



Getting consumers to eat more whole-grains: The role of policy, information, and food manufacturers[☆]

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ABSTRACT

The 2005 *Dietary Guidelines* were unique because they offered quantitative recommendations for consumption of whole-grains. This case study examines the hypothesis that the changed recommendations were responsible for the recent increase in retail sales and consumption of whole-grain food products. We find that release of the *Dietary Guidelines* and related media attention did increase availability and sales of whole-grain foods. A large impact on consumption occurred through reformulation of existing products, induced by competition among food suppliers. This study reveals the key role product reformulation plays in inter-firm competition and in realization of dietary changes recommended by public policy.

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Introduction

Since 1980 the *Dietary Guidelines* have been published jointly every five years by the Department of Health and Human Services (USDHHS) and the Department of Agriculture (USDA). From the beginning, these recommendations have encouraged consumption of whole-grains for a healthy diet. The 2005 *Dietary Guidelines*, however, marked a significant departure from past recommendations by making specific recommendations about whole-grains – that at least half of a person's daily grain intake should come from whole-grains (USDHHS/USDA, 2005).

Analysis of consumers' purchases immediately following the release of the *Guidelines* indicates that individuals took this advice to heart by buying more whole-grains – nearly 13% more than the previous two months (Mancino, 2005). Other statistics also demonstrate the initial success of these whole-grain recommendations. For example, a 2006 survey found that 73% of respondents sampled said they were trying to eat more whole-grains (International Food Information Council Foundation, 2006). Tabulations of Nielsen data show that sales of whole-grain breads and baked goods increased 23% in the 52 weeks ending June 18, 2005, when compared to the prior 52-week period. During this same time period, sales of whole-grain pasta sales rose 27% (Whole Grain Council, 2008).

These statistics, however, are also somewhat unusual. Analysis of dietary patterns and health outcomes show that many Americans continue to ignore longstanding advice to eat plenty of fruits and vegetables, limit saturated fat, sodium and added sugars, and

maintain a healthy weight (Guenther et al., 2007; US Department of Health and Human Services, Centers for Disease Control and Prevention, 2007). Thus, it would be surprising if the apparent success of the whole-grain recommendations were solely the result of consumers reading and acting upon *Dietary Guidelines*. It is likely that government-issued dietary recommendations did influence consumers' decision to buy more whole-grains. But the ability to act on these recommendations may have been bolstered by manufacturers offering new or reformulated whole-grain products, thereby increasing the supply of whole-grains foods.

While past studies on dietary recommendations and whole-grain intake have generally focused on consumers' decisions (Lin and Yen, 2007; Marquart et al., 2006; Seal et al., 2006; Lang and Jebb, 2003; Kantor et al., 2001; Moutou et al., 1998), the latest *Dietary Guidelines* provide an opportunity to trace incentives that influence manufacturers' decisions on whole-grain product introductions, reformulations, and marketing. As such, this paper provides an analysis of trends that could impact both demand and supply of whole-grains – availability, information, and prices – to identify how these economic factors correlated with the observed increase in the sales of whole-grain foods. We provide insight into the attributes of food markets that influence efficacy of dietary recommendations. Although we cannot prove whether supply led demand or vice-versa, our results point to the importance of competition among food manufacturers in realizing dietary changes recommended by the public sector.

Background

Many grain products are calorie-dense dessert and snack foods, foods for which the public health community recommends

[☆] The opinions expressed here are those of the authors and not necessarily those of the US Department of Agriculture.

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moderation. For marketing purposes, having a product widely recognized as unhealthy is clearly a barrier to sales. The 1990s saw increasing popularity of the Atkins diet and other diet plans, which recommended little to no carbohydrate or grain consumption. Increased consumption of refined grains was marked as a potential culprit in Americans' weight gain (Putman et al., 2002), further reinforcing negative aspects of grain consumption.

The 2005 *Dietary Guidelines*, along with general media attention suggesting that whole-grain's importance for a healthy diet was, in historical context, unique. Our hypothesis is that the *Dietary Guidelines* offered food manufacturers an opportunity to market their products with a new and healthful attribute. Food manufacturers did not wait passively until consumer demand demonstrated that whole-grain foods would sell. *Dietary Guidelines* gave food manufacturers an opportunity to promote whole-grain content, differentiating their products from refined grain products. Manufacturers reformulated their products and promoted the whole-grain attributes of their products. The attraction of doing so was that even if consumers would not pay much more for healthfulness, the positive attribute might sway some consumers from competitors' products.

