the results for concentration across trading partners, most countries decreased the concentration of their cheese imports. Concentration was still quite high; in 2004 , most countries concentrated over 70 percent of their cheese imports in their top three cheese categories, and 82 percent in their top five cheese categories. The average country reduced its concentration by .5 percentage points per year in the top five cheese categories. The results suggest an increase in variety, but not one of a large magnitude.

RESULTS FOR MEASURING VARIETY ACROSS FOOD CATEGORIES

Here, we considered the share of calories devoted to the top three food categories, the most heavily consumed grain's share of grain calories, and the most heavily consumed meat's share of meat calories. In all cases, we looked at the categories that were at the top in 1992, and contrasted them with the shares in 2002 for the same food.

On average, most countries experience decreases in concentration in all three categories, but again there was variation. The average country only experienced a raw decrease in calorie share of the top three foods of 1.9 percent over the ten year period. Eleven of the countries actually experienced an increase in the share of the foods that were in the top three in 1992.

The average country also only experienced a decline in share of the main grain of 1.5 percent of grain calories. Ten of the 28 countries actually experienced an increase in share of the top grain.

The results for meat indicated the largest jump. On average, countries decreased their main meat's share of meat calories by 7.7 percent. Only 4 increased the share of the main meat. Since meat demand is very price sensitive in many middle income countries, these changes could be the result of changes in relative prices.

ARE THESE MEASURES CORRELATED WITH INCOME MEASURES?

In order to measure the relationship between measures of variety and income, we ran several simple regressions of the annual changes in each measure against average income growth, average per capita GDP and GDP, all taken from World Development Indicators, 2005, using simple averages for the period covered by the starting year for each country up through 2003. Results are displayed in table 2. Again, this is somewhat simpler than Behrman and Deolalikar's method of explicitly mapping indifference curves against income.

For agricultural imports as a whole, for importing partners, per capita GDP has a negative relationship with increases in numbers of trading partners. Growth and per capita GDP are positively correlated with an increase in import concentration. For cheese, GDP or

country size is negatively correlated with increases in number of trading partners, and growth is again positively associated with increases in concentration across trading partners. For fruit varieties, none of the variables is significant for this measure, but for cheese varieties, the growth rate is positively associated with a decrease in concentration.

Dietary measures of variety were more correlated with income growth, with significant and negative coefficients for GDP growth in regressions of both concentration in the top three food categories and concentration in the top meat category.

CONCLUSIONS

This research attempted to consider different measures of a taste for variety and their relationships with income.

Countries seem to experience a modest increase in the number of import sources over time, with very mixed results for the concentration of importing partners. The results for the number of countries have the same sign as Miljkovic (2005). A significant percentage of countries increased their concentration of agricultural and cheese trade with their top five trading partners. Income growth is actually associated with increases, not decreases, in concentration across trading partners. This suggests that the case for using the Armington assumption as a measure of variety in agricultural trade is mixed. It also could hint at support for the hypothesis that trade increases with some countries and fall with those with less similar incomes, as suggested by Ramezzana (2000).

When looking at variety measured by types of foods (HS categories), there are few changes in number of types of fruits, and larger percentage increases in the number of cheese varieties. These results also take the same sign as Miljkovic's results for the US, but the effects do appear small. Changes in concentration within the top varieties were similar in size, about .5 percent, for both goods, and here, values for most countries took the expected sign, indicating an increase in taste for variety over time. These results suggest that the desire for variety measured by concentration in types of goods grows rather modestly over time. With respect to income, fruit varieties weren't correlated with income and growth measures, but cheese concentration declined more for countries with higher average income growth rates.

Dietary variety measures also gave mixed results, with wide variations across countries in concentration of top sources of calories and in grains. Meat concentration did decline, although since only the main meat was examined, further research will be necessary to determine whether this is the result of long term changes in preferences, or changes in relative prices of meats. However, the association with income for the dietary measures seems more solid than the association with the trade measures, as the declines in concentration in meat and the top three food categories were associated with size of income growth, which is consistent with a great deal of literature, including the work of Behrman and Deolalikar.

The results consistently indicate that there is a large variation across countries in the development of their taste for variety over time and income levels. Most of the measures had wide dispersions, in some cases even in the sign the measure took. Some sources of this variation appear to be regional, and regional characteristics that could influence taste for variety are a potential avenue for further investigation.

These results suggest that these measures of variety change modestly over time, that their association with income is very dependent on the good or measure chosen, and that there is wide variation across countries in changes in variety of goods consumed and imported.

Table 1 – Measures of variety

Good	Average, 2004	Average change per year, percent	Average concentration top 5	Average raw percent ³ change in concentration among top 5, per year
Partner countries - Total agricultural imports	57.9	.4	57.9	.6
Partner countries - Cheese	18.8	2.2	88	.07
Number of varieties - Fruit	48.7	.4	70.8	-.5
Number of Varieties - Cheese	19.8	1.8	70.7 (top 3)	-.5

³ These figures give the change in the share of the top five partners or varieties, so an annual decline of .5, e.g., could indicate that, for example, the top 5 trade share fell from 90 to 87.5 over the course of five years

Table 2

Dependent Variable – Average annual change	GDP growth	GDP per capita	GDP
Countries - Agricultural imports	-.002 (-1.46)	-6.36E-6 (-3.74)*	1.17E-14 (.74)
Countries - Cheese	.002 (.811)	-2.07E-6 (-.45)	-8.67E-14 (-2.00)*
Countries, Concentration - Agricultural imports	.170 (3.12)*	.0003 (3.64)*	-1.14E-12 (-1.51)
Countries, Concentration - Cheese	.138 (1.97)*	.0001 (1.372)	1.36(E-12) (1.42)
Number of varieties - Fruit	.002 (.815)	-2.06E-6 (-.66)	-1.63E-14 (-.56)
Number of varieties - Cheese	.003 (1.08)	5.88E-06 (1.26)	-6.10 (-1.40)
Number of varieties, Concentration - Fruit	-.134 (-1.39)	9.96E-05 (.715)	0.00 (0.00)
Number of varieties, Concentration - Cheese	-.165 (-1.90)*	-5.15E-05 (-.41)	1.94E-12 (1.65)
Top three dietary categories - Share	-.007 (-2.88)*	-4.37E-6 (-1.17)	-4.13E-14 (-1.18)
Top Grain - Share	.003 (.74)	-2.33E-6 (-.36)	2.44E-14 (.40)
Top Meat - Share	-.023 (-3.53)*	-2.04E-6 (-.21)	9.94E-14 (1.10)

T statistics in parentheses, * = significant at the 95% level

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