CONVERGENCE OR DIVERGENCE IN FOOD DEMAND: A COMPARISON OF TRENDS IN THE EU AND NORTH AMERICA

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Abstract

Whether food demand is "converging" is tested in two ways. First, the convergence of food expenditures among 18 high-income countries is examined from 1990 to 2004. Convergence is apparent in total expenditures, cereals, and meats, even after correcting for differences in income and levels of protection. Second, specific food retailing and product introduction patterns are examined for the US, Canada, and four northern European countries for the past two decades. These show increasing shares for retail outlets selling standardized products, and increased preference for convenience, upscale, and natural product attributes across all six countries.

Introduction

Past studies of food demand and food retailing have suggested growing similarity or convergence between the EU and the US. Blandford (1984) and Hermann and Röder (1995) found evidence of convergence in food expenditure patterns among OECD countries, particularly in meat demand. Cotterill (1997) argued that global demand for multi-national brands would drive increasing trans-Atlantic convergence. As these studies are about a decade old, it seemed timely to re-examine this question. Our own anecdotal observations lead us to believe that US and EU food systems continue to converge. More European-style products are available in the US than just a few years ago, and many US brands and food services have been introduced in the EU during the past decade. Whether or not food systems are converging continues to be an important question, as it has implications for food policy issues regarding nutrition, standards, and trade.

In this paper, we are able to address the question of convergence with three different kinds of data that provide new insights. To set the stage, we begin with a brief conceptual framework and review of the literature. Then we examine different dimensions of convergence in food demand. First, we examine food expenditures by major category, using Euromonitor data from 1990 through 2004 for 17 countries. Evidence of convergence is found using two different methods, which give similar results. Second, we focus on 6 countries in North America and Northern Europe for a more detailed examination of food preferences. We examine food retailing systems to see if changes in how food is purchased would tend to support convergence. Then we examine food product introductions for evidence of similar product preferences among countries. These data tend to support convergence as well. We conclude with the implications for policy.

Conceptual framework

The term convergence implies dynamics, or movement towards some common model. In food demand, these dynamics are driven by income growth. It has long been recognized that diets change in predictable ways as incomes rise. These include the changes summarized by Bennett's Law which states that the share of animal products in calories consumed increase as incomes increase (Bennett, 1947). Recent research has highlighted how dietary changes in middle- and high-income countries include other high-value products, in addition to meat (Regmi and Gehlhar, 2005). Changes in consumption are also accompanied by modernization of the retail sector (Reardon and Berdegué, 2002) and increased demand for services and quality attributes.

The US and the EU both have highly evolved food systems, and increasingly sophisticated consumers. Higher income and more information leads to greater product differentiation in food systems, by leading to more effective demand for quality attributes. We hypothesize that quality differentiation is occurring along similar paths (converging) among high-income countries. In other words, a greater variety of products are increasingly available throughout the world, but the range of product offerings is also increasingly similar among countries. Higher incomes may also facilitate greater accommodation of specific local or individual tastes. Therefore, we expect that there will be some limits to convergence. In the remainder of this paper, we examine the evidence for convergence in food products and in food product attributes.

Convergence in expenditures

Annual per capita food expenditure data are available on an international basis from Euromonitor, for the years 1990 through 2004. We selected 18 high-income countries for analysis of expenditure convergence, including Canada, US, Australia, Japan, France, UK,

Germany, Netherlands, Austria, Belgium, Finland, Greece, Italy, Spain, Sweden, Denmark, Ireland, and Portugal. Thus, the set includes countries from the EU 12, as well as the three EU affiliate countries, and representation from other developed regions. Per capita food expenditure data are available for all food, and for several broad product categories (see Table 1 for a list of the expenditure categories). Per capita income (purchasing power parity) was obtained from the World Bank. To represent differences in relative prices among countries, consumer nominal protection coefficient (NPC), a measure of the ratio between the domestic price paid by consumer (at the farmgate) and the border price (at the farmgate), was obtained from the OECD.