To substantiate our hypothesis, we examine trends in whole-grain purchases, the timing of new product introductions, trends in whole-grain food prices, and trends in the use of terms like "whole-grain" and "whole-wheat". Specifically, if competition among manufacturers helped to bolster consumers' response to dietary recommendations, then we would expect to find the following:

- (1) *Purchases of whole-grain processed foods, such as bread and ready-to eat cereals, rose faster than ingredients such as flour and rice.* Suppose the issuance of *Dietary Guidelines* increased consumer demand for all whole-grains. All sellers of brown rice would benefit from increased demand for their product, but no one seller would be at an advantage relative to other sellers. The situation is entirely different for manufactured foods that might be reformulated to meet whole-grain food standards. In addition to the overall increase in demand, a single supplier might be able to reformulate and advertise a product formerly considered unhealthy as healthy, taking sales away from rival products that did not reformulate. That is, the incentive to offer whole-grain foods should be stronger among manufacturers of products that can be reformulated. If market-share competition spurred manufacturers to respond, we would see faster-rising trends among processed foods, as compared to whole-grain ingredients.
- (2) *The timing of new-product introduction coincided with, or even predated, the release of the Dietary Guidelines.* An early version of the 2005 *Dietary Guidelines* was released in August of 2004 for a period of public comments (USDHHS, USDA, 2004). Buzby et al. (2005) noted that many companies launched new branded packaged foods with higher whole-grain content in 2004. Thus, anticipation of the new whole-grain recommendations and competition among manufacturers could have created strong incentives to be timely. A firm that failed to anticipate changes in consumers' preferences, like their increasing demands for whole-grains, risks losing sales to rivals who are better able to gauge shifts in consumer preferences. Even an established firm that fails to be vigilant in monitoring demand shifts can find its product out-of-favor and new firms have taken its market share. As long as firms gain profits or market share by being quick to satisfy consumer demands, new-product introductions and product reformulations of whole-grain foods would have to appear at, or even before, the onset of the demand shift (the release of the *Dietary Guidelines*), not substantially afterward.

- (3) *The price of whole-grain foods, relative to their refined-grain counterparts did not change.* If the equilibrium quantity of whole-grains sold increases without a corresponding price increase, then it must be that some portion of this increase is due to manufacturers increasing their supply. On the other hand, observing an increase in the prices of whole-grain foods relative to refined-grain foods would imply that consumer demands exceeded the ability of manufacturers to respond, and that manufacturers were lagging behind consumer demand in making whole-grain reformulations. In this case, unchanging relative prices indicate that manufacturers' supply response closely shadowed, or even preceded, consumers' increased demand.
- (4) *The use of terms like "whole-grain" or "whole-wheat" have increased while the use of more ambiguous claims, such as "multigrain" and "stoneground" have declined.* Competition among manufacturers might lead to an 'unfolding' (Ippolito and Mathios, 1990) of product claims, whereby manufacturers who are able to highlight positive product attributes do so. Manufacturers who do not highlight such attributes inadvertently signal to consumers that their product does not contain that positive attribute. Additionally, we would expect the emergence and increasing use of third-party labeling services to support the credibility of producers' claims.

Data sources

We use the Nielsen Homescan panel data set to track trends in consumer purchases of processed and unprocessed whole-grains, both before and after the 2005 *Dietary Guidelines*. These data come from a nationwide sample of households that use a scanning device to scan the universal product codes (UPCs) on purchased products. Participants scan their food purchases from all retail outlets at home after they finish shopping. The purchase data is then uploaded to Nielsen to create a database of consumer food purchase behavior. These data include detailed product characteristics, date of purchase, quantity purchased, and expenditures for each food item purchased by each household.

The dataset is a geographically stratified random sample of households, where selection is based on both demographic and geographic targets. That is, the weighted proportion of households in the sample matches the proportions of households in the US Census. Each year, weights are constructed to match the US Census (Muth et al., 2008). The number of households in the data has varied from 7124 households in 1999 to a high of 39,572 households in 2004.¹

The dataset is unique because it comes from a nationally representative sample of households; it finely differentiates food products, expenditures and purchases; and it includes exact days when each household purchase was made. Thus, we were able to construct relatively high frequency purchase data (monthly) suitable for analyzing the timing and magnitude of whole-grain product purchases in relation to new information about whole-grains. We use monthly totals for calculating growth rates and changes in growth rates, but graphically present quarterly aggregates to focus attention on long-run changes. The main limitation to using food purchase data is that nearly half of what typical consumers spend on food is spent at restaurants (USDA-ERS, 2007). Thus,

¹ In 1998–2003, ERS only purchased the fresh foods sub-sample of Homescan that includes households that recorded both fixed weight (UPC-coded) and random weight products. This is a sub-sample of the full static sample that Nielsen produces each year. In 2004 and beyond, ERS purchased the complete static sample from Nielsen that includes all households that participated during a given year.

the data only reveal whole-grain purchases for meal preparation at home, and do not show whether such products also increased in restaurant meals.

