THE RED MEATS INDUSTRY: STRUCTURAL CHANGE OR ECONOMIC ADJUSTMENT?

by
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Events regarding the red meats industry have been prominent in the past several years. Concerns about a shift in consumer preferences away from red meats have caused industry comment in Canada (Western Producer) and recently prompted the National Cattlemans Association in the United States to fund an extensive and costly beef promotion campaign. In effect, it is commonly believed that an increased consumer nutritional awareness that associates red meat (particularly beef) with undesirable health consequences underlies the downward trend in per capita consumption levels of beef and increased levels of poultry and fish consumption. Whether these health concerns are real or exaggerated, suggested responses by some observers in the beef industry all appear to require costly adjustment on the part of beef producers, processors and retailers at a time when many can ill-afford to do so.

The effects of these general industry trends are exasperated when considered in the context of their impacts on regional economies, particularly in a post-free trade era which may require regional economic adjustments. Meat slaughtering and processing is a labour-intensive industry with relatively attractive wage rates and large multiplier effects. It is, therefore, not surprising that policy makers and community members react strongly to plant closures and relocation, especially if it is perceived that subsidies in some other location are the cause of the loss of an important "value-added" industry.

This paper describes the empirical evidence relating to the structural change issue. This is critical because before the Canadian industry reacts with costly adjustments to production and marketing systems it is important to examine the nature and extent of the evidence. Thus far, only data drawn from the United States have figured prominently in the debate and recent findings suggest that there is no evidence of changes in consumer preferences.

The Demand For Meat

Considerable attention has focused on circumstances in the U.S. meat industry during the past 15 years. The U.S. cattle herd peaked at 132 million head in 1975, with a subsequent liquidation to current levels of about 100 million head. Per capita consumption of beef fell from over 94 pounds (41.7 Kg) in 1976 to 73 pounds (33.2 Kg) in 1988, while poultry consumption rose dramatically from under 40 pounds (18.2 Kg) to about 60 pounds (27.3 Kg) per capita. Poor returns in the cattle industry over this period caused many U.S. cattle producers and feeders to leave the industry. In response, the National

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Cattlemans Association invested heavily in a beef promotion campaign and a concerted effort has been made to develop export markets, particularly in the Pacific Rim. The U.S. Meat Export Federation and American beef packing companies have located offices in Japan, and numerous trade missions have been conducted to other countries in the Pacific Rim. A protracted effort to encourage a more open Japanese market successfully caused the replacement of Japanese quotas with a system of declining tariffs to 1992.

Much of the decline in U.S. beef consumption levels has been attributed to a growing health awareness among U.S. consumers, where beef is increasingly viewed as a major contributor to dietary fat and cholesterol. Attention has also focused on the potential consequences of using growth-enhancing steroids and antibiotics in animal production. Consumer surveys list the use of animal drugs and hormones as an important concern, although environmental and microbiological contaminants are also considered serious. Some confusion is also evident as many consumers think that productivity-increasing management practices, such as the use of growth steroids, leads to higher food costs. However, regardless of the accuracy of consumer perceptions, surveys reported in the public press indicate general concerns about health and nutrition of meat consumption.

Causes of Consumption Shifts

Economists generally postulate cause-effect relationships in their analysis. A change in consumer behavior as a result of greater consumer awareness about health and nutrition is consistent with changes in the per capita consumption levels of meat products. That is, it is possible that these consumer perceptions could be the cause of changes in meat consumption patterns over the past 15 years. However, other events that are less visible to the public eye are equally consistent with observed changes in consumption patterns and must be regarded as potential causes also. A list of these market-related events include (Dahlgran, 1989; Chalfant and Alston):

1. changes in the relative prices of meats;

2. changes in the household technology and costs transforming meat into final consumer products;

3. demographic changes; and

4. differences in the adoption of product packaging and merchandising techniques for the various meats.

The cause defines the necessary action. A prudent approach would be to first discover the cause (or causes) of observed demand shifts and then define the appropriate private and public policy. If consumer tastes have changed then an advertising and promotion campaign would be appropriate. However, if the shifts in consumption were caused by declines in the price of chicken, relative to beef then investment in productivity-increasing research might yield a higher

payoff. Table 1 illustrates various causes and implied policy responses.

