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**THE FOOD CONSUMER IN THE 21ST CENTURY
NEW RESEARCH PERSPECTIVES**

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The Food Consumer in the 21st Century: New Research Perspectives

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Abstract

A far more complex set of factors are now driving food consumption patterns in high-income countries than economists have traditionally analyzed in demand studies. Food consumers have moved up Maslow's hierarchy of needs pyramid from satisfying basic physiological needs. If the traditional focus was on quantity demands for homogeneous commodities, attention needs to increasingly be given to the demand for quality-differentiated food products. Although the income elasticity in terms of quantity may be low, the elasticity for many food attributes, such as nutrition and health, safety, convenience, and diversity, are quite high. Where people buy food, the form in which they buy it and where they eat it are all changing. To simply distinguish between food consumed at home and away from home is no longer adequate. Rapid demographic and socioeconomic changes, such as the massive entrance of women into the workforce and increasing multi-ethnicity, are a fundamental driver of food buying and dietary patterns.

Research needs to give more attention to the demand for differentiated, frequently branded food products, to disaggregation of the population, and to a recognition that traditional demographic factors may have limited explanatory power. A specific research study is given as an example of each. The single quality-differentiation factor currently receiving the most attention is genetic modification. The difference in the general consumer acceptance of biotechnology and genetically modified foods between the United States and Europe is dramatic. Kevin Lancaster's consumer model can be utilized to more fully understand this difference, especially to distinguish between a difference in the perception of the risks and benefits of the technology and in the underlying consumer preferences for risk avoidance or naturalness in food.

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THE FOOD CONSUMER IN THE 21ST CENTURY: NEW RESEARCH PERSPECTIVES

Food consumption patterns in the United States and Europe, as well as other high-income countries, are increasingly being driven by a much more complex set of factors than economists have traditionally analyzed in our demand studies. The basic model of demand for a homogenous food commodity like wheat, specified as a function of relative prices, income and preferences, has been a powerful analytical tool for understanding consumer behavior. Economists could focus on price and income elasticities and largely ignore the effect of underlying food preferences which reflected culturally determined dietary norms. These dietary patterns were very slow to change and broadly shared within a culture. European immigrants in the 18th, 19th and early 20th Century brought their relatively homogeneous food customs with them to the United States. Food preferences could be successfully captured in demand analysis with demographic factors, such as region, age, and household size, for example.

However, this traditional demand analysis model is no longer adequate to understand the complexity of consumer food behavior in advanced, post-industrial societies. Consumers buy differentiated, frequently branded, food products, at a specific time and location, not an undifferentiated, homogeneous commodity. Their food purchases and consumption are increasingly motivated by information, attitudes, perceptions and other complex psychological factors, and less by prices and income. Traditional, culturally determined food preferences, passed on from one generation to the next, have broken down. It would clearly be a mistake to assume that a German or an American of German heritage has a diet heavy in the traditional sausages, potatoes, bread and beer. In advanced, modern societies individuals' diets have

become far more varied from one day to the next and food consumption patterns within a society across individuals are far more diverse.

“Individual” was used purposely here, because the household or family is no longer the key decision making unit in terms of food consumption in most cases. More and more meals are eaten away from home, or at least prepared away from home. Even for many at-home meal occasions family members eat very differently. This was always true for breakfast in my own family once my children were teenagers. Most American families no longer have a wife/mother who functions as a ‘gatekeeper’, who purchases and prepares the same food for the whole family. Unquestionably, dinner, the main meal of the day, is the most traditional and one at which household members are most likely to share the same food.

MASLOW’S HIERARCHY OF NEEDS

One way to think about food consumers in Europe and the United States is that they have moved up Maslow’s well-known hierarchy of needs pyramid, which is shown in Figure 1. At lower income levels, people are first and foremost motivated to satisfy their basic physiological needs for food in the context of the traditional food preferences of their culture, the lowest level of the pyramid. Historically, the food consumption of the elites in society, such as the aristocracy in Europe, has been motivated by needs, such as prestige, superiority and status, further up the Maslow Hierarchy. In addition, the masses in every society have used food to denote special occasions, such as weddings and religious celebrations, and express higher motives, such as love, friendship and affiliation.

Now with the widespread, although certainly not universal, affluence in Europe and the United States, most consumers are motivated by factors higher on the pyramid. These consumers expect food to be safe, literally risk free in many cases, which is probably impossible. Many increasingly want foods that are not only safe, but that positively promotes good health. For example, my wife and I now use Benecol margarine, which was developed in Finland and contains an extract from pine trees, that helps promote healthier blood cholesterol levels. Moreover, many consumers' attitudes towards food can only be understood by considering them in the context of self-actualization and self-fulfillment needs, at the top of Maslow's hierarchy.

Much of the rapidly growing demand for "natural" food, what Americans call organic food and Europeans refer to as biological, arises from far more complex personal motivations than a simple desire to avoid possible agricultural chemical residues. People may also be utilizing their food consumption to express a certain self-image and world vision, an image of the kind of environment and world they want to live in. Again, my own family is an example, my 25 year old daughter who is a staunch environmentalist, is a strict vegetarian. My wife and I have virtually eliminated meat and poultry from our diet at home and consume much more fish. My wife increasingly buys organic produce and always buys the milk certified to come from cows not treated with rBGH, the genetically modified growth hormone that can increase milk production and has been approved for use in the United States. This shift in our food consumption pattern has occurred even though I accept the scientific evidence that organic food and non-rBGH milk are not necessarily safer.

One of the implications of this shift up the Maslow hierarchy for the economic analysis of demand is the possible effect on income elasticities, the percentage change in consumption for a

percentage change in income. A plausible hypothesis is that at the higher income levels enjoyed by wide segments of society in advanced countries, such as in Europe and the United States, the income elasticities for needs or attributes at the bottom of the pyramid, involving the basic physiological needs for food, are low. On the other hand, the income elasticities of attributes associated with needs further up the hierarchy, such as food safety, status and self-fulfillment, rise with higher incomes.

THE DEMAND FOR QUALITY ATTRIBUTES

In his Presidential Address to the American Agricultural Economics Association, John Antle (1999) addressed “The New Economics of Agriculture”. In the “old” (or traditional) economics of agriculture the focus was on quantity demand. Antle argued that the “new economics” is more concerned with the markets for quality-differentiated products. He presented a stylized demand function (Antle, 1999, p. 994):

$$(1) \quad X = D(\mathbf{P}, I, N, \mathbf{C}, \mathbf{Q})$$

where demand (X) depends on the price of that product and other goods (\mathbf{P}), income (I), population (N), characteristics of the population (\mathbf{C}), and nonprice attributes of the product (\mathbf{Q}).

The quality factors can include any attributes of the product from which consumers derive utility or disutility. They may include nutritional content, safety and convenience characteristics and might also include how the product was produced, the environmental impact of production, and production processes and inputs like pesticides, irradiation and genetically modified organisms (Antle, 1999). Demand analysis in the “old economics” concentrated on the impact of prices and income on quantity demand. In the “new economics”, demand analysts need to give

much more attention to understanding the effect of consumer characteristics (C) and quality attributes (Q) on food demand and consumption. The income elasticity of demand for quantity, in terms of basic agricultural commodities, is low. The income elasticity for many quality characteristics is substantially higher. As incomes have grown, demand has shifted toward high-quality, processed and prepared foods that provide convenience and other desired attributes. Domestic agricultural commodity demand has grown only slowly or been stagnate (Antle, 1999).

My impression, although it may not be particularly well informed, is that European agricultural economists have given more attention to the analysis of the consumption of quality-differentiated foods than Americans. The American tradition of demand analysis has been dominated by sophisticated modeling and econometrics techniques applied to aggregate, undifferentiated commodities, such as beef, pork and poultry. Many of these studies have been primarily motivated by methodological issues.

The development of the food processing and retailing industries reflects a response to this demand for quality-differentiated products, as does the “industrialization of agriculture” to some extent (Antle, 1999). The basic commodity is only one input to a multi-stage process that adds much more value to the quality-differentiated product after it leaves the farm. Quality-differentiated products necessitate coordination between the different stages of the production process, but do not necessarily require ownership or concentration. There may be economies of size, but there are also opportunities for small specialized enterprises to fill the specific quality preferences of some consumer segments or niches.