We used Nielsen purchase data from January 1, 1998 through December 31, 2006. We constructed monthly time series (1998–2006, 108 observations) for the purchases of five products: bread, ready-to-eat cereal, pasta, rice, and flour. The product categories were selected so that some are products that manufacturers can formulate to meet whole-grain standards (bread, cereal, and pasta), while others either are or are not whole-grain. (Flour and rice are typically either whole-grain or not.) Within each product category, we applied Nielsen’s coding and abbreviations to UPC descriptions to identify those that were whole-grain products. For example, any bread with a UPC description that indicated it was whole-grain, whole-wheat, or whole multigrain was identified as whole-grain bread. Similar techniques were used to identify whole-grain cereals, flour, and pasta. Rice that was described as brown, wild, or red was classified as whole-grain. For each product, we constructed three series. We weighted each recorded quantity purchased and dollar expenditure by the associated household sampling weight and summed the result to construct estimates of US total quantities purchased and expenditures each month. Prices were estimated as unit values: expenditures divided by quantity.

To measure trends in availability of whole-grain foods, we track changes in new product introduction of whole-grain foods. Again, focusing on the time period 1998–2006, we use Marketing Intelligence Service’s Productscan Online to track new food product introductions in the United States among the same five product categories for which we tracked changes in consumer purchases – cereal, bread, pasta, rice and flour. For breads, cereals, pasta and flour, we searched Productscan’s database for new products using the terms “whole-grain” or “whole-wheat”. For rice, we searched this database for new products using the terms “whole-grain”, “brown”, or “wild”. We use the LexisNexis Academic search engine to search for newspaper articles on whole-grains and references to the *Dietary Guidelines* (among US newspapers) to examine the quantity and timing of media attention for whole-grains and the *Dietary Guidelines*.

Trends in whole-grain purchases – 1998–2006

Trends in the total quantity shares of whole-grain purchases, show, for example, how the average amount of whole-grain,

ready-to-eat cereal, as a share of total ready-to-eat cereal, has increased during the 1998–2006 time period (Fig. 1). Again, to focus attention on long-run changes, we present quarterly shares. The quarterly shares of whole-grain bread, pasta, rice and flour have also increased over this time. Supporting our first hypothesis – trends suggest that purchases of whole-grain processed foods, such as bread and ready-to eat cereals, rose faster than ingredients such as flour and rice. The sharp upward-spike in cereal purchases following the pre-release of the *Dietary Guidelines* (but pre-dating their official release) also supports the possibility that some manufacturers reformulated or introduced new whole-grain cereals in anticipation of increased consumer demand.

We use monthly purchase data to construct average annual growth rates for each product category, in which the quantity purchased (Q_t) was assumed to grow at some rate (r), as a function of time (t). In effect, quantity purchased in month t ($t = 1, 2, 3, \dots, 108$; a nine-year period) grows following $Q_t = Q_0(1 + r)^t$. We estimate the growth rate from the ordinary least squares regression $\ln Q_t = \beta_0 + \beta_1 t + \varepsilon_t$, in which $\ln Q_t$ is the natural logarithm of quantity purchased during month t and ε is a normally distributed error term, $\varepsilon \sim N(0, \sigma^2)$. The estimate of β_1 reveals the monthly average growth rate, calculated as $\exp(\beta_1) - 1$. The annual average growth rate was approximated as $12(\exp(\beta_1) - 1)$.

For all product categories, we find that over the 1998–2006 period, purchases of the whole-grain foods examined here grew significantly (Table 1). Pasta grew at an average annual rate of 35.8% and purchases of whole-grain bread grew at an average annual rate of 13.6%. Slower rates of increase were observed for whole-grain rice (4.3%), whole-grain flour (3.1%), and whole-grain cereal (2.4%). However, comparing growth rates in whole-grain cereal should be interpreted with caution because it started with a much higher share of total product sales. In the first quarter of 1998, whole-grain cereal made up about 40% of total cereal purchases, whereas whole-grain pasta constituted less than a 1% of total product category.

Continuing with this same idea, we ran another set of regressions to test whether sales grew at different rates before and after the release of the *Dietary Guidelines* (Table 1). In these regressions, we allow for differing growth rates: $Q_t = Q_0(1 + r_1)^t(1 + r_2)^{t-84}$, where r_1 indicates growth rate before release ($t = 85$), and $r_1 + r_2$ is the post-release rate. The variable I is an indicator variable, that takes on a value of 0 before release and 1 afterward. Parameters were estimated with the OLS regression $\ln Q_t = \beta_0 + \beta_1 t + \beta_2 I(t - 84) + \varepsilon_t$, where $\beta_1 = (1 + r_1)$ and $\beta_2 = (1 + r_2)$. We find that

