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Sticky Prices: New Evidence from Retail Catalogs

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Sticky Prices: New Evidence from Retail Catalogs

Abstract

Despite the central importance of the debate in macroeconomics over whether prices are flexible, there is almost no evidence on the time series movements of actual transaction prices. This paper presents new results on the size, frequency, and synchronization of price changes for twelve selected retail goods over the past 35 years. Three basic facts about the data are uncovered: first, that nominal prices are typically fixed for more than one year and that the time between changes is very irregular; second, prices change more often during periods of high overall inflation; third, when prices do change, the sizes of the changes are widely dispersed. Both "large" and "small" changes occur for the same item and the sizes of these changes do not closely depend on overall inflation.

These findings are then used to critique standard models of price-setting. Simple versions of both target/threshold models and fixed timing models are strongly rejected. Modifications of the target/threshold models that introduce time-varying costs or benefits to price changes seem more promising. Similarly, models focussing on customer markets receive some support from these data.

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Introduction

Despite the central importance of the debate in macroeconomics over whether prices are flexible, there is very little direct evidence on how actual transaction prices evolve over time. For instance, in Gordon's [1990] recent survey of "New Keynesian Economics", he is only able to identify three other time series studies on price flexibility. This paper contributes to the small empirical literature on price rigidity by describing the evolution of twelve selected retail goods prices over the past 35 years.

One factor that has inhibited the empirical literature in this area is the lack of clear guidance from many of the competing theories of price rigidity about how testing should proceed. As Blinder [1991] points out, "what we mean when we say that a theory predicts that prices are 'sticky': Often nothing more than that prices adjust less rapidly the Walrasian market clearing prices." Given this amorphous benchmark, in many cases it is not obvious what one can do to "test" whether prices are or are not flexible. The goal of this paper is to document the characteristics of the prices that I have collected and then discuss how these characteristics cohere with the various competing theories of price rigidity.

The evidence can be summarized in terms of the size, frequency and synchronization of price changes. I find three basic facts about these data: first that nominal prices are typically fixed for more than one year and that the time between changes is very irregular; second, prices change more often during periods of high overall inflation; third, when prices do change, the sizes of the

changes are widely dispersed. Both "large" and "small" changes occur for the same item and the sizes of these changes do not closely depend on overall inflation. Below, I argue that these facts challenge many of the recent theories put forward to explain price rigidities and suggest certain directions in which to extend existing models.

The remainder of the paper is separated into 5 sections. In the next section, I explain why these data are particularly appropriate for testing many of the leading theories of price rigidity. In the following section, I describe the method of data collection and items in the study. The third section of the paper documents the facts mentioned above. The fourth section of the paper discusses how these facts bear on the leading theories of price setting. The final section summarizes my findings and suggests several promising directions for future research.

I The Relevance of Catalog Data

The data were collected from the mail-order catalogs of L.L. Bean, Inc., The Orvis Company, Inc., and Recreational Equipment, Inc. (REI). There are a number of reasons why the data are well-suited to testing certain theories of price rigidity. For instance on theoretical grounds, Sheshinski and Weiss, in their classic 1977 article on price setting, motivate their model by describing the pricing problem facing a mail-order retailer. Similarly, the data provide a natural benchmark to which models based on fixed timing between price changes can be compared. Since elements of these two types of models are the major components of much of the literature, a priori, one should expect the data to be informative.

In addition to being relevant to certain theoretical models, retail catalog data are valuable because they can be used to: 1) track items which have been available and unchanged for long periods of time; 2) examine both big and small ticket items; and 3) draw inference about retail goods in general. The goods analyzed below have a number of these desirable features. For instance, although they vary considerably in price and potential clientele, they all can be purchased in retail stores and for the most part are high volume items. Likewise there is a presumption that the behavior of these prices can be extrapolated beyond just the mail-order industry.¹ Rees [1961] has shown that for these types of unchanging items, broad movements in catalog prices closely track price movements in conventional retail stores.² And indeed the management of one of these companies regularly draws up a formal list of competitors which includes many non-mail-order firms and checks to see that their own prices are comparable to this reference group's prices.