Table 1 provides stylized income elasticities of demand for various food attributes. Calories, in some respect, represent a basic measure of quantity. The demand for additional

calories is close to zero in the United States and negative for many consumers who are trying to reduce their caloric intake, hence the abundance of reduced calorie products on the market. The income elasticity is also negative among many consumers for food components, such as fat and cholesterol, which have been shown to have a detrimental impact on health. In the 1999 Parade Magazine “What America Eats Survey”, 42% said low fat was either an extremely or very important factor in their food choices (Parade, 1999). However, for the aggregate population, the demand for fat is still positive since U.S. per capita consumption of fats and oils rose 25% between 1970-1997 (Putnam and Allshouse, 1999, p. 32). On the other hand, the nutritional/health value of food has become more important. The demand for nutrients, such as calcium, that are important to good health is high, at least for many people; hence the availability of calcium-fortified products, such as orange juice and milk. In the Parade survey, 69% said nutritional/health value was either extremely or very important in their food choices (Parade, 1999, p. 6).

One of the food attributes for which demand is high is convenience. Fifty-five percent said it was either extremely or very important in the Parade survey. At higher income levels, people want diets that are more diverse and varied and become more concerned about food safety. Because the demand for food safety rises, even though the safety of the U.S. food supply is higher than ever before, it may appear at times as if the demand for safety is not being met. At higher income levels, many consumers become concerned about whether production is environmentally benign (the term “green” is widely used in Europe) and sustainable. Naturalness may also be an important attribute for some. They want food that is a product of “Mother Nature”, not technology.

Taste remains the single most important food attribute. In the Parade survey (1999, p. 6), taste was the most important criteria affecting food choices; for 97% of respondents it was either extremely or very important. For the women surveyed, 88% indicated that taste is the main reason for buying the same brand and for 72% taste is a major reason for switching brands (Parade, 1999, p. 34). Moreover, increasing numbers of people can afford to pay for foods and meals that provide unique sensory experiences, such as served at gourmet restaurants. Food can also be used as a means of attempting to gain status, which is really nothing new, but is now affordable for more of the population. The concept of value relates the quality to the price. People with lower incomes are very price conscious, but virtually everyone wants to feel they are getting good value for the money they spend. In the same Parade survey, 74% indicated cost/price was either extremely or very important and 73% said it was the major factor behind switching brands (Parade, 1999).

FOOD PURCHASE AND EATING OCCASIONS

Food is now also differentiated by an increasing array of diverse options in terms of the time and location of its purchase, preparation and actual consumption. In the past most food in industrialized societies was purchased at a grocery market or other food store, prepared at home and eaten at one of the traditional three major meals, breakfast, lunch and dinner. Although still the predominant pathway for most food, certainly in terms of quantity, it is a continually declining share, especially in terms of food expenditures. As one example, the term “grazing” has been coined for the eating pattern of some, primarily younger people and perhaps more

Americans than Europeans, in which fewer main sitdown meals are consumed and replaced by more frequent, lighter eating or snacking (Senauer, Asp and Kinsey, 1991).

The share of income spent for food at home fell from about 14% in 1960 to only 6.6% in 1997 in the United States, whereas the share spent on food away from home rose from about 3.5% in 1960 to 4.1% in 1997, the last year for which the data are currently available (Putnam and Allshouse, 1999). One wants to be careful not to overstate the changes that have occurred, though. Although food away from home accounts for a steadily increasing share of total food expenditures, food at home spending still accounted for 54% of total food spending in 2000 and food away from home 46% (USDA, 2001, p. 51). On a quantity basis food at home still accounted for an even larger proportion. Seventy-two percent of the food eaten in the United States came from groceries and other food stores, when measured in grams or calories, based on data from the Continuing Survey of Food Intake of Individuals (CSFII) for 1994 (Carlson, Kinsey and Nadav, 1998).

However, the trends are such that the traditional primary division, at least in the United States, into food at home and food away from home is no longer really adequate. Figure 2 provides a much more complete breakdown of eating occasions (McKinsey, 1996, p. 2). The upper numbers give the percent of eating occasions (based on expenditures) in each category in 1995 and the lower numbers (in parentheses) in 1985. The shifts are driven by the demand for convenience with growth in categories such as on-premise and off-premise consumed away from home. The largest drop was in prepared at home from basic ingredients, with a decline from 25% to 21%. In the area of fully prepared away from home and consumed at home, there is a shift from packaged to fresh products.

As of now, only a small proportion of people are using the internet and home delivery as a more convenient way to shop for food. There are predictions of robust future growth by some and a number of new companies are counting on such growth. A survey of 900 consumers by The Retail Food Industry Center, located at the University of Minnesota, found that in 1999 only 3.3% of food shoppers had ever purchased food over the internet. Some 35.4% said they would be either very likely or somewhat likely to do so in the future. Home delivery is actually a return to something quite traditional. In 1929 before supermarkets became the dominant U.S. grocery retail format, home delivery accounted for 13.8% of food-at-home sales (The Food Institute, 1996).

POPULATION CHANGES AND THEIR IMPLICATIONS FOR QUALITY DEMAND

Fundamental changes in the characteristics of the American population, **C** in eq. 1, are having a major impact on the quality attributes demanded, **Q** in eq. 1. The most important of these population changes fall into the following major areas: the increased participation of women in the workforce, the rising value of time and the demand for convenience; the increasing inequality in the distribution of income, the resulting economic haves and have-nots and the division into price-conscious and convenience/quality oriented consumers; and finally, the evolution of a multi-ethnic culture and other factors which have led to the replacement of the mass market with a segmented market.

Working Women, the Value of Time and the Demand for Convenience

When historians of the future look back at the last decades of the 20th Century in the United States, the dramatic increase in the labor force participation of women will almost

certainly stand out as one of the most significant social and economic changes of this period. The labor force participation rate for women, which stood at 43.3% in 1970, reached 59.8% in 1998, with 61.4% forecast for 2006 (U.S. Census Bureau, 1999). For women age 35-44, the rate climbed from 51.1% in 1970 to 77.1% in 1998, and a predicted 80.2% in 2006. The rate for men age 35-44 is predicted to be only 10 percentage points higher at 90.7% in 2006. The most obvious and widespread impact of these changes is the rising pressure on time and the increasing demand for convenience in how people buy, prepare (if at all), and eat food. For many meal occasions what people want is a meal to eat not food to prepare.

The household production model of Gary Becker, who won the Nobel Prize in Economics, can be used to enrich our understanding of the forces driving the demand for convenience. In the Becker (1965) model, the goods actually consumed that generate utility are produced through combining goods that are purchased with household time, and household and human capital. As incomes (wages and salaries) have risen over time, and especially as women have entered the workforce, the opportunity cost of time has increased. The rising value of time has driven the shift away from time-intensive consumption (home-cooked meals) and the demand for convenience.

Income Inequality: the Price Conscious and the Convenience/Quality Oriented

The gap between the economic “have’s” and the “have-not’s” has been growing in the United States. The Center on Budget and Policy Analysis using Congressional Budget Office data calculated that the share of all income received by the top quintile (20%) of households increased from 44.2% in 1977 to 50.4% in 1999, whereas the other four out of five households received a smaller piece of the economic pie in 1999. Moreover, the after-tax income, after

adjusting for inflation of the lower three quintiles (60% of households) was actually lower in 1999 than 1977 (Johnston, 1999).

The most fundamental segmentation of food consumption and shopping patterns is into those who are price conscious with lower incomes and the convenience/quality oriented with higher incomes. The original segmentation by the Food Marketing Institute put 45% of food shoppers in the price-conscious group and 55 % into the convenience oriented (Sansolo, 1996). In the recent consumer survey by The Retail Food Industry Center, a question was asked concerning the importance of 33 various factors in choosing a grocery store to shop at. Fifty-two percent could be identified as price conscious based on their ranking price as a more important factor than the median response for all 33 of the factors. The other 48% who did not rank price higher than the median for all of the factors could be considered convenience/quality oriented (Katsaras, 2001).