Convergence is examined in two ways. First, so-called sigma convergence was examined by looking at the coefficient of variation (CV) in expenditures among the countries. If the CV is declining over time, then expenditures are converging (Barro and Sala-i-Martin, 1992). Second, we used the regression methodology of Hermann and Röder (1995), which utilizes a cross-section time-series model. Due to data availability, we use data from 15 countries for 1995 through 2003, and regression analysis could be implemented only for a subset of the food categories. In this method, the difference in annual per capita expenditures for a country of interest in a given year from the country with the lowest observed per capita expenditure for the same year is the dependent variable. To test for convergence or divergence in consumption patterns, difference in food expenditures from a previous period is used as an explanatory variable. We use a 5-year lag, which allows sufficient time for changes (divergence or convergence) in preferences to be reflected in change in the relative expenditures for each country. The dependent variable is regressed on the difference of 5-year lagged per capita expenditure, along with per capita income, and NPC to control for changes in expenditures arising from changes in income levels or relative prices.

As stated by Intriligator (1978, pp 235) consumption patterns in an earlier period may be used to capture habit persistence. Lagged difference in consumption expenditures indicate past diversity in food consumption patterns across countries. The coefficient of this variable indicates trends in tastes and preferences and implies convergence if it is significantly less than 1.0. A coefficient of <1 implies that differences in food expenditures are becoming smaller over time. Since our regression controls for changes in income and differences in relative food prices among countries, any observed convergence can be attributed to convergence in tastes and preferences.

The results are summarized in Table 1. Full regression results are available in Appendix Table 1. Both methods show significant convergence in total food expenditures, which appears to result from convergence in expenditures for cereals and meats. These two categories together account for about 40 percent of total food expenditures in most of these countries, so they can have a significant influence on overall convergence. Sigma convergence is also apparent in fish and in vegetables, two high valued food items that have increased importance in global diets and trade (Regmi, Ballenger and Putnam, 2004). Other food expenditure categories did not show sigma convergence. Figure 1 shows the decline in the CV for total food expenditures, from .32 to .19 over this past decade, as well as the CV decline for sub-categories demonstrating sigma convergence. Figure 2 shows the CV for sub-categories that did not demonstrate sigma convergence.

The regression results reinforce the finding that convergence is partly due to changes in tastes and preferences. Significant lagged dependent variable coefficients are less than one for total food expenditures, cereals, and meats, which shows that convergence is partly independent of incomes and relative prices. Per capita income was not significant in most of the regressions, reflecting the fact that these are all high income countries where the income

elasticity for many foods approaches zero. Higher consumer prices that reflect greater protection had a significant and positive effect in the regression for total food expenditures, indicating that such protection raises total expenditures and explains some of the variation in expenditures. The NPC coefficients for expenditure categories are negative and significant in most cases. At this level of aggregation, higher prices lead to lower expenditures as consumers tend to substitute away from the protected foods. This seems to explain the lack of convergence in fruits, vegetables, and sugar.

These results contrast with findings from earlier studies, which suggested that convergence was slowing as most of the changes expected from Bennett's Law had already taken place in the US and in Europe. Convergence continues to be apparent at the level of broad expenditure categories. These results also reinforce the findings of Gil, Garcia and Pérez (1995), who found that diets within the EU were converging. The lack of convergence in many categories of high-valued products is somewhat surprising, but it is at least partly due to continued high and widely varying levels of protection. This suggests that continued reductions in protection could lead to even greater convergence in the future.