The trade-offs are not trivial. For example, in the U.S. the national beef promotion campaign was first aired on January 12, 1987, ran for 28 weeks at a cost of over $30 million, and has continued afterward. Thus far, beef consumption has not rebounded, although it is difficult to predict if consumption might have fallen even more in the absence of advertising or if the advertising effect is of a lagged nature and will eventually respond. However, large payoffs from beef promotion and advertising in the United States have not been demonstrated.

A growing body of research suggests that changes in consumer preferences do not appear to be the major cause of observed shifts in meat consumption. In the early 1980's economists tended to believe that, due to underlying changes in consumer attitudes, demand had shifted away from beef in favor of chicken (eg., Frank; Chavas). However, as subsequent data were collected in the believed "post-change" period and attention focused on the effect of changes in relative prices a different picture began to emerge. Moschini and Meilke, Dahlgran, and Chalfant and Alston have all since concluded that the evidence of structural shift is weak at best and that changes in the relative prices of beef, pork and chicken are an important determining factor in the observed consumption shifts. In other words, it appears that the large gains in the productivity of chicken production have caused the price of chicken to fall, relative to beef, and consumers have responded by consuming more chicken and less beef.

This does not imply that the widespread concerns of shifting preferences are wrong, but places events in their proper perspective as a secondary cause of meat consumption changes. The payoff of a long history of productivity gains from poultry production research is a strengthened market share due to lower relative prices. It should be emphasized that the gains in poultry production must be considered in a broad light. The poultry industry has responded to consumer preferences with a suitable product form and packaging system, especially with regard to providing for consumer demand for white meat and the development of an impressive array of specialty side cuts and products. Meat scientists are currently focusing considerable efforts at emulating this process for beef.

Much has been written and stated in the public press about the need to reduce the fat content of beef. Excess fat leads to waste and consumers may prefer a leaner product. In the most complete study to date Branson et. al. reported that American consumer perceptions of beef palatability are positively associated with levels of marbling, confirming accepted opinion about beef quality but in contrast to several recent small-scale studies. This study used (1) expert laboratory panels, (2) consumer laboratory panels, (3) household panels, in four large U.S. centers; and (4) actual purchasing consumers to reach conclusions. Furthermore, in general, the ordinal ranking of U.S. grades tended to correspond to consumer preferences.

Given these findings then why is it that the U.S. grading system has come under such severe criticism in the past several years and several important U.S. food chains have developed internal beef classification systems to describe quality? Two answers to this question are relevant. First, while U.S. grades may reflect the general quality perceptions of U.S. consumers the rankings and/or borders between classifications may not be well-defined. The classification system may define more detail and accuracy than consumers can perceive. The results reported in Branson et. al. suggest this may be the case. Although they found evidence of a general hierarchical relationship there was also evidence of overlap between grades. Second, even with stable overall preferences specific segments in the demand may develop for certain product characteristics. The average profile of consumers may remain constant but specific polarized segments will demand different product forms. Thus, beef could evolve into a range of special products and lose its general commodity orientation. This may be occurring in the United States. Branson et. al. report the existence of a significant segment in the U.S. beef market (10-25 percent of consumers) who are willing to accept "Good" grade beef (Good Yield Grade 2) which contains slight marbling when priced at the same level as "Choice" grade beef (Choice Yield Grade 2) which is more heavily marbled. This suggests the existence of a specific market segment which would choose the option of a low-calorie diet version of beef, even when priced at the same level as the standard product.

Grading

Mandatory national grading systems tend to cause conformity in agricultural products such as meat. In defining grade standards, products are segregated into distinct groupings that display high degrees of uniformity. Many product grading systems also contain an ordinal ranking of actual or implied quality and yield so that those products which achieve the highest grade are perceived to be of highest quality and/or value. Incentives are created for retail stores to deal exclusively with the highest ranked grades and lower grades generally trade for substantial discounts. This creates incentives for producers to adjust management practices to achieve higher grades, which may or may not be an efficient economic decision depending on how well the goods reflect actual quality or value.