Ethnicity and Other Segmentation Factors

The United States has increasingly become a multi-ethnic society. The last two decades of the 20th Century saw the highest levels of immigration since the first two decades of the century. There were 7.3 million immigrants in the period 1981-1990 and 6.9 million in 1991-1997 compared to 8.8 million in 1901-1910 and 5.7 million in 1911-1920. Of course, at the beginning of the century these numbers represented a far larger proportion of the existing population (U.S. Census Bureau, 1999). Currently, African-Americans compose 12.3% of the population, Asians 3.6% and Hispanics 12.5% (U.S. Census Bureau, 2001). By 2020, African-Americans are predicted to account for 14%, Asians 6% and Hispanics over 16%. Together they

will represent over 36% of the population and Hispanics will be the largest minority with a forecast of 53 million (U.S. Census Bureau, 1999).

The melting pot, in terms of rapid adoption of the dominant culture by immigrants, no longer operates as previously. Immigrants retain more of their own cultures and bring a richer cultural diversity to American society, that some have referred to as a tossed salad rather than a melting pot. The market for ethnic foods has grown rapidly. Moreover, there has been a marked impact on Americans' eating habits in general. Most Americans eat a far more ethnically diverse diet than previously. Most large cities contain a considerable array of authentic ethnic restaurants. There are a number of other demographic shifts leading to the breakdown of the mass market into segments. However, there is not time to discuss the others here.

SOME RESEARCH IMPLICATIONS

These changes in consumer food behavior have a number of implications for research. Three of the most important involve the need to: i.) analyze the demand for differentiated, frequently branded, food products rather than aggregated commodities, ii.) disaggregate the population rather than analyze the consumption/purchases of an average or "representative" consumer, and iii.) recognize that traditional demographic factors may be of limited importance in explaining differences in consumer preferences and behavior. Attitudes and perceptions may play a greater role. Each of these points will be illustrated with a specific piece of research.

Demand for Differentiated, Branded Food Products

Park (1995) analyzed household demand for branded spaghetti products using the A. C. Nielson household scanner panel (see also Park and Senauer, 1996). These data link food

products purchased, which are actually scanned in the household with UPC bar-code scanners provided to panel members by A. C. Nielson, with household demographics and market information on the store where the purchase was made. The major limitation with store-level scanner data has been that it provided no information on the consumer making the purchase. This also is beginning to change as stores establish frequent shopper or loyalty programs, in which consumers have an identification number which is provided at the time of purchase to receive certain benefits, such as a discount. These data provide a rich new source of information for analysis, but they are proprietary and not typically available without a charge.

Pasta consumption has increased markedly in the United States, as it probably has in Europe, outside of Italy also. The average per capita annual U. S. consumption of spaghetti might be analyzed with traditional demand analysis techniques. However, what consumers actually purchase is a specific brand and size package of spaghetti. During a specific shopping trip, a consumer will chose among the specific brand-size choices on the store shelf if they want to buy spaghetti. Demand will be discrete and not continuous. If they buy spaghetti, they will typically buy one package of the chosen brand, although they might stock up and buy several. However, on many trips no spaghetti will be purchased at all even if they consume it fairly regularly and if a consumer purchases one brand on a trip they will be very unlikely to purchase another. The A. C. Nielson data, which were for the first quarter of 1994, covered the weekly spaghetti purchases of 1, 744 panel households. The purchases were made in 22 different grocery chains.

Given the structure of the consumer purchase decision, discrete choice models were used for the analysis. A multinomial logit model was used which treats the alternatives choices

independently and assumes that the consumer chooses the spaghetti brand and size alternative which represents the preferred alternative at the time of choice. Seven choice alternatives were selected: 16 ounce (oz.) and 32 oz. size packages of Creamette which was the best selling brand nationally and available in all the stores covered and the same package sizes of the first and second best selling brand in each store, excluding Creamette. The latter was done because of the variation in spaghetti brands carried from store to store, with the exception of Creamette. In addition, a nested logit model was estimated which incorporates a decision-making process in which the choice alternatives are interdependent within choice clusters. The first decision is whether to purchase spaghetti during a given week or not, then which brand to buy and the third which size package.

The most interesting empirical results relate to the price elasticities of choice probabilities. These elasticities are much more elastic than in traditional food demand analysis for aggregate commodities. The own-price elasticity for the 32 oz. size Creamette was -3.61 and the lowest elasticity was -1.29. Different brands and sizes of spaghetti on the same grocery store shelf are much closer substitutes than more aggregate commodities such as beef, pork and poultry. The results are consistent with microeconomic theory which suggests that the more substitutes a product has and the closer they are, the more elastic will be the response to a price change. If a consumer perceives the quality of two spaghetti brands to be equivalent, then they may virtually represent a case of perfect substitutes.

Preferences and Taste Changes Dissaggregated by Demographic Groups

The issue of structural change in preferences, particularly for beef and poultry consumption, was a major focus of U.S. food demand research between the late 1980's and mid

1990's. Most of this research focused on taste change related to the average or representative consumer. However, as Cortez and Senauer (1996) showed there are vast differences in the preference shifts related to various food categories for different demographic groups in the United States. A nonparametric technique was used to analyze the stability of preferences and measure any change in tastes for 19 major food categories. An actual change in underlying preferences must, of course, be differentiated from a simple observed change in consumption. Data from the 1980-1990 annual household-level Consumer Expenditure Survey was used. Households were divided into eight demographic groups based on income, the household head's age, and education level. Households were classified into two income categories depending on whether it was less than, equal to, or more than twice the U. S. poverty level. The age split was less than 45 years old and equal to or greater than 45 and education was high school (secondary school; 12th grade) or less, or more than a high school education.

In terms of empirical results, the cumulative change in tastes between 1980 and 1990 were negative for every demographic segment for beef, preferences shifted away from beef. However, the preference shift was over four times larger for households with higher incomes, older heads, and more educated spouses compared to those with lower incomes, younger heads and less educated spouses. For three demographic groups, the change in tastes was in favor of pork, whereas the preferences of five segments shifted away. More generally, not only must the product be disaggregated, but the population analyzed must also be to gain a fuller understanding of consumer food behavior.

Grocery Shopper Segmentation

Katsaras (2001) used cluster analysis techniques to segment grocery shoppers into six

segments according to their preferences for 33 store and shopping experience characteristics.

The segmentation was done on the basis of attitudes and the surprising result was there were very few differences in the segments in term of demographic factors. The data analyzed was from the consumer survey conducted by The Retail Food Industry Center at the University of Minnesota in 1999. The telephone survey collected information from the primary food shopper in 900 representative households in the United States. The question analyzed asked the respondent to rate the importance of 33 factors on a 1-10 scale in choosing a store. The characteristic rated most highly by all shoppers was cleanliness and sanitation, followed by the quality of fresh fruits and vegetables and the quality of fresh meats (Katsaras, Wolfson, Kinsey and Senauer, 2001).

The six groups identified by cluster analysis were referred to as:

- i.) Discriminating Leisure Shoppers (22% of the sample): They placed a high value on the shopping experience and wanted an atmosphere that invited browsing and to run into friends.
- ii.) Time Pressed Meat Eaters (20%): They cared little about the shopping experience and the only factor they rated above the overall average for the sample was the quality of fresh meat.
- iii.) Back to Nature Shoppers (20%): They wanted a good selection of natural and organic foods and environmentally friendly products.
- iv.) Middle of the Road Shoppers (16%): They desired a comfortable, friendly shopping environment and services like bagging.
- v.) One Stop Socialites (15%): They sought a selection of alcoholic beverages and ethnic foods and saw shopping as a social experience.
- vi.) No Nonsense Shoppers (7%): They wanted convenience and to spend as little time as possible shopping.

An unexpected result was that there was much less variation in the underlying characteristics of these six groups than might be expected in terms of age, the number of food shopping trips per month, the number of people they were shopping for, the percent of their meals prepared at home and the number of adults employed outside the home. There were some differences in household income, but less than might be expected. Time Pressed Meat Eaters, Back to Nature Shoppers and No Nonsense Shoppers had relatively higher incomes. The implication is that increasingly the typical socioeconomic factors used to explain consumer behavior may need to be augmented with attitudinal and perceptual data.