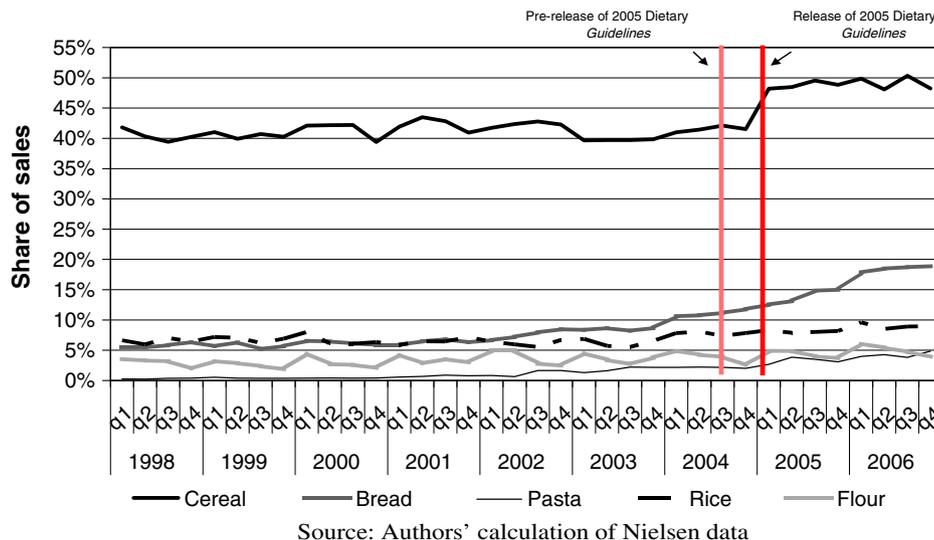


Fig. 1. Sales of whole-grain products relative to total product category sales.

Table 1
Annual growth rates of whole-grain product sales volume

Whole grain product	Calculated average annual growth rates (%)		
	1998–2006	Before Dietary Guidelines	After Dietary Guidelines
Bread	13.6*	10.4*	34.7*
Cereal	2.4*	1.0	11.5*
Flour	3.1*	1.0	16.8*
Pasta	35.8*	36.5*	31.0
Rice	4.3*	3.0*	36.7*

Source: Authors' calculation of Nielsen data.

* Indicates parameters (growth rates) are estimated to be significant at $\alpha = 0.05$.

for all these product categories except whole-grain pasta, the quantity purchased grew at a significantly faster rate after the *Dietary Guidelines* were released.

Trends in availability, information and prices

Availability

Increasing information and media attention about the benefits of whole-grains may have influenced food production and manufacturers' decisions to reformulate product attributes. In general, introducing new products into the market may help food companies boost sales, increase market share and stimulate demand. In the US, a record number of 18,722 new food and beverages were introduced in 2005. The probability of success, however, is quite low. In some product categories, the failure rate among new product introductions is as high as 90% (Martinez, 2007). Thus foresight and the ability to anticipate future consumer demands provide manufacturers with a short-term advantage in a competitive market. Using the same time frame used to gauge trends in whole-grain sales, we see there is an upward trend in new product introductions of whole-grain foods beginning in 2003. This suggests that food manufacturers have expanded the availability of whole-grain foods (Fig. 2). As expected, this trend is more pro-

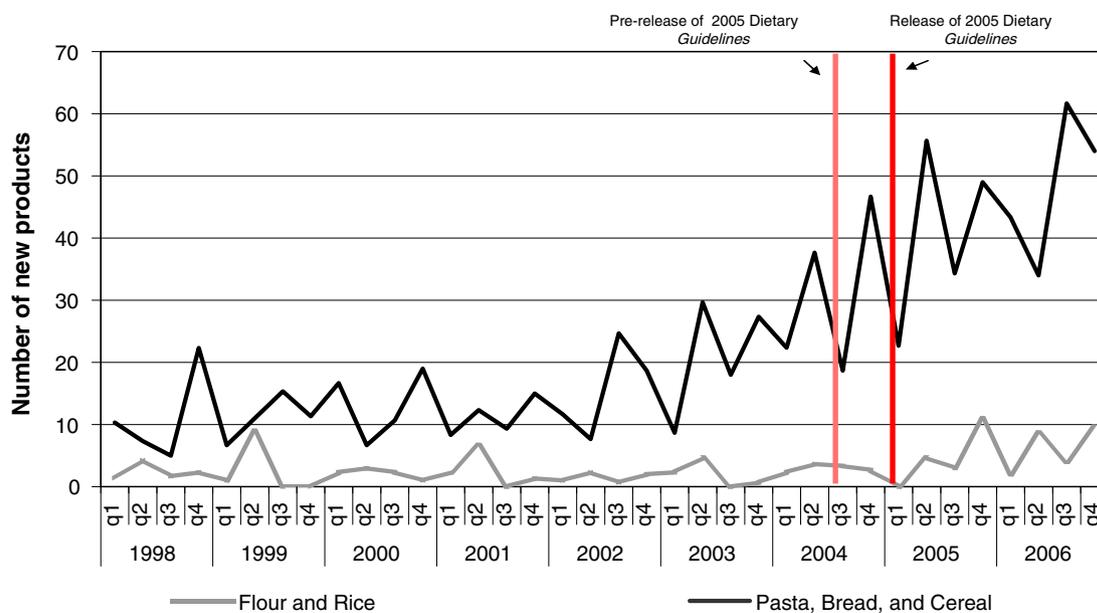
nounced for processed foods – bread, cereal and pasta. For these processed foods, the upward trend in new-product introductions also became evident shortly after the pre-release of *Dietary Guidelines*, suggesting that competition for market-share was the impetus. This finding supports to our second hypothesis – that the timing of new-product introduction coincided with, or even predated, the release of the *Dietary Guidelines*.