Table 1. Measures of convergence in food expenditure categories among 18 high-income countries, 1990-2004

	Sigma convergence	HR method convergence	Lagged dep. var coefficient
All food	Yes	Yes	0.67
Cereals	Yes	Yes	0.82
Meat	Yes*	Yes	0.89
Fish	Yes	na	
Dairy	No	na	
Oils	No	na	
Vegetables	Yes	No	1.00
Fruits	No	No	1.13
Coffee & tea	No	na	
Other beverages	No	na	
Sugar	No	No	1.03

* At beginning of time period, not in recent years.
 'na' means not applicable due to lack of data for that method

Figure 1. Coefficient of variation for food expenditure categories with convergence
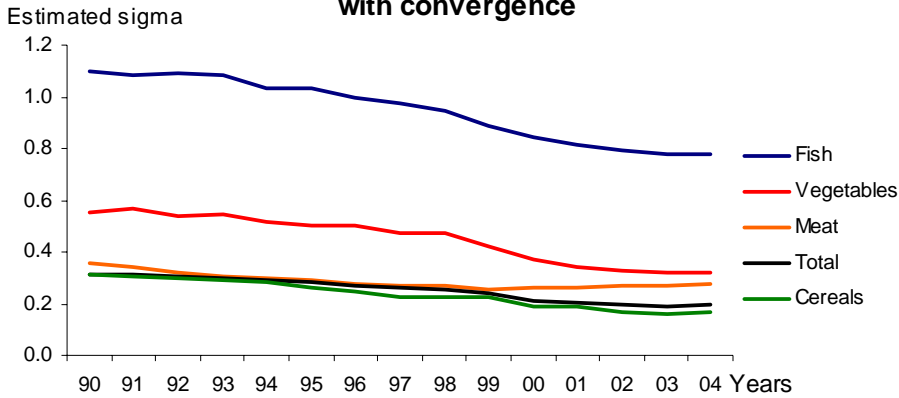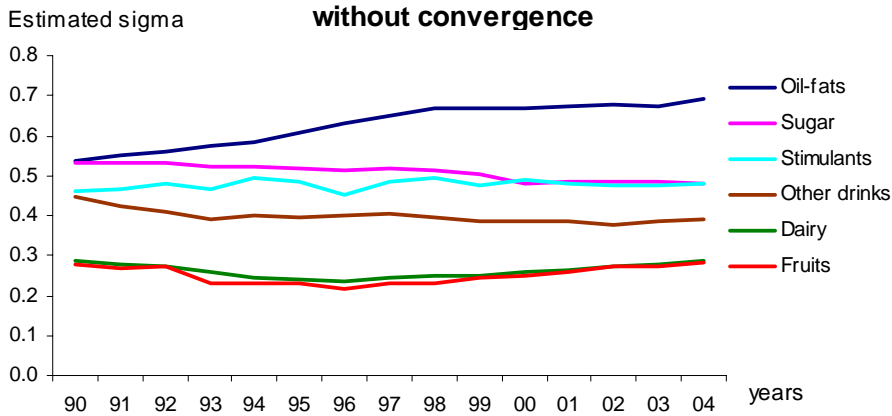
Estimated sigma

- Fish
- Vegetables
- Meat
- Total
- Cereals

Years

Figure 2. Coefficient of variation for food expenditure categories without convergence

Estimated sigma

- Oil-fats
- Sugar
- Stimulants
- Other drinks
- Dairy
- Fruits

years

Convergence in food preferences

The above results show convergence for important food expenditure categories. But they do not illuminate any specifics regarding preferences for food services and quality attributes, which seem to be so important to the casual observer. In order to examine whether preferences for food services and quality attributes are also converging, six countries were selected: Canada, US, Denmark, UK, Germany, and France. Data on retail outlets share of food sales from 1998 to 2004 are from Euromonitor Inc. Product introduction data from 1986 though April 2005 are from Productscan data, a service of Datamonitor.

Retail outlet categories include supermarkets, hypermarkets, discounters, convenience stores, independent food stores, and all other. We have added up the shares for the first four outlets; supermarkets, hypermarkets, discounters, and convenience stores to represent outlets that provide standardized products, often from multi-national food companies. While the services provided by these four outlets differ somewhat, they all provide a similar standard for

service and product quality. In contrast, independent food stores and "other" include a wide variety of outlets, including specialty shops and markets that may or may not provide standardized products or services.