Changes in Canadian pork and beef grading systems in the 1970's were designed to adjust grade standards to actual economic value. Over time, producers respond to grade changes and the percentage of marketings achieving high grades tends to rise. Considine et. al. have demonstrated the Canadian response to the 1972 beef grade change, where the proportion of A1 marketings increased each year and the proportion of A2, A3 and A4 grades fell. Thus, changes in the grading system communicate signals to producers who respond with changes in production and management practices. According to Considine et. al., the 1972 change imposed transition costs on producers, which reduced net revenues for 5-7 years afterward. These adjustment or transition costs should not be ignored and the payoff from any grade change must compensate producers for these costs in order to benefit them.

The primary economic purpose of a grading system is to reduce the information costs of consumers in two ways: (1) the cost of assessing product characteristics and (2) the cost of assessing quantities of characteristics (Considine et. al.). A certain minimum standard is defined thereby ensuring consumer confidence and an ordinal scale provides a low-cost method to determine quality. However, changes in consumer preferences toward grades ranked lower in the hierarchical ordering or the emergence of a distinct market segment for certain characteristics can cause difficulties and a lack of confidence in the grading system. One solution is to avoid building inflexibility into grading systems by making them descriptive of product characteristics without implying quality. Prices of grade categories would be free to adjust in response to consumer preferences without requiring the long process of changing grade standards and the hierarchical ordering of rankings. Grades would not need to change in response to consumer preference shifts, thereby avoiding the transition costs imposed on livestock producers caused by a new grading system.

The Case of Pork

Thus far, the discussion has not centered on pork, but has emphasized the beef-chicken tradeoff. In fact, a common thread throughout much of the recent U.S. empirical data is that the demand for pork has changed, but in a quite specific way. Chavas, Moschini and Meilke, and Thurman all show that prices of pork and chicken have become more independent, suggesting that consumer substitutability between the two meats has declined. In other words, U.S. consumers respond much less in terms of chicken consumption to changes in the price of pork.

Before turning to a discussion of Canadian evidence one point must be emphasized. All the available studies focus on changes that occurred during the 1970's, a period of considerable general macroeconomic disturbance and specific agricultural sector adjustment. In fact, Thurman pinpoints 1973 as the year in which the change in the relationship between chicken and pork began. Using an innovative approach, Dahlgran, (1987) demonstrates that macroeconomic conditions at that time caused substantial reactions in all demand relationships (own-price, cross-product, and income). Studies based upon data between 1950\60 and 1980\82, as all the studies have been, are likely to suggest adjustments and shifts in the preferences of consumers. However, these adjustments appear to be temporary and the demand structure reverts by 1985 to a pattern almost identical to the pre-1970 period. (Dahlgran, 1987) Thus, it appears that the demand for meats is remarkedly stable, even when subject to considerable external shock.

The Canadian Experience

A major gap exists in the literature. No published study replicates those conducted in the U.S. using Canadian data. This replication would be a very worthwhile exercise because Canadian price levels for meats have been quite different due to the existence of supply management programs in poultry. If Canadian consumers respond differently than their American counterparts or are subjected to different relative prices then it might be unwise to emulate U.S. agricultural producer and government policies. But, if changes in Canadian relative meat prices mirror those in the U.S. or markets become more integrated as a result of the Free Trade Agreement then Canadians could learn much from analyzing events in the U.S. In the absence of available direct evidence the discussion below is limited to a description of price and consumption trends. Figure 1 plots per capita consumption data since 1960. The per capita consumption of beef has been quite constant since 1965 at about 38 to 40 Kg., with the major exception being the 1972-78 period where it rose to a peak of over 51 Kg. In contrast, the per capita consumption of chicken has trended sharply upward from a 1963 level of 9 Kg. After flattening out at about 17 Kg. between 1980 and 1982, per capita chicken consumption rose through the remainder of the decade. Pork consumption has been more volatile, fluctuating considerably and reaching two peaks, in 1971 and 1980, with a major trough in 1975 (coinciding with the large cattle liquidation). Overall, there appears to be a slight upward trend in per capita consumption of pork.

In Figure 2, price indices for beef, pork and chicken are graphed (1981=100). The CPI for beef is quite flat through 1965, climbs slowly through to 1977, then rises sharply over the remaining years. In contrast, the CPI for chicken declines rather continuously before flattening out in the mid-1960's, then increases in concert with the other meat prices. The pork CPI is only available from 1971 and for the remaining period it rises above the other meats. Notice the prominent and regular price cycles in the pork market.