Information

Several studies have found a significant link between health information and aggregate food choices. Brown and Schrader (1990) found that increases in the quantity of information linking cholesterol consumption and coronary heart disease had a significant and negative effect on egg consumption. This same information was found to increase consumption of poultry and fish (Capps and Shmitz, 1991); corn, cottonseed, and soybean oil (Chern et al., 1995) and decrease consumption of pork (Capps and Shmitz, 1991), butter and lard (Chern et al., 1995). Ippolito and Mathios (1995) found that aggregate consumption of fats and oils decreased as the government increased campaigns to educate individuals on the links between dietary fat and health. This consumption decreased even further when food producers were able to make additional health claims as part of their advertising campaigns.

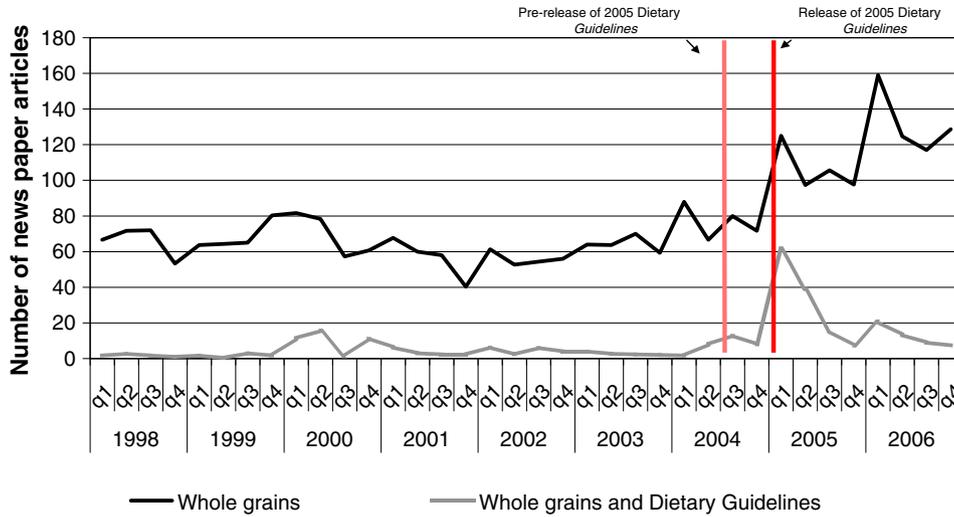
We therefore trace trends in health information about whole-grains and *Dietary Guidelines* to gauge how closely these trends correlate with trends in both consumer purchases and new product introductions. The quarterly number of US newspaper articles that mentioned the *Dietary Guidelines* and “whole-grains” and “whole-grains” only (Fig. 3) varied between 1998 and 2006. For consistency, we used the same time frame as the analysis of household whole-grain purchases and product introductions.

It is interesting to note that, except for a few spikes that coincide with the release of the 2000 and 2005 *Dietary Guidelines*, coverage of whole-grains as they relate to *Dietary Guidelines* has been quite flat. However, general coverage of whole-grains has increased steadily since 1998, with a steep and continued jump in



Source: Authors' calculation of ProductsScan data

Fig. 2. Number of new whole-grain product introductions.