Figure 3 shows the shares for these two types of outlets in 1998 and in 2004 for the six countries. In all countries, standardized outlets have grown at the expense of other kinds of outlets. Independent or non-standardized outlets remain relatively important in France, Germany, and Canada, indicating continued demand for more specialized products and services. But the trends in how food is purchased for consumption at home are clearly working towards convergence in these six countries. Within the standardized outlet category, it is worth noting that discounters are particularly important in Germany, and are growing rapidly in the US.

Figure 3A. Packaged food retail sales share of 'standardized outlets'
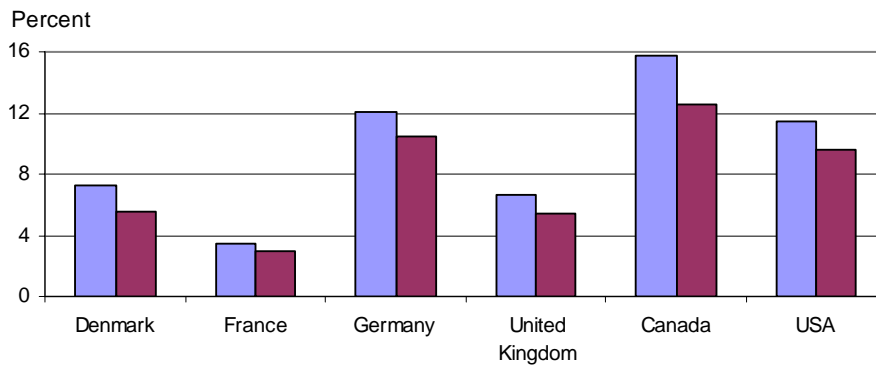
Percent
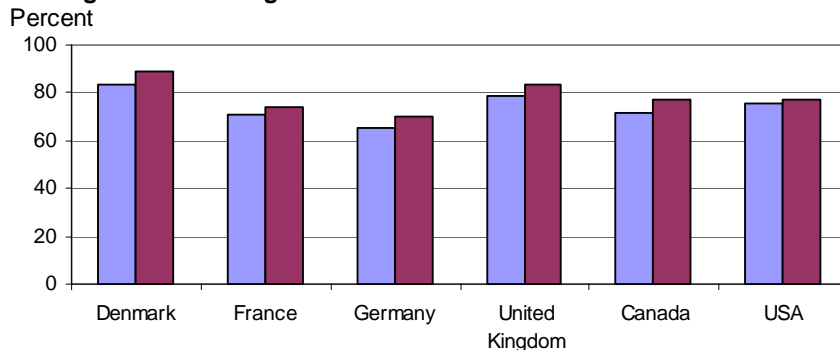
Source: Euromonitor Inc. □ 1998 ■ 2004

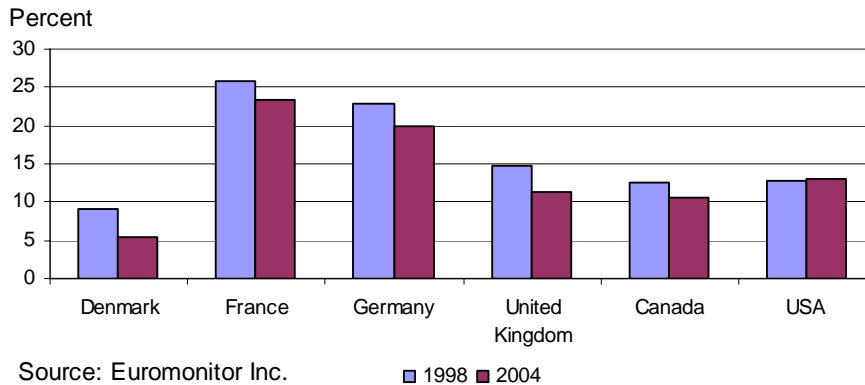Outlets include supermarkets, hypermarkets, convenience stores and discounters.