Because beef and chicken are close substitutes for meat consumers it is instructive to look at beef price to chicken price and beef consumption to chicken consumption ratios. The price ratio illustrates the movement in beef prices relative to chicken prices over time.[1] The consumption ratio shows the relative consumption levels of beef and chicken. Figure 3 contains two panels: (a) U.S. ratios and (b) Canadian ratios. The U.S. graph is taken from Dahlgran (1989). Because of differences in underlying assumptions in the data, direct comparisons of levels between the two countries should not be made. However, it is valid to compare changes in the ratios over time between Canada and the U.S.

First, note that patterns in consumption ratios are quite similar. In both countries the ratio of beef to chicken consumption rises to a peak in the mid-1970's, declines rapidly to 1980, flattens out for 3 to 4 years then declines steadily through to 1988. Second, the price ratio patterns are also remarkedly similar, declining until 1977, peaking about 1980, then slowly declining through

to 1988. Thus, although supply management policies in Canada may affect the absolute differences between the price of beef and chicken, their relative movements over time track the U.S. experience quite closely. This suggests that the chicken marketing board policies in Canada may reflect economic conditions and respond to market adjustment more than some critics think. As a result, per capita consumption levels display similar relative behavior as in the United States.

Note that the consumption shifts have occurred in Canada, despite the fact that Canadian beef tends to be considerably leaner than the U.S. counterpart. This presents a puzzle: if consumer health concerns are driving the consumption changes then why is it the case that Canadian trends closely mirror U.S. trends even though the Canadian product better fulfills the new diet-consciousness? Could it be that changes in relative prices have caused this result, as much of the empirical evidence drawn from the U.S. now suggests? If so then it has important implications for Canadian producers and policy makers.

Conclusions

This paper has provided a brief survey of issues underlying changes in meat consumption trends. Some recent research findings have been highlighted and the implications noted. Evidence appears to indicate that changes in relative prices may be a primary cause of changes in meat consumption over the past two decades. Importantly, the unexpected finding is that Canadian experience since 1970 has largely mirrored trends in the U.S.

Several important implications for Canadians appear in order. First, it would be very helpful if the structural change issue could be explicitly studied with Canadian data. The Commodity Markets Analysis Division of Agriculture Canada is widely acknowledged as an international leader in demand analysis. They should be encouraged to conduct this study. Second, concern about the future of the beef industry should be tempered with the realization that extra-ordinary macroeconomic events in the 1970's were the cause of the initial disruption and more normal market effects have since occurred. Third, a significant advancement in the productivity of chicken production and improved product and packaging design have encouraged large increases in the market share of poultry in the U.S. diet. Similar trends may be occurring in Canada. This type of research for pork and beef appears advisable. Fourth, changes in the grading system and a large investment in a general promotion/advertising campaign might not be cost effective. Revision of the grading system tends to cause extensive disruption and transition costs, and lower producer net earnings for periods up to 7 years could be a result. A general promotion campaign to convince consumers that beef consumption is consistent with good health, if they have reduced consumption due to relative price movements, is unlikely to be successful. A more advisable approach is that being pursued by the Red Meat Forum in Manitoba, where attention is focused on an exhaustive study of the entire market for meat cuts. A "strategic market" plan where specific existing market segments, such as described by Branson et. al., are targeted is

likely to be of considerably more value to the Canadian meat industry than an unfocused attempt to encourage consumers to eat more beef.

ENDNOTES

1.

The data are in terms of price indices so the ratio reflects actual relative prices, but adjusted by a constant which is the ratio of base prices used to calculate the two indices

Mathematical this can be shown as follows. Define the beef CPI (I^b) as

$$I^b = P^b_t/P^b_{1981}$$

and the chicken CPI (I^c) as

$$I^c = P^c_t/P^c_{1981,}$$

Where P is the price, superscripts c and b refer to chicken and beef, and the subscripts refer to the year of the price.