BIOTECHNOLOGY AND GM FOOD PRODUCTS

The single quality-differentiation factor currently receiving the most attention is genetic modification. The difference in the consumer perception of biotechnology and genetically modified (GM) food products between Europe and the United States is dramatic. In general, Americans are still much more accepting of biotechnology and GM products and Europeans much less trusting. There are few factors that will have a greater impact on agriculture and the food industry than this difference. The consumer attitudes presented here are based on surveys of 1,067 American consumers and 16,246 European consumers, collected in the period 1995-1998 (Hoban, 1998). The European data are from the European Commission (1997).

A high proportion of Europeans see genetic engineering as a serious food risk. In 1995, 65% of Swedish consumers felt genetic engineering posed a serious food risk, 57% of Germans, 48% of the Dutch, 39% of the British, 38% of the French, and 30% of the Italians, whereas only 21% of the Americans did (see Figure 3). The willingness to buy produce developed through

biotechnology to resist insect damage was 73% in the United States in 1995, 63% in the United Kingdom, 60% in France, 53% in Italy, and only 30% in Germany and 22% in Austria (see Figure 4). Fifty-seven percent of Americans feel that biotechnology and genetic engineering will have a beneficial impact, but only 28% of Austrians and 36% of Germans do. However, 57% of Italians do and 56% of Spaniards do, which is as high as the Americans (see Figure 5).

Some of the mistrust of biotechnology and genetic engineering may be based on a quite shocking level of ignorance. When asked to indicate whether it is true or false that “ordinary tomatoes do not contain genes while genetically modified ones do”, 10% of the consumers surveyed in the USA agreed with this statement, 22% in the United Kingdom, 21% in Italy, 29% in France and an astounding 44% in Germany and Austria (see Figure 6). When asked to indicate whether the statement “by eating a genetically-modified fruit, a person’s genes could also be changed”, 9% of Americans indicated it was true, 15% of the British, 18% of the Italians, 23% of the French, and an amazing 30% of the Germans and 39% of the Austrians (see Figure 7).

AN ANALYSIS OF ATTITUDES TOWARDS GM FOODS

In the model developed by Kelvin Lancaster (1966a and 1966b), consumers derive utility (U) from the attributes or characteristics (C’s) which are embodied in the goods they purchase. Preferences relate to these attributes or characteristics.

$$(2) \quad U = f(C_1, \dots, C_n)$$

There is a “technology of consumption” which reflects the relationship between goods (X’s) and attributes.

$$(3) \quad C_{ij} = a_{ij} X_j$$

where C_{ij} is the amount of the i th characteristic obtained by consuming the j th good, a_{ij} is the amount of the i th characteristic or attribute in a unit of the j th good, and X_j is the amount of the j th good consumed.

Lancaster thought of this relation between goods and attributes (the a_{ij} 's) as being objective. However, what actually affects consumer choice is their subjective perception of the technology. This model can be utilized to analyze the underlying explanations for the sharply different attitudes toward biotechnology and GM foods in Europe and the USA.

In the next figures (see Figure 8a), the vertical axis reflects benefits and the horizontal axis risks, such as possible negative health and environmental impacts. Risk is a “bad” producing disutility, not a “good” attribute. Its measurement is reversed with more to the left and less to the right; less risk can thus be treated as a “good”. The indifference curves in Figure 8a are meant to reflect the typical American consumer’s preferences between benefits and less risk. The direction of the vector OA reflects the relative amounts of benefits and risks that are perceived to be embodied in the food product being considered. The length of the vector OA is determined by the budget allocated for the purchase of the product considered and its price, and hence the amount of benefits and risks yielded by the product if purchased.

At this point, most American consumers do not see much difference between GM food products, in terms of providing more benefits or having greater risks, and traditional (non-GM) foods. Therefore, the GM and non-GM vectors are the same in Figure 8a. The consumer will buy whichever is less expensive or will not care if they are identified by label as GM or non-GM. For example, only a minority of consumers are willing to pay the premium for milk

certified to come from cows not treated with rBGH (recombinant bovine growth hormone), when it is available. Those consumers who do purchase the certified milk can be presumed to do so because they perceive it to have fewer risks, and thus it yields more utility for them. In this case, the non-GM vector would be longer and reach a higher indifference curve than the GM product. Most Americans are content to purchase unlabeled milk, which may come from cows treated with rBGH.

Proponents of biotechnology argue, that if not now, there will be distinct health benefits from GM foods in the future. In that event, Figure 8b would reflect the general perception of a GM food product yielding more benefits in relation to any risks, for the amount that can be purchased with a given allocation. As drawn, the figure shows a case in which the GM product has the same risk level as the non-GM food, but is perceived to have additional benefits. Consumers would get more utility from the GM food and would be willing to pay a premium for it.

Figure 9 reflects the situation of European consumers who perceive that GM products have no additional benefits, but are riskier for their health and/or the environment. Therefore, the GM product as shown by the vector OB, yields less utility than the non-GM food (OA) and is avoided. In Europe foods containing GM ingredients are starting to be labeled. There are opponents of biotechnology that would like to convince American consumers generally that this European perception of the riskiness of GM foods is correct.

Figures 10a and 10b reflect a situation in which the perception of the technology is similar in the USA and Europe. However, the underlying preferences may be different. Europeans are depicted as having a greater preference for naturalness and tradition as food

attributes. One of the complaints against genetic modification is that it is seen as “tampering with Mother Nature”. As modern work and life have become increasingly technological, for some people the naturalness of food may have become more important. Moreover, Europe has a rich heritage of food traditions. Speciality foods have a provenance (origin) and are produced according to long-standing traditions, which are closely regulated.

In Figure 10a, the typical American consumer gains greater utility from purchasing the GM product. In contrast in Figure 10b, the typical European consumer, even though his/her perception of the technology is similar (OAB is the same in both graphs), obtains more utility from the non-GM product because of their greater preference for naturalness and tradition. There are also a growing number of Americans who may share the European preference for naturalness as an attribute, which is one reason for the growing demand for organic products.

Moreover, European consumers may be more risk adverse because of recent major food safety incidents. Mad cow disease (BSE) has had a major impact in Europe. In addition, there are a number of other recent food safety incidents, such as poultry that was found to contain dioxin because of contaminated feed in Belgium. Europeans may also have less belief that government action will protect them from food safety risk. The British government downplayed the risk of mad cow disease to humans for a long time. There has not been a pan-European equivalent to the U.S. Food and Drug Administration (FDA) in the past to provide effective food safety regulation. If Figures 10a and 10b were cast in terms of benefits and risks as the previous figures were, the indifference curves could be left unchanged to reflect Europeans’ greater risk averseness. The end result would be the same, Americans would purchase the GM product and the Europeans the non-GM, because of an underlying difference in risk aversion.