Source: Authors' calculation of Lexis-Nexis

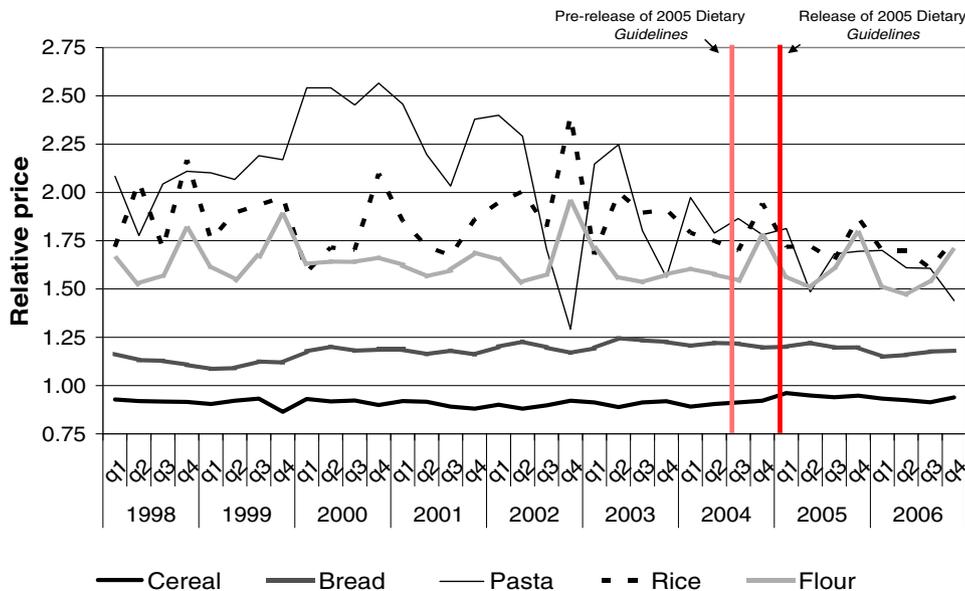
Fig. 3. Number of newspaper articles.

coverage beginning in 2004. This jump coincides closely with increases in product introductions of whole-grain foods (Fig. 2). Thus this simple examination of media trends suggests that general media coverage of whole-grains correlates more closely with trends in new product introductions, which became evident by 2004 and preceded the official release of the 2005 *Dietary Guidelines*.

Prices

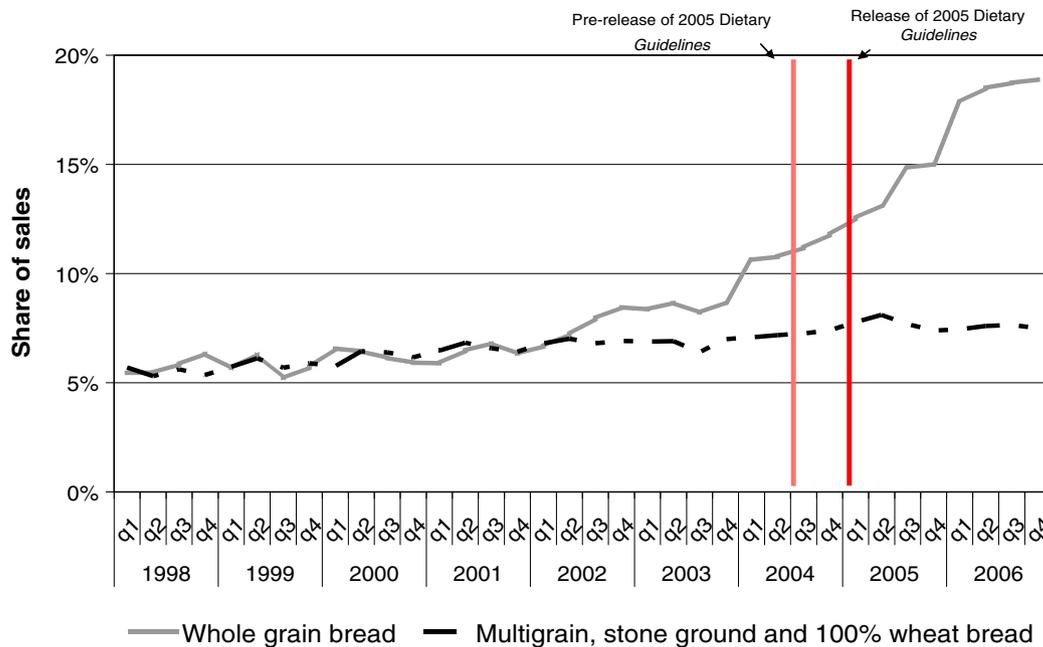
If the 2005 *Dietary Guidelines* boosted consumer demand for whole-grain foods before food companies increased availability, then we should be able to see some short-term increases in their prices. However, the quarterly average price of each whole-grain product relative to the refined product (focusing on relative prices

avoids the need to account for inflation) shows no upward trend in whole-grain prices after the *Dietary Guidelines*. In support of our third hypothesis, we find that the price of whole-grain cereal and bread, relative to non-whole-grain cereal and bread, has remained remarkably flat between 1998 and 2006 (Fig. 4). Given that these two product categories saw the largest absolute increase in share of sales, this suggests that supply of whole-grain breads and cereals also increased during this same time frame. The reason for this supply response (and lack of price premiums) may be that manufacturers introduced new products as part of an on-going strategy of new product introduction. By anticipating the *Dietary Guidelines*, they were able to reformulate products so as to use the new nutrition information as part of their marketing strategy, to both encourage and anticipate any increases in demand for whole-grains. While there has been no obvious price trend for



Source: Authors' calculation of Nielsen Data

Fig. 4. Relative price of whole-grain product to non-whole grain.