The ratio of indices is

$$\frac{I^b}{I^c} = \frac{P^b_t/P^b_{1981}}{P^c_t/P^c_{1981,}}$$

Which, after manipulation yields

$$\frac{I_b}{I^c} = \alpha\, P^b_t/P^c_t,$$

Where α is a constant ($= P^c_{1981}/P^b_{1981}$)

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Table 1

Causes of Meat Demand Shifts and Possible Responses

Cause of Shift	Possible Responses
1. Shift in consumer preferences as a result of health concerns	- advertise and promote product - change grading system - research to discover healthier product forms. - eliminate technology from meat production (antibiotics, hormones)
2. Changes in relative prices as a result of differences in productivity advancement	- research in biological advances in production - more efficient marketing system
3. Advances in chicken packaging and physical marketing, especially in the context of modern family organization	- alter product packaging - alter product form - develop new and more convenient products
4. Demographic shifts and changes in ethnic structure of population	- market segment marketing to appeal to growing segments - targeted promotion of product to consumers not accustomed to beef and pork. - accept new market conditions

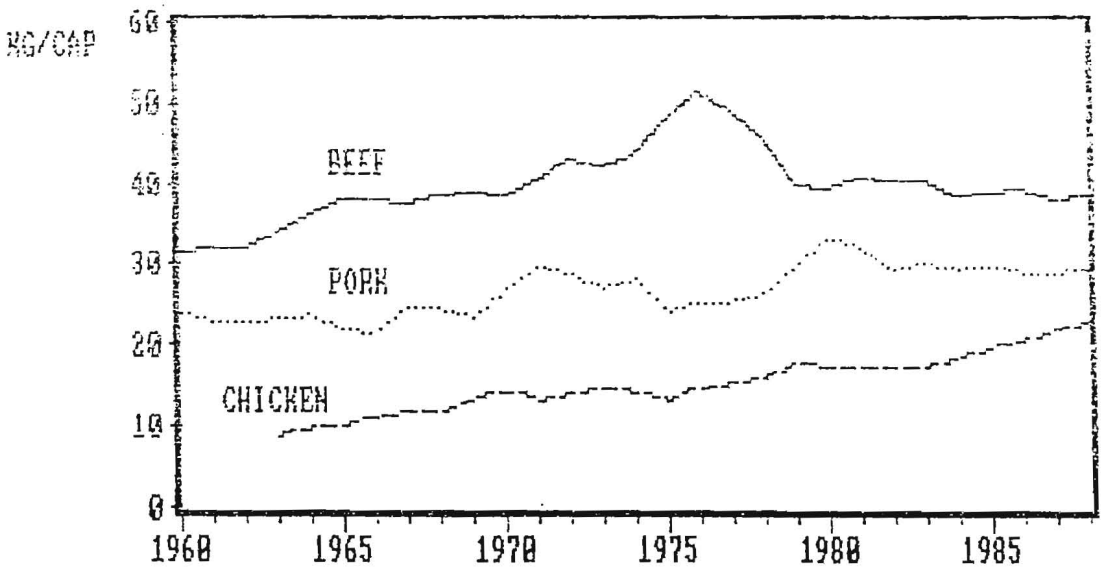


FIGURE 1: PER CAPITA CONSUMPTION OF BEEF, PORK & CHICKEN
—— BEEF ····· PORK --- CHICKEN

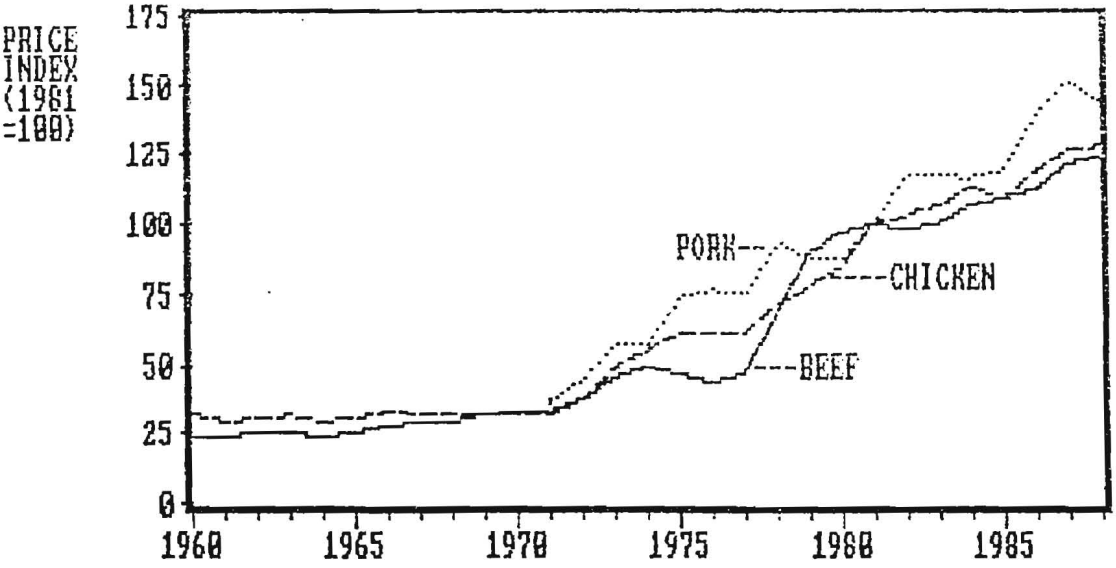
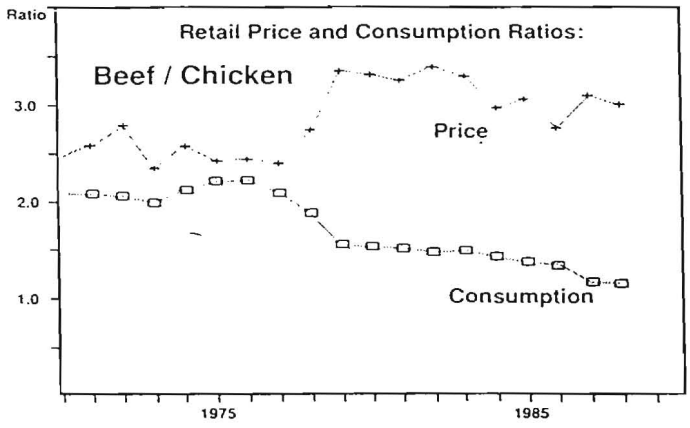


FIGURE 2: PRICE INCICES FOR BEEF, PORK, & CHICKEN
—— BEEF ····· PORK --- CHICKEN

A. United States



B. Canada

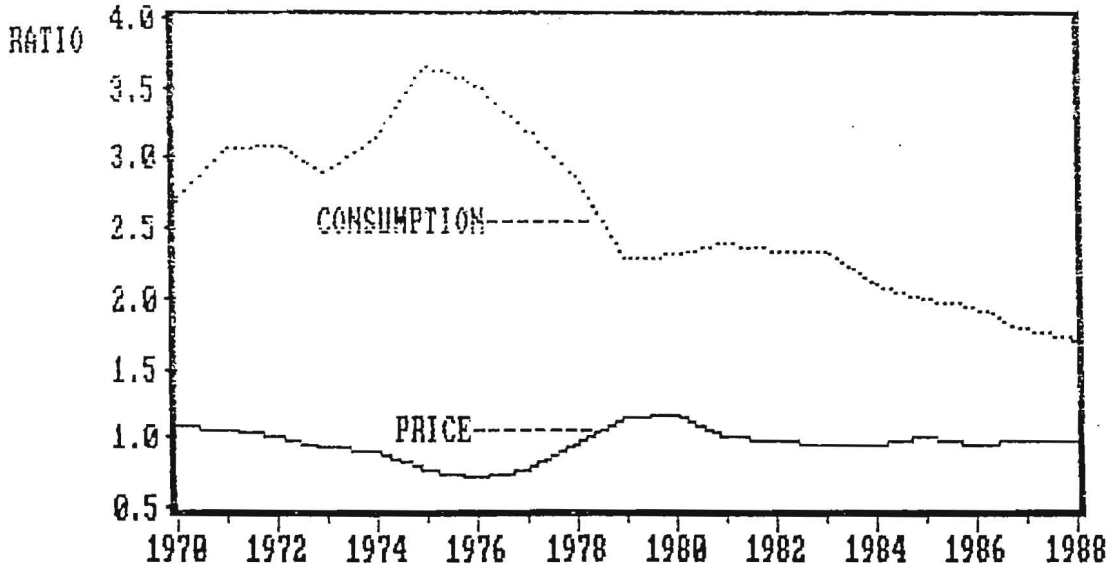


FIGURE 3: BEEF-CHICKEN PRICE AND CONSUMPTION RATIOS
—— PRICE ····· CONSUMPTION