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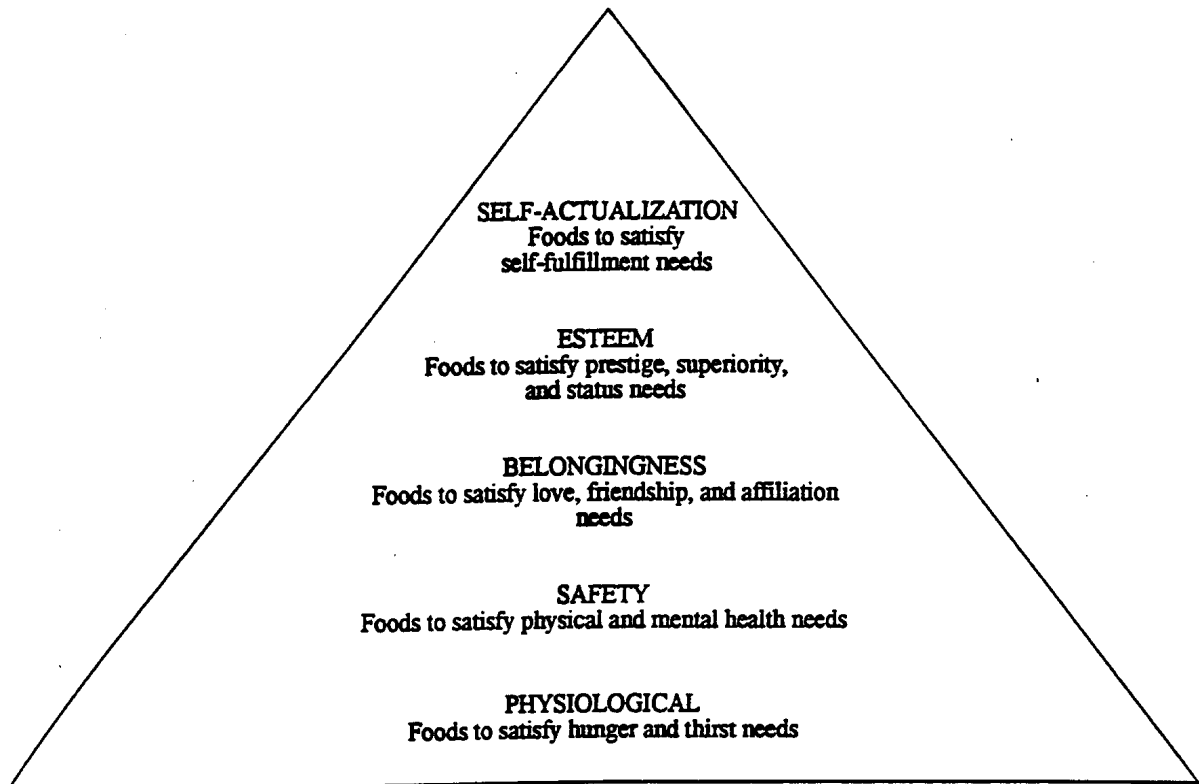
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Table 1. Stylized Income Elasticities of Demand*

Calories	Close to zero; negative for many people
Fat & Cholesterol	Low; strongly negative for many people (low fat: 42%)
Nutritional/Health Value	Positive; high for many people (69%)
Convenience	High generally; very high for some people (55%)
Diversity & Variety	High
Food Safety	High
Greenness & Sustainability	High, especially for some people
Natural	High for some people
Taste	Very high for virtually everyone (97%)
Experience	High, especially for some people
Status & Prestige	High, especially for some people
Value (quality/price)	Desired even at higher incomes (cost/price: 74%)

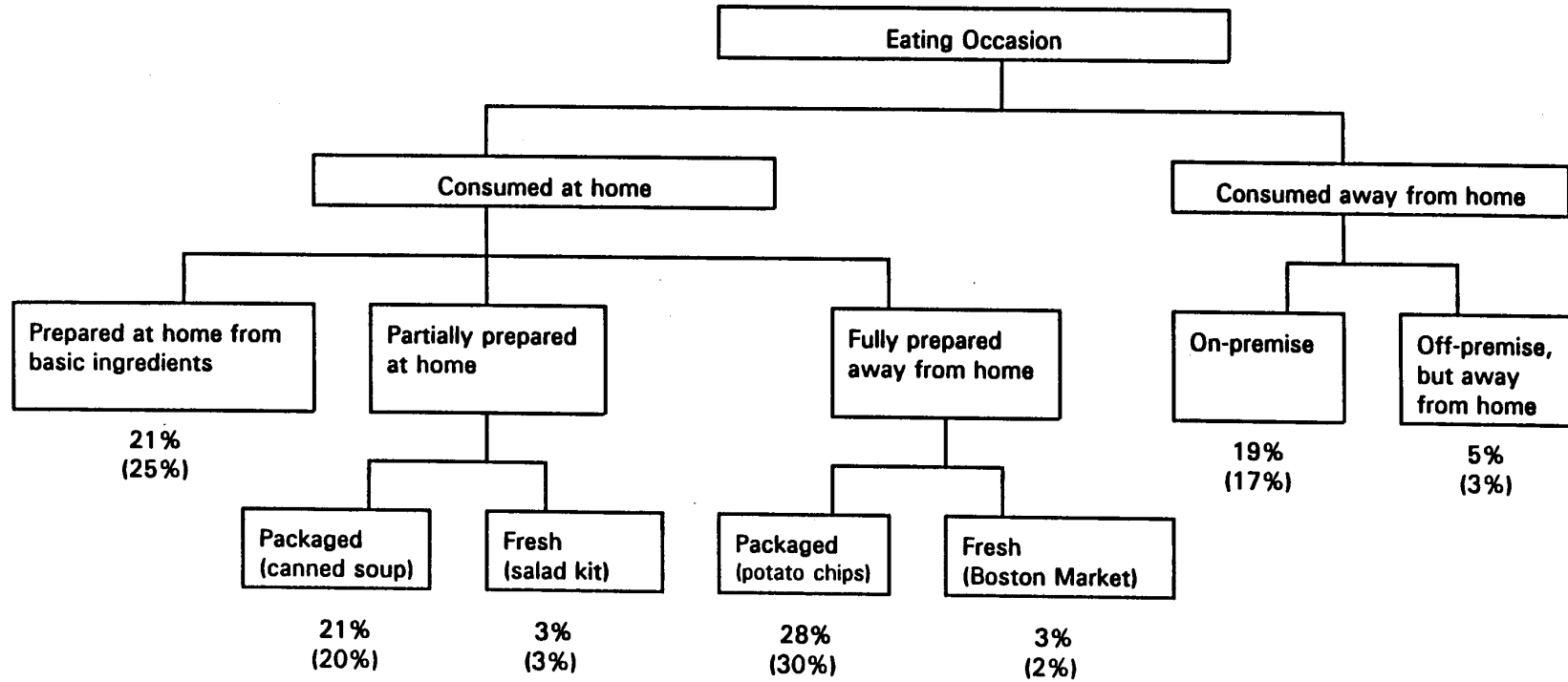
* Percent of respondents in the 1999 Parade Magazine survey, indicating the factor was either extremely or very important in their food choices (Parade, 1999, p. 6).

Figure 1. Maslow's Hierarchy of Needs and Food as a Source of Satisfaction



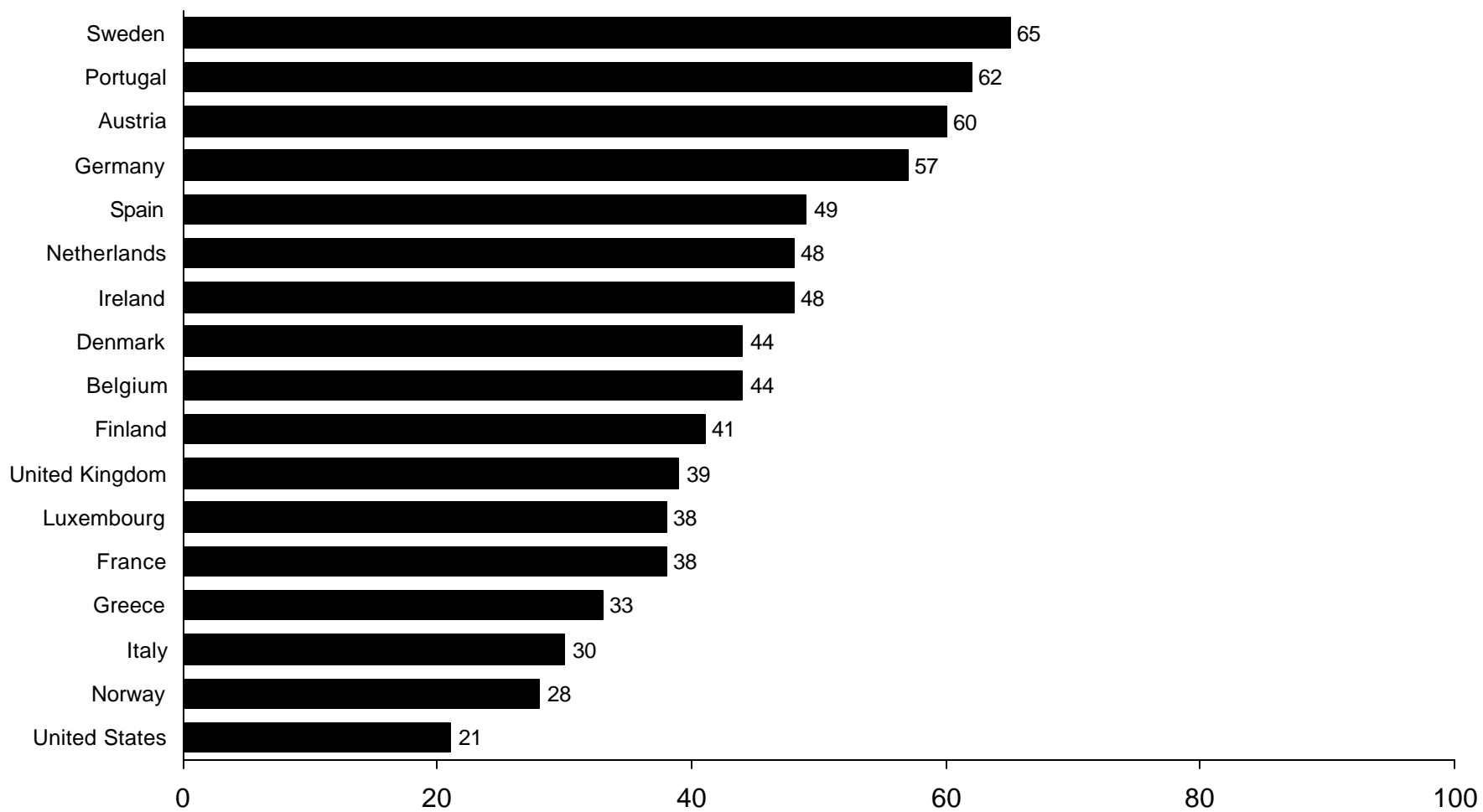
Source: Belonax, 1997.