The goods in this study were chosen for several reasons: first, I wanted items which are popular and representative of the goods that a firm sells; second, I wanted high-volume goods so that an incremental price increase would produce a non-trivial amount of revenue; third, I wanted only items that underwent minimal quality changes.³ By considering items that are representative of the firm's product line I can abstract from any pricing behavior that may occur when a firm is trying to break into a new market. By studying large revenue items, I insure that firms have incentives to carefully scrutinize the prices. Finally, by studying staple

items that have undergone very little quality change, I can focus on pure pricing behavior.⁴ Obviously, these considerations limit the number of goods that can be studied and the types of questions that can be analyzed.

Another potential drawback of the data is that by their very nature, prices advertised in catalogs might be suspected of being artificially rigid. Indeed, to be useful the prices appearing any given catalog must be applicable over some non-trivial time horizon. Of course, this does not mean that the same nominal price must be operative at all times; it would be straightforward to index the prices in the catalog. As a practical matter, however, index prices are rarely used, at least in the U.S. Thus a key issue is how much is lost by studying the flexibility of these prices, which necessarily have to be posted for non-trivial periods of time.

All three of the companies in this study fix their prices for six month intervals. One interesting question that I do not study is why the companies choose this particular interval over which to quote fixed nominal prices. Nevertheless, as a result of this choice, only two price changes per year that could be observed using these data. Recent evidence presented by Blinder [1991] suggests that a built-in rigidity of this form may not be as serious a problem as might first be expected. Blinder finds that 55% of the firms he surveyed change prices either once or not at all year during a typical year. So during "normal" periods the catalog prices are not obviously more rigid than other prices.

Furthermore, given that firms have the option of resetting the nominal price twice a year, there is presumably information implicit in the decision not to reset

the price. Since I find that for all the items in this study there are sometimes long spells, say longer than 4 years, of fixed nominal prices, I do not believe that the marketing considerations that seem to prevent very high frequency price revisions render these prices uninteresting--particularly for students of business cycles. Of course there are a number of other issues regarding seasonal pricing that are masked--see Barsky and Warner [1990] for recent work in this area.

In my view, a more serious concern about these data is that in these type of retail markets, prices are effectively the sole determinant of allocations.⁵ Most of the existing empirical work on prices focuses on intermediate goods transactions between buyers and sellers who have long-term relationships. Carlton [1986], in a careful study of such transactions, shows that these prices are quite sticky. As he points out, however, this need not imply any inefficiency because, in this situation, price is only one of the instruments which can be used to allocate goods. Blinder's [1991] survey results reinforce the view that this flexibility is important: survey participants often cite the ability to vary the non-price attributes of a good as a reason for price rigidity. Since most of the goods in my sample are quite popular, and have been carried by the companies for a long time, stock-outs are uncommon and delivery lags are not too variable. This line of argument suggests that prices may have to do more of the work in adjusting to clear these markets than in other situations. In this case, one might suspect that these prices might be more flexible than the prices involved in many other transactions.

On balance, it seems fair to conclude that although these prices are not

ideal for studying all issues concerning rigidity, they should be relatively informative for many important questions.

II Data Collection and Description

Given the general goals for choosing the types of items to be analyzed, there were several additional conventions that I adopted in the process of collecting the prices. The prices were assembled by directly copying prices from old catalogs. I collected the information from Bean and Orvis, while the REI data were processed by a member of their staff.

As mentioned above, although these companies issue many catalogs per year, the prices advertised in the Spring and Fall catalogs for each company effectively cover the next six months.⁶ One major convention is to use the last advertised price for an item if it does not appear in a particular catalog. This is sensible because all three companies will sell an item at its last advertised price if it does not appear in the current catalog. The majority of the items studied appear in both the Spring and Fall catalogs each year, so that this issue is somewhat academic.⁷ However, the Orvis fishing items are often advertised only in the Spring catalog. Accordingly, the duration between price changes for these items must be interpreted appropriately.