Source: Authors' calculation of Nielsen Data

Fig. 5. Sales of whole/multi-grain breads relative to all bread sales.

whole-grain rice and flour, the price of whole-grain pasta has trended downward. It is also important to note that again, the flat and downward price trends are most discernible for processed foods – bread, cereal and pasta – again suggesting that manufacturers helped to reinforce consumers' response to whole-grain recommendations.

Trends in labeling claims, policy and third-party certification

Properly identifying whole-grain breads is most frequently cited as a barrier to increasing whole-grain consumption (Marquart et al., 2006; Seal et al., 2006). If there were a one-to-one match between dietary recommendations and labeling policy, consumer confusion would likely present less of a barrier. For example, the term “low-fat”, when used on product labels has a specific meaning: 30% or less of that product's calories come from fat. This definition corresponds to the USDA's recommendation to choose a diet that is low in fat, which is also defined as getting no more than 30% of one's daily calories from fat. As such, competition among manufacturers has resulted in an ‘unfolding’ of product claims. Producers of low-fat products make factual claims about the fat content of their products. Producers of higher fat products are not able to make such claims, and thereby signal to consumers that their product is not low fat (Ippolito and Mathios, 1990).

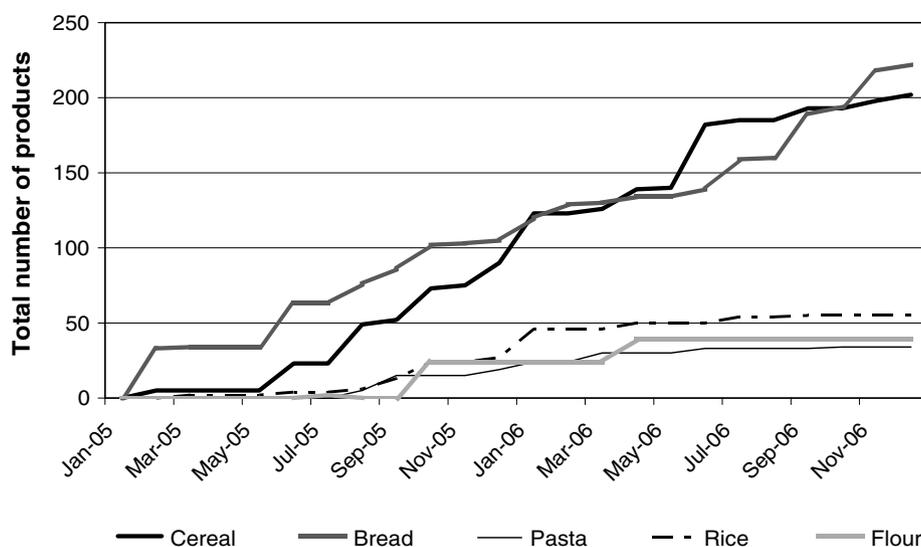
In the case of whole-grains, there is not a direct match between dietary recommendations and labeling policy. The *Dietary Guidelines* defines whole-grain food, such as bread, flour or pasta, as those that retain roughly the same relative proportions of bran, germ and endosperm as the found in the original grain (USDHHS/USDA, 2005). For processed foods, it is can be difficult to determine if this criterion has been met. Moreover, the Food and Drug Administration (FDA), which regulates US nutrition labeling of most foods and authorizes the use of nutrient and health claims has no mandatory requirements regarding whole-grains. Although the *Dietary Guidelines* has specific recommendations about the amount (in grams) of whole-grains a person should consume each day, food manufacturers are not required to indicate the amount of whole-grains contained in their food product. This may

make it difficult for individuals to know how much, if any, whole-grains they consume. While many whole-grain products can be identified by looking for “whole” or “whole-grain” as one of the first ingredients (USDHHS/USDA, 2005), foods made with several different whole-grains noted further down on the list of ingredients may also be considered a whole-grain food.

Manufacturers can elect to use certain nutrient claims, such as “100% whole-grain” or “10 g of whole-grains”, as long as the statements are not false or misleading. However, other product claims, such as “multigrain”, “stoneground”, or “100% wheat”, may be used regardless of whether a product is made with whole-grains. Manufacturers of whole-grain food products can also use one of two whole-grain health claims that relate whole-grain intake with a reduced risk of heart disease or cancer. To qualify, the product must be at least 51% whole-grain by total weight of ingredients and the whole-grains must contain at least 11% fiber. Additionally, the claims require that the product fall within fat or saturated fat limits, depending on the specific health claim (FDA, 2003). However, these claims have limitations. Foods with non-grain ingredients or high moisture levels, such as raisin bread made from 100% whole-wheat flour, would not be able to use the whole-grain health claim. Products made with lower-fiber grains have difficulties qualifying for the whole-grain health claim as well. For example, a bag of brown rice, which is by definition a whole-grain, could not use the whole-grain health claim because it only contains 3.5% fiber.