Figure 2. Breakdown of Eating Occasions



Source: McKinsey, 1996.

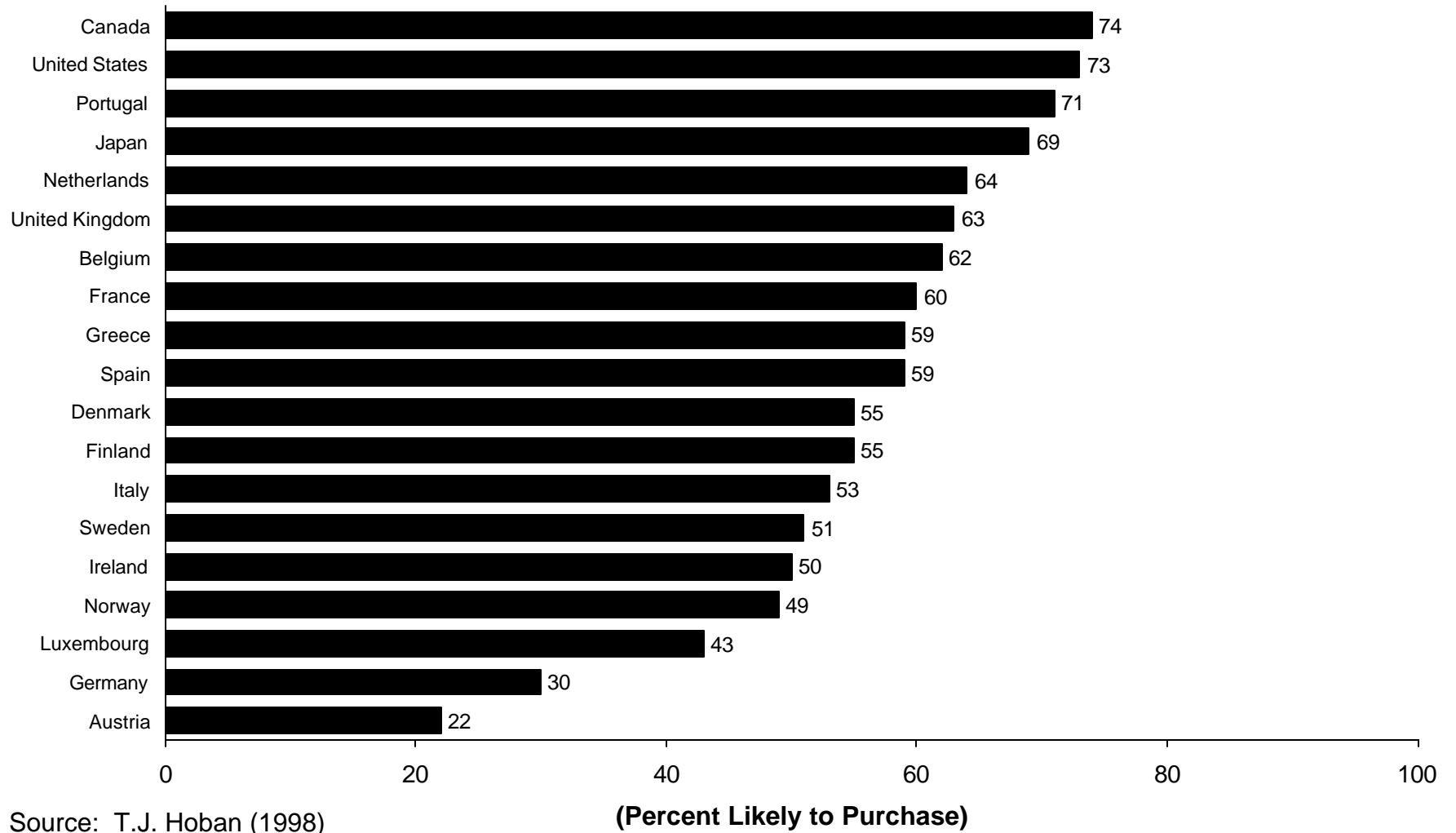
Figure 3: Perception of Genetic Engineering as a Serious Food Risk (1995)



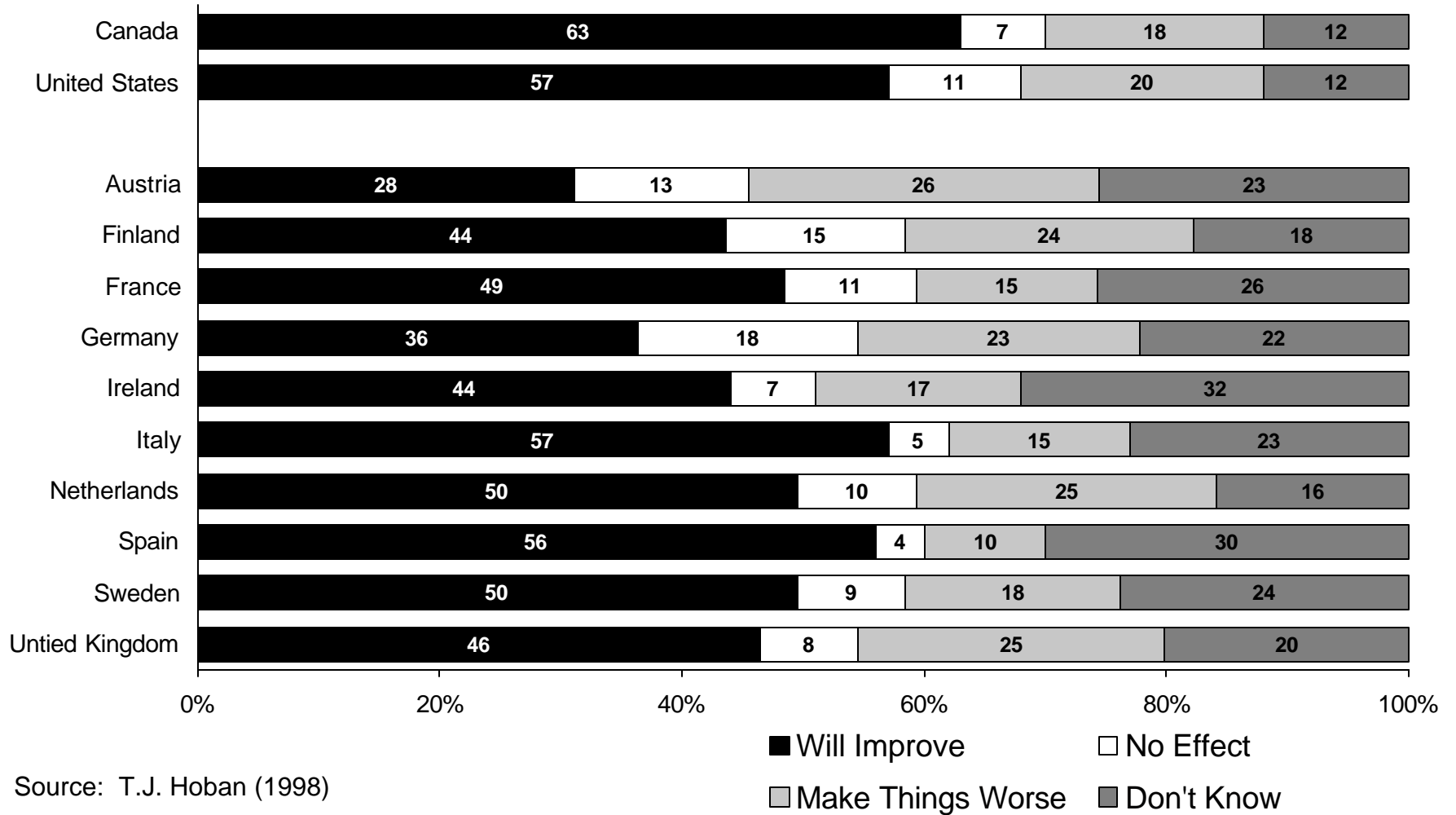
Source: T.J. Hoban (1998)

