Data and Methodology

Data on 47 countries were obtained from Euromonitor International, which derives its expenditure estimates from national statistics and statistics available from other agencies such as the OECD, Eurostat, and the World Bank (appendix B). Data on retail and foodservice sales are collected by Euromonitor staff in regional offices. Data on product label claims were obtained from Product Scan, a service of Datamonitor, which reports new product introductions in many countries (appendix C).

Total food expenditures and expenditures on different food categories were available, in current U.S. dollars, on a per capita basis for 1990-2004. Data on retail sales of packaged food products (in current U.S. dollars) were available for 1998-2005, while data on product label claims were obtained for 15 countries (see table 1) for 2001-2005. Data on food sales share by different outlets—such as supermarkets, hypermarkets, convenience stores, and foodservice—were available for 1999-2004 (see appendix B). Middle- and high-income countries were selected for analysis based on whether the country was represented in both the expenditure and sales data, and whether data were available for all years included in the analysis.

The model specification used to examine convergence follows Barro and Sala-i-Martin (1992, p. 247) and is presented below.

$$\left(\frac{1}{T}\right)\log(y_{i,t_0+T}) = B + \frac{e^{-\beta T}}{T}\log(y_{i,t_0}) + u_{i,t_0,t_0+T} \quad (1)$$

Above, y_{i,t_0+T} is the expenditure level in the ending year, and y_{i,t_0} is the expenditure level in the starting year; the subscript *i* denotes a particular country and T is the number of years in the data series. β, which can be interpreted as some measurement of the speed of convergence, is represented as (Barro and Sala-i-Martin, 1992, p. 247):

$$\beta = -\frac{ln(T * slope)}{T}. \quad (2)$$

The slope in equation (2) is the coefficient estimate of $\log(y_{i,t_0})$ in equation (1). The standard error of β, $SE(\beta)$, can be asymptotically estimated by equation (3).

$$SE(\beta) \approx \left|\frac{1}{T * slope}\right| * SE(slope). \quad (3)$$

A positive β indicates convergence and a negative β indicates divergence, with the speed of convergence reflected by the magnitude of β. For food expenditures, the expenditure at the end of the period of observation is determined by the expenditure in the beginning (1990) and the convergence expenditure that will be reached at some steady state. A significant positive β indicates that countries with lower expenditures are experiencing faster growth in expenditures and "catching up" to countries with high expendi-

tures.[1] However, the intercept may also be influenced by structural factors that vary among groups of countries, putting them on a path to a different steady state. Barro and Sala-i-Martin (1992) posit that the intercept in equation (1) may vary among countries with differences in technology or preferences. These types of structural differences, such as lower labor costs in food processing or delivery, may also influence convergence in the food sector.

Since the rate of convergence can be influenced by such structural differences, data are examined for 4 separate groups: the initial 18 high-income countries included in the analysis by Regmi and Unnevehr (2005), other high-income countries, upper middle-income countries, and lower middle-income countries. Food expenditure patterns are distinct across the four groups (table 2), and indicate various levels of food system modernization. The original 18 high-income countries, with the most modern food systems, have the largest share of total food sales occurring in standardized retail outlets. These countries also have higher per capita expenditures on foodservice and on soft drinks, both indicators of modern food delivery systems. Lower middle-income countries, with the least modernized food systems, register the smallest share of food sales in standardized retail outlets, and the lowest per capita expenditures on foodservice and soft drinks. However, with rapidly growing economies, middle-income countries are witnessing more standardized retail and foodservice outlets.

Wealthier countries have higher total food expenditures (although the food share of total expenditures is smaller), but middle-income countries show faster growth in food expenditures. Figure 1 indicates that countries with lower initial food expenditures (within each group) experienced faster growth over 1990-2004, in expenditures, or beta convergence.[2] Faster growth for countries with lower food expenditures implies that they are "catching up" to countries with higher expenditures. The rate of convergence appears similar, but each income group appears to be on a path toward a somewhat different steady state. Therefore, the intercept in equation (1) could differ for countries at different levels of development. Accordingly, dummy variables are used to denote country groupings in the actual estimation: d_H for high-income countries other than the original 18, d_{UM} for upper middle-income countries, and d_{LM} for lower middle-income countries.

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[1] A positive β is associated with a negative slope in figure 1 due to the negative sign in front of β in equation (1). More explicitly, we can express (1) as,

$$\left(\frac{1}{T}\right)\log(y_{i,t_0+T}) - \left(\frac{1}{T}\right)\log(y_{i,t_0}) = B + \frac{e^{-\beta T}-1}{T}\log(y_{i,t_0}) + u_{i,t_0,t_0+T}$$

or

$$\left(\frac{1}{T}\right)\log\left(\frac{y_{i,t_0+T}}{y_{i,t_0}}\right) = B + \frac{e^{-\beta T}-1}{T}\log(y_{i,t_0}) + u_{i,t_0,t_0+T}$$

The left hand side in the second equation is an approximation of the annual growth rate, which is the y-axis in figure 1. If $\beta > 0$, then $e^{-\beta T} < 1$ and $e^{-\beta T} - 1 < 0$, which indicates that the growth rate and natural log of the expenditure level in the beginning year is negatively correlated.

[2] The estimated β in equation 2 has the opposite sign of the slope, which is represented by the data plot in figure 1. A negative slope gives a positive β.

Table 2

Selected indicators of food system modernization across country groups

	Original 18	Other high-income	Upper middle-income	Lower middle-income
		Percent		
Share of food sales in standardized retail outlets[1]	77	60	58	32
Share of packaged food in total food expenditures	52	33	40	26
		US $		
Per capita foodservice expenditures	855	649	260	95
Per capita fast-food expenditures	191	157	34	15
Per capita soft drink expenditures	144	116	42	33
Per capita total food expenditures	2,195	1,772	775	388

Note: The indicators are average values for 2004, except for share of retail outlets, which is a 2005 value.

[1]Share of total 2005 sales from hypermarket, supermarket, discounter, and convenience stores.

Figure 1

Relationship between food expenditure level (per capita) and growth rate, 1990-2004