Figure 3B. Packaged food retail sales share of independent stores

Percent

Source: Euromonitor Inc. □ 1998 ■ 2004

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Figure 3C. Packaged food retail sales share of 'other stores'

Source: Euromonitor Inc.   ☐ 1998 ■ 2004

New product introductions thus reach most consumers through standardized outlets providing economies of scale in marketing. Next, we examine the nature of product attribute demand as reflected in new product introductions. New product introductions have been increasing in all six countries since 1986. Table 2 reports the overlap in top product categories for new product introductions in 1986-90 and in 2000-April 2005. This comparison shows that in recent years a greater number of new products introduced in the six countries were in the same categories. Conversely, only a few categories of new products are represented in only one country. The top categories have also changed somewhat over the last twenty years, although "Meals and Entrees" has remained a focus for new introductions. In 1986-90, dairy products (ice cream, cheese) were important categories for new products in three of the six countries. In 2000-April 05, besides meals & entrees, candies, cookies, and fruit drinks were more important in these countries. The countries sharing the same product categories are found in both North America and Northern Europe, so that product introduction trends are trans-Atlantic. These data suggest that similar or possibly the same products are introduced in multiple countries, and that food "fashion" trends for particular products are global in nature.

Table 2. Top five categories for new product introductions observed
in more than one country in 1986-90 and 2000-April 2005

Product category	Number of countries where the product is among top 5		Product rank within country in 2000-05: from top first to fifth					
	1986-90	2000-Apr05	Canada	US	Denmark	France	Germany	UK
Candies, chocolates		5		2nd	4th	4th	1st	3rd
Meals & entrees	5	5	2nd	3rd		1st	3rd	1st
Fruit drinks		4	1st	5th		2nd		2nd
Candies, non-chocolates		3		1st	3rd		2nd	
Cookies	2	3		4th	1st		4th	
Ice Cream	4	2	5th			3rd		
Cheese	4							
Liqueur	2	1						5th
Bread products	2	1			5th			

Source: Productscan, Datamonitor

Perhaps the most important indicator of convergence in tastes and preferences is found in product attribute data for new introductions. The absolute number of new products is highest

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in the US, reflecting the size of the market. To make comparisions across countries, we calculated the share of new introductions in each country with different kinds of attributes. We focused on indicators of convenience, quality, health or nutrition, and environmentally-friendly or natural attributes. The data in Table 3 show that the share of products with these attributes has increased over the last twenty years.   We have divided the table into two parts to show which attributes are most popular and which are less popular as claims in new product introductions.

Certain claims have increased remarkably in popularity (Table 3A). These include convenience, low or no amounts of unhealthy nutrients (such as low saturated fats or low salt), enhanced amounts of good nutrients (such as vitamins, minerals or fiber), and upscale or natural attributes. Claims related to allergens, environmentally friendly packaging, vegetarian content, or targeted to demographic groups have also increased, but are not as popular (Table 3B).

The "natural" category has become particularly important in North America. This includes claims such as no artificial additives, organic, non-GM, and no added hormones. Presumably the latter two claims are taken for granted by many consumers within the EU countries, who rely either on government regulation or retailer reputation to ensure these attributes.

Convenience, as evidenced both in Tables 2 (Meals & Entrees) and in 3A, has been consistently popular over time and in all countries. Microwaveable, instant, hand-held and single serving products have been increasingly introduced in the North American and European markets to meet consumer demand for convenience.

Nutrient claims were fewer in North America in the latter half of the 1990s, following the implementation of the Nutrition Labeling and Education Act of 1990 (NLEA), which suppressed certain kinds of advertising (Ippolito and Pappalardo, 2002). But they have rebounded in the new century, although positive claims for beneficial nutrients still lag behind negative claims for the absence of unhealthy ones.

In both the European and North American markets, the nutritional claims have shifted based on changing consumer awareness and media coverage of food attributes. In the 1980s, dietary fiber and calcium contents were highlighted in product labels, in recent years, beneficial label claims indicate Omega-3 and various vitamin contents. Similarly while product labels indicated low or no calories and fats in the 1980s, current labels may indicate "low glycemic" and "no trans fat."