(Percent Rating as a "Serious" Risk)

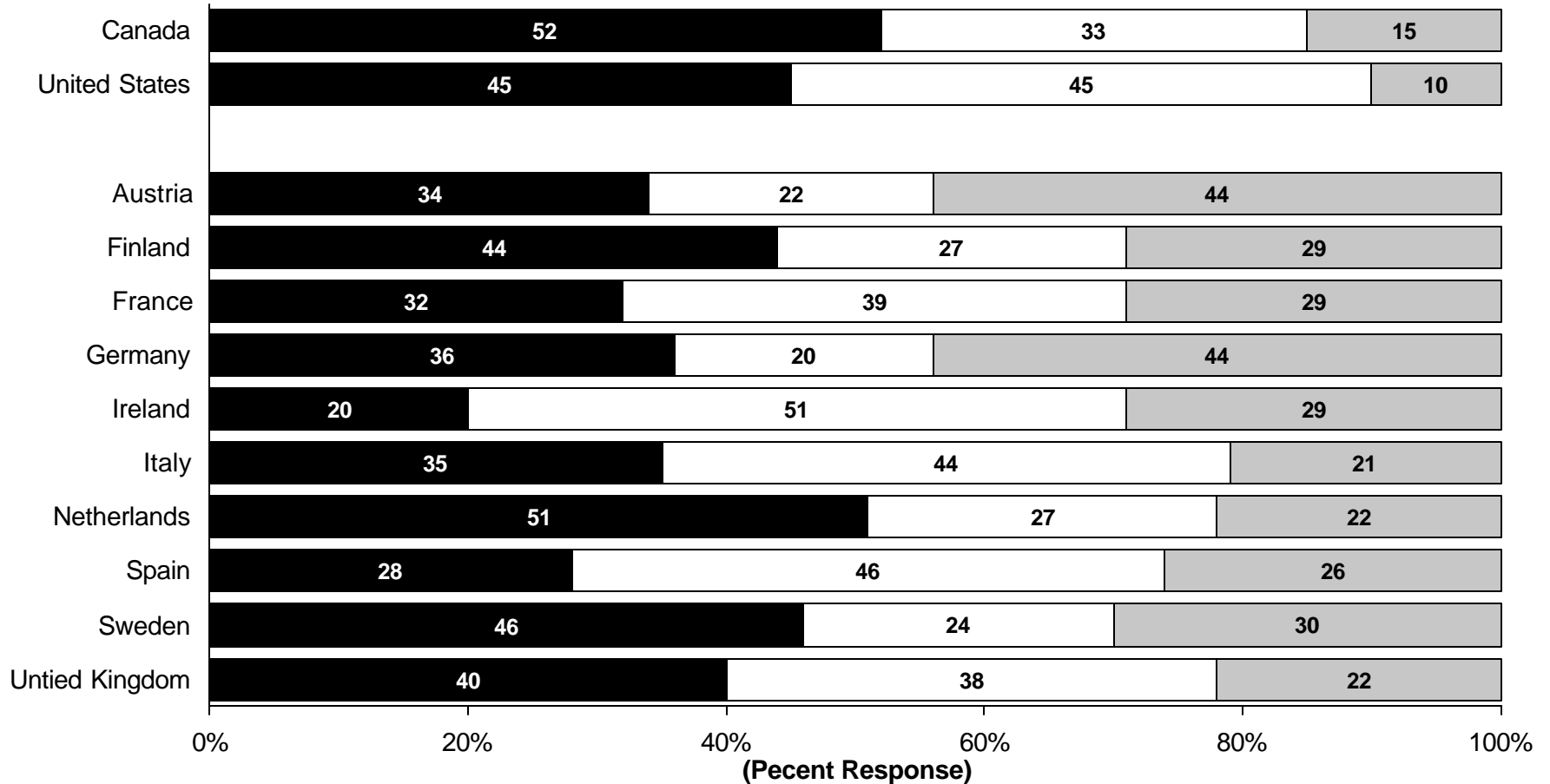
Figure 4: Willingness to Buy Produce Developed through Biotechnology to Resist Insect Damage (1995)



**Figure 5: Perceived Impacts of Biotechnology or Genetic Engineering -- Split Sample
(Only includes Selected European Countries)**



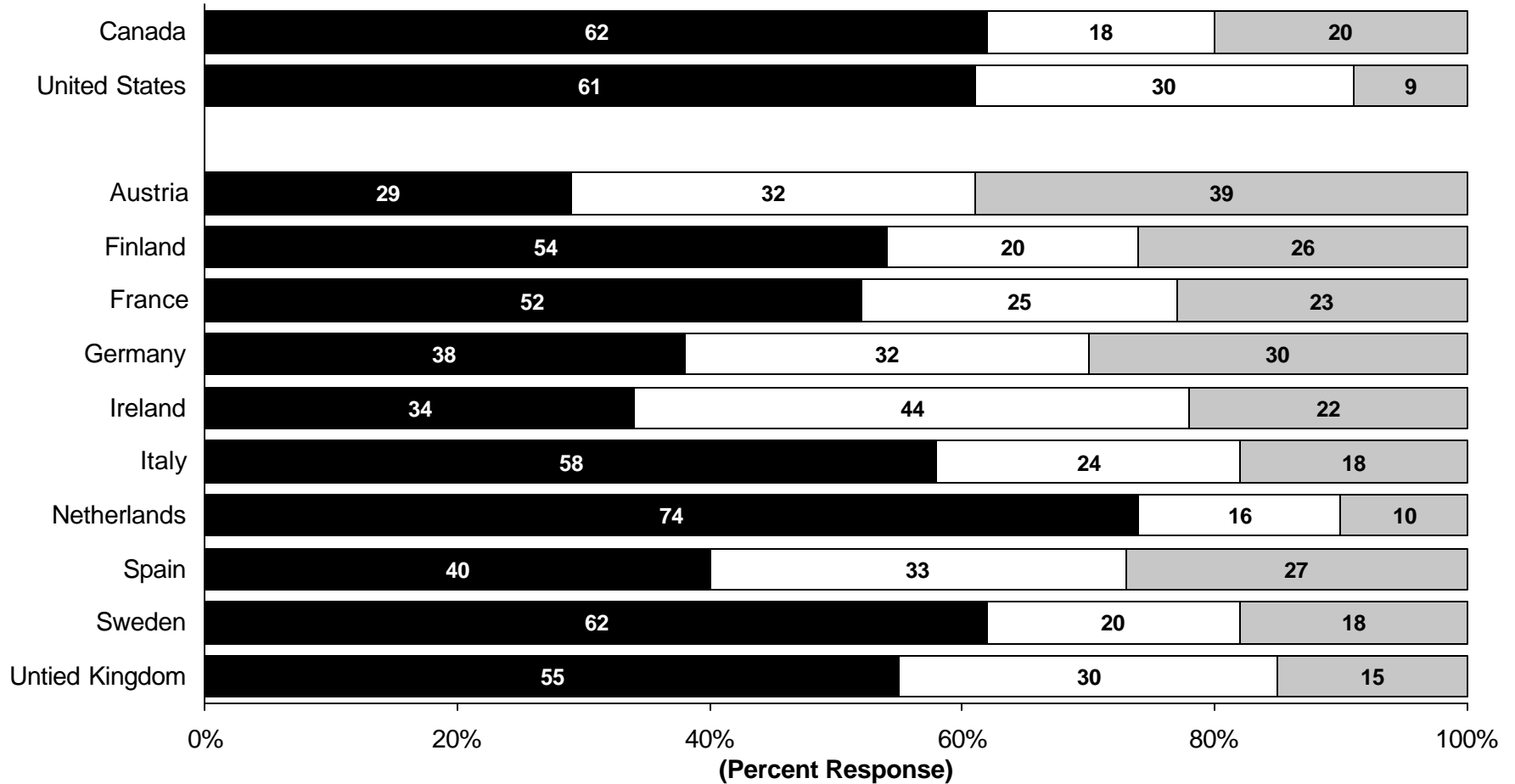
**Figure 6: "Ordinary tomatoes do not contain genes while genetically modified ones do."
(Only Includes Selected European Countries)**