Thus to gauge the extent to which producers compete on whole-grain claims, we again use data on consumer purchases, new-product introduction and prices. To keep the discussion manageable, we limit this analysis to bread products. Using Nielsen data, we define whole-grain breads the same as before. From the subset of refined breads, we then search UPC descriptions for abbreviations that indicate bread is labeled as multigrain, brown, 100% wheat or stoneground. Here, we refer to these as multigrain breads.

Whole-grain and multigrain bread sales were about the same until the middle of 2002. They began to diverge, quite sharply around the beginning of 2004. This again corresponds to the in-



Source: Authors' calculation of data from the Whole Grain Council

Fig. 6. Number of products with 'whole-grain' seal (total per quarter).

crease in general media coverage about whole-grains. While sales of breads labeled as whole-grain and whole-wheat has expanded between 1998 and 2006, the sales of multigrain breads have remained flat (Fig. 5). We find similar trends in new product introductions. While new bread product using terms such as "whole-grain" and "whole-wheat" have been on the rise, use of multigrain claims has stayed very flat. The difference in sales between whole-grain and multigrain cannot be attributed to prices. Calculations of price differences show that between 1998 and 2006, the relative price of whole-grain breads has been remarkably similar to the price of multigrain breads – on average there has been a 3% difference between the price of whole-grain and multigrain breads.

This is not entirely what we had expected – we had expected sales of multigrain breads to decline. Of course, one reason for this may be that some portion of the population simply prefers multigrain breads. Our analysis cannot dismiss this possibility. However, it also possible that consumer confusion, combined with differences between dietary recommendations and labeling policy, may serve as impediments to competition and product unfolding. As such, some consumers who intend to incorporate more whole-grains into their diet may unwittingly buy multigrain products instead.

Third-party certification

When voluntary labeling leaves information gaps, it is not uncommon for third-party labeling services to emerge in order to increase reliability and credibility of producers' claims (Golan et al., 2007). Thus it is not surprising that The Whole Grain Council (WGC), a nonprofit organization that promotes the consumption of whole-grains, created a Whole Grain Stamp in 2005. Food manufacturers may find the Whole Grain Stamp an attractive alternative to the FDA approved health claims because standards for the latter are difficult to obtain for some product categories, such as brown rice and certain breads. To use one of the certified Whole Grain Stamps,² manufacturers can voluntarily work with the WGC to check that their formulations are eligible. Increasing use of this stamp would indicate that being able to differentiate products on whole-grain content is of value to food companies. We therefore

use data from the Whole Grains Council, to further assess trends in whole-grain marketing and track changes in products that opt to use a third-party certified Whole Grain Stamp. We focus on the same five product categories – bread, cereal, pasta, rice and flour.

We find that use of the Whole Grain Stamp has increased since the release of the *Dietary Guidelines* (Fig. 6). This provides further evidence that marketing whole-grain content is valuable to some manufacturers. We also find that use of the Stamp has increased more for processed foods, especially bread and cereal, and has been used much less by flour and rice manufacturers. Again, this suggests that food companies that produce more processed foods are competing more on whole-grain content than producers of ingredient foods.

Lessons from observing developments in the whole-grain market

This paper provides evidence that consumers have increased purchases of whole-grain foods, particularly cereals, breads, and pasta, after the issuance of the 2005 *Dietary Guidelines*. We find evidence that these guidelines led to market competition among food manufacturers, whereby manufacturers offered consumers new and reformulated whole-grain products, increased availability of whole-grain foods and made it easier for consumers to act on whole-grain dietary recommendations. Thus, this research shows that competition among food manufacturers can play an important role in supporting dietary recommendations led by the public sector. However, this support is tempered when labeling policies are not directly matched with dietary recommendations. While third-party certification on whole-grain claims is gaining popularity, use of ambiguous terms has not waned. Although this may indicate that some consumers prefer multigrain and stoneground products, it may also suggest that some portion of shoppers are simply unable to properly identify whole-grains. If the latter is true, requiring specific information on whole-grain content may improve consumers' ability to act on dietary recommendations.

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² To be eligible, a product must contain at least 8 g of whole-grain per labeled serving to use the basic Whole Grain Stamp. Products with at least 16 g of whole grains, or products where all the grain is whole grain can use the 100% Stamp.

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