It does appear that almost all of the claims listed in Tables 3A and 3B are more important as a percent of new product introductions in North America than in Northern Europe, although the UK is often in step with North American trends. While the trend for increased demand of these attributes is shared, it is frequently less important in three of the four European countries considered here.

Table 3A: Percent of New Product Introductions with Most Popular Attributes

	86-90	91-95	96-00	01-05[1]
		Percent of total claims		
Natural products				
Canada	37	29	50	81
USA	47	59	58	74
Denmark	24	10	11	16
France	9	11	11	23
Germany	7	6	7	16
UK	33	18	17	33
Convenience				
Canada	55	19	20	43
USA	18	18	25	37
Denmark	5	6	12	14
France	8	17	20	34
Germany	4	22	15	13
UK	13	16	15	28
Higher quality indications, eg 'upscale', gourmet				
Canada	17	25	42	62
USA	15	26	45	55
Denmark	1	3	11	9
France	5	9	6	13
Germany	2	5	7	9
UK	5	8	15	25
Low or no bad nutrients, fat, calories, sodium				
Canada	34	49	38	42
USA	39	58	43	42
Denmark	20	23	12	24
France	16	9	11	14
Germany	8	16	9	14
UK	10	19	14	20
High in specific good nutrients, minerals, vitamins, Omega-3 etc				
Canada	10	11	12	34
USA	15	7	12	25
Denmark	9	4	2	6
France	18	4	13	16
Germany	15	4	8	10
UK	9	4	4	9

Note: Total shares in a country do not add to 100, since the same product may have more than 1 claim.
[1]2001 through April 30, 2005.
Source: Productscan, Datamonitor

Table 3B. Percent of new product introductions with less popular attributes

	86-90	91-95	96-00	01-05[1]
		Percent of total claims		
Allergen alert				
Canada	0	0	1	8
USA	1	3	4	5
Denmark	1	0	0	1
France	0	0	2	1
Germany	0	0	0	2
UK	1	1	1	6
Targeting demographic groups				
Canada	0	4	13	8
USA	0	2	9	12
Denmark	0	1	4	6
France	0	1	12	8
Germany	0	2	6	7
UK	0	3	11	11
Environment friendly packaging				
Canada	2	2	3	2
USA	1	2	3	2
Denmark	0	0	0	6
France	0	1	0	5
Germany	0	0	0	11
UK	0	0	0	4
Vegan, Vegetarian				
Canada	0	2	2	7
USA	1	2	4	5
Denmark	1	0	1	2
France	0	0	1	2
Germany	1	0	1	2
UK	2	3	8	14

Note: Total shares in a country do not add to 100, since the same product may have more than 1 claim.
[1]2001 through April 30, 2005.
Source: Productscan, Datamonitor

Conclusions

Convergence in food expenditures among high-income countries has continued during the past decade, primarily through continued convergence in expenditures for cereals and meats. This appears to result from underlying convergence in tastes and preferences, as well as reductions in overall price protection. Continued high price protection for some categories of high-valued products, such as fruits, vegetables, and sugar, may have prevented convergence for those expenditures.

One factor fueling overall food expenditure convergence is the increasing standardization of packaged food product delivery at the retail level. Although substantial demand for independent retailers and specialized markets persists, the trend in six North American and Northern European countries indicates growing standardization of food retailing.

New product introductions provide insight into how food trends are reflected in global markets. Similar products are introduced on both sides of the Atlantic. Furthermore, consumers on both continents are seeing greater numbers of products with claims alluding to convenience, quality, natural or nutritional attributes. Although North American consumers may see more of such claims, these trends in demand seem to be global. They reflect similar developments in the household economies of industrialized nations, as well as international awareness of advances in nutrition, and appreciation for environmental amenities.