Source: T.J. Hoban (1998)

■ False (Correct) □ Don't Know ▒ True

**Figure 7: "By eating a genetically-modified fruit, a person's genes could also be changed."
(Only Includes Selected European Countries)**



Source: T.J. Hoban (1998)

■ False (Correct) □ Don't Know ■ True

Figure 8. Benefit/Risk Perception - U.S.: GM & Non-GM

Figure 8a. No Difference

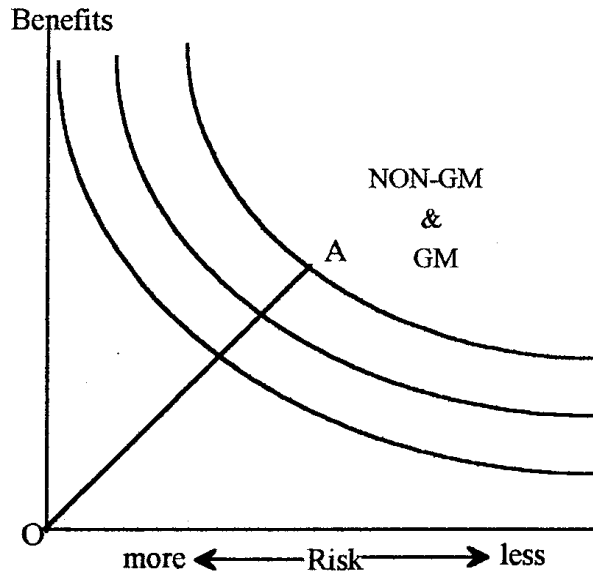


Figure 8b. GM Better

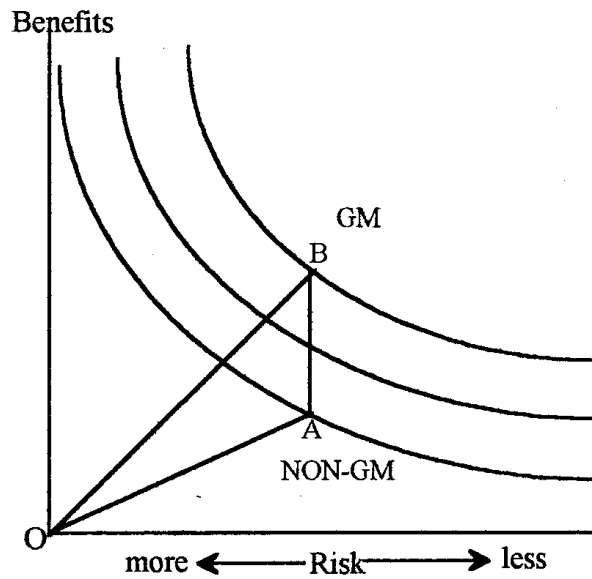


Figure 9. Benefit/Risk Perception - Europe: GM & Non-GM

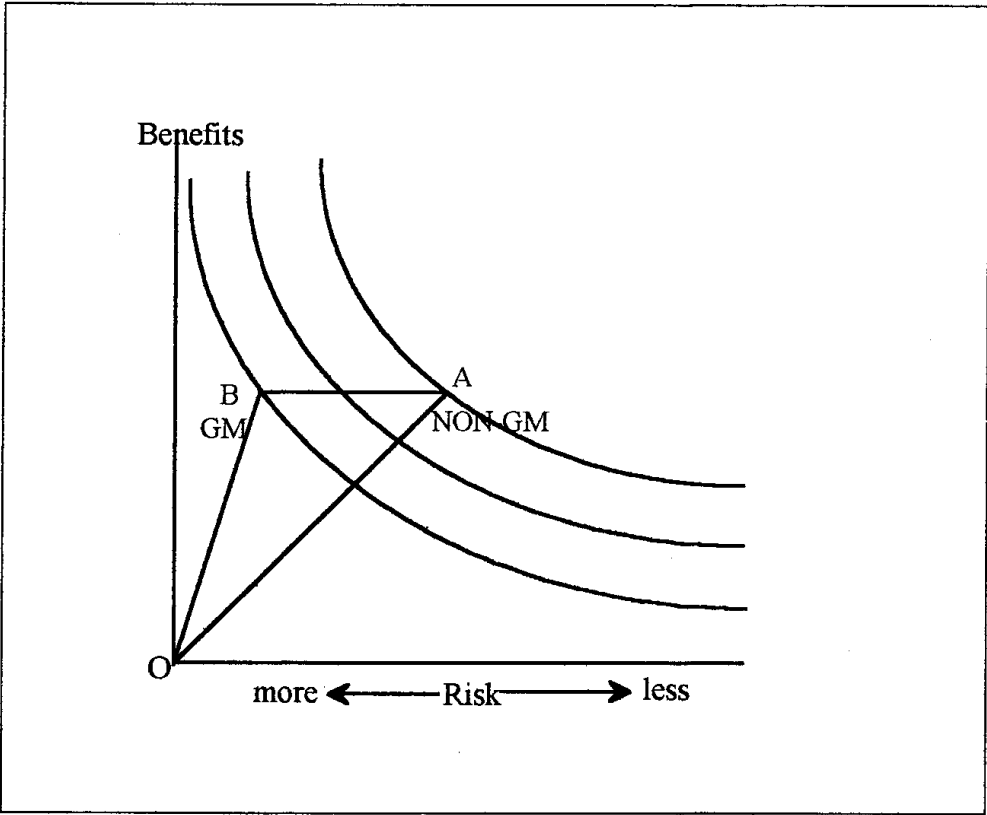


Figure 10. Preference Differences: USA & Europe

Figure 10a. USA

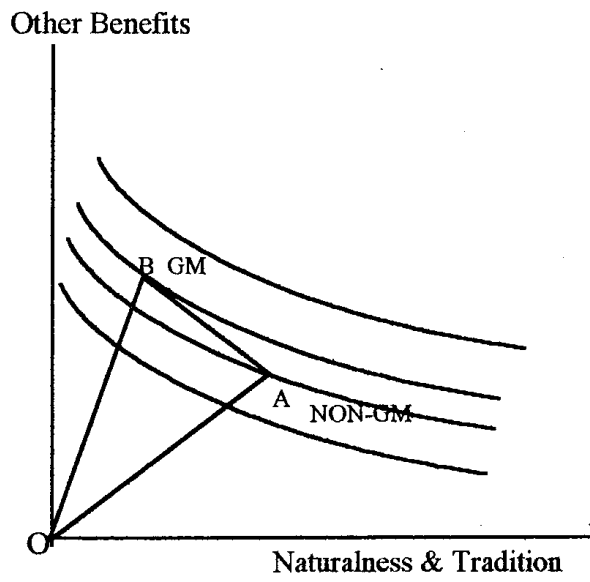


Figure 10b. Europe