This paper has been limited by lack of data on food away from home, an important and more dynamic sector in high-income countries. In the future, it would be interesting to compare developments in that sector. Furthermore, we plan to examine whether and how middle-income countries reflect the trends identified above. With globalization and growing per capita income levels, food consumption and marketing trends of North America and Europe are spreading to developing countries. As food consumption and marketing systems trend toward convergence, there is growing pressure for food policy issues with respect to standards, including those for nutrition and food safety, to also converge (Roberts and Unnevehr, 2003). Moreover, convergence in food systems will mean that both benefits and problems, such as the current obesity epidemic, associated with high-income country diets will rapidly become global issues.

References

Barro, R. J. and Sala-i-Martin, X. (1992). Convergence. *Journal of Political Economy* 100(2): 223-251.

Bennett, M.K. (1941). Wheat in national diets. *Wheat Studies* Food Research Institute XVIII(2): 37-76.

Cotterill, R. (1997). The food distribution system of the future: convergence towards the US or the UK model? *Agribusiness* 13(2): 123-135.

Gil, José M., Gracia, A. and Pérez Y Pérez, L. (1995). Food consumption and economic development in the European Union. *European Review of Agricultural Economics* 22(3): 385-399.

Herrmann, R. and Röder, C. (1995). Does food consumption converge internationally? Measurement, empirical tests and determinants *European Review of Agricultural Economics* 22(3): 400-414.

Intriligator, M.D. (1978). *Econometric models, techniques and application.* Englewood Cliffs, NJ: Prentice-Hall.

Ippolito, P.M. and Pappalardo, J.K. (2002). Advertising nutrition & health: Evidence from food advertising 1977-1997. Bureau of Economics Staff Report. Federal Trade Commission. Washington D.C.

Reardon, T., and Berdegué J.A. (2002). The rapid rise of supermarkets in Latin America: challenges and opportunities for development. *Development Policy Review* 20(4): 317-334.

Regmi, A., Ballenger, N. and Putnam, J. (2004). Globalization and income growth promote the Mediterranean diet. *Public Health Nutrition* 7(7): 977-983.

Regmi, A. and Gehlhar M. (eds.) (2005). *New Directions in Global Food Markets.* AIB No. 794. ERS-USDA.

Roberts, D., and L. Unnevehr. "Resolving Trade Disputes Arising from Trends in Food Safety Regulation" in *International Trade and Food Safety: Economic Theory and Case Studies*, USDA/ERS AER 828, November 2003

Appendix Table 1: Regression results of Herman Röder convergence model (*p*-value in parenthesis)

	Total Exp	Cereals	Meat	Vegetable	Fruits	Sugar
$(Exp_i - Exp_{MIN})_{t-5}$	.6729	.8201	.8855	1.004	1.127	1.025
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
PPP_t	.0057	-.0003	-.0018	-.0012	-.0008	-.0009
	(.124)	(.519)	(.011)	(.001)	(.006)	(.033)
NPC_t	305.9	-10.02	11.37	-35.61	-47.36	-8.457
	(.010)	(.003)	(.397)	(.001)	(.000)	(.010)
Constant	-348.1	16.23	38.30	72.06	82.32	45.06
	(.075)	(.172)	(.194)	(.000)	(.000)	(.000)
No Obs	135	135	135	135	135	126
R^2	.808	.820	.887	.941	.804	.932
Adj R^2	.803	.816	.884	.939	.799	.930
P-value	.000	.000	.000	.000	.000	.000

Notes: Estimates are from this linear regression

$$(Exp_i - Exp_{MIN})_t = a + b \cdot (Exp_i - Exp_{MIN})_{t-5} + c \cdot PPP_t + d \cdot NPC_t + u_t$$

Expenditure data are from Euromonitor for 15 countries: US, Japan, Canada, Australia, UK, France, Germany, Italy, Belguim, Denmark, Greece, Ireland, Netherlands, Portugal and Spain. The regressions use data from 1995 through 2003, with the lagged dependent variable based on expenditure data extending back to 1990. Purchasing power parity measures of per capita income are from the World Bank. The consumer nominal protection coefficients are from OECD. Due to data availability, the regression for sugar expenditures does not include Canada.