A second caveat is that the prices discussed below refer only to the list prices in the standard catalogs for one unit of an item. Hence, I ignore the very slight discounts for bulk purchases which have been offered occasionally by each of the companies. I also ignore sale prices which may have been available for very

short periods. Each of the companies from time to time offers discounts if an item is over-stocked or a particular model is being discontinued. Similarly, each of these firms operate retail outlets where the goods in the catalogs can be purchased in person at the catalog prices.⁸ Again, the retail outlets sometimes offer short-lived sales that are not available to catalog customers. For the items in this study, sales are very infrequent.

In using only stated catalog prices I am also ignoring any postage and handling charges. This can be justified for at least three reasons. First, all Bean prices include these charges and the Bean prices can be used to establish essentially all of the claims made below. Second, the Orvis and REI prices also apply for goods bought through their retail stores and as such, do represent transaction prices for some customers. Lastly, Bean management reports that numerous customer surveys have indicated that most customers are insensitive to shipping charges. Again, this last claim would be interesting to document and study for its own sake, but it is beyond the scope of this paper.

REI is a consumer cooperative, so once per year REI members are given rebates for purchases made in the preceding year. The last implication of using stated catalog prices in our calculations is that I ignore any rebates that members may subsequently receive for buying through REI.

Finally, I limit my analysis to the post-Korean war period. Many of the items did not exist prior to 1953. But for some of the items early data are available. I exclude them here because of the price controls and rationing that prevailed during

the Korean War and World War Two. In many cases, goods completely disappeared from the market. In other cases, quantities were limited and often only available if the buyer had a ration coupon.

Turning to the actual products, I study five items from Bean--a more complete description is given in the appendix of my 1990 working paper. Together these items cover Bean's traditional product areas: footwear, clothing, hunting and fishing gear and hand-sewn canvas and leather specialty items. More specifically I study the prices for two shoes, a shirt, a blanket and a duffel bag. Of the two shoes, one is a moccasin and the other a hunting boot. The shirt is a cotton "chamois" shirt. The duffel bag is made from canvas and the blanket is made of wool. Bean manufactures the duffel bag and the shoes. The chamois shirts are contracted out and the manufacturer changes from time to time. The blanket is a Hudson's Bay Blanket that Bean imports from England. All of these items are studied over the entire 1953-1987 period.

The items I track from Orvis reflect the fact that it began as a fishing tackle supplier and has expanded over the last 25 years to now offer a wider variety of products. The earliest Orvis items are a bamboo fly rod and a fly. Both are individually made, although the fly-tying is contracted out and the bamboo rods are made in-house by Orvis craftsmen. The popularity of the bamboo rod declined with the invention of graphite, and the rod was discontinued in 1985. The fly is available over the entire 1953-1987 period. I also analyze a poplin fishing hat that Orvis has sold since 1963.

The non-fishing items have a shorter lifetime. The hunting item that I follow is a pair of binoculars which Orvis sold from 1966 until 1986. After 1986 the case for these binoculars was changed, so I dropped the item. The binoculars are made for Orvis in West Germany. The last two Orvis items were selected because of their comparability with Bean goods. I track the Orvis chamois shirt, which the company introduced in 1974 and the Hudson's Bay Blanket during the twelve years that Orvis carried it. The Orvis and Bean chamois shirts are close substitutes for each other and the Hudson's Bay Blanket that the two companies offered were identical.

The data from REI were restricted by the availability of past catalogs. Complete catalogs prior to 1969 were not available. Given that I was limited to less than 20 years of data I chose to use only one REI item: the REI chamois shirt. This shirt is manufactured for REI and is very similar to the Bean and Orvis shirts.

III NOMINAL PRICE CHARACTERISTICS

I begin with an examination of the frequency of price changes. Table 1 introduces the mnemonics used throughout the remainder of the paper and presents the first basic finding: that nominal prices typically stay fixed for periods of longer than one year. As mentioned in the last section, it is the nature of the catalog business that prices listed in a catalog do not expire immediately. But there is no a priori reason why price schedules could not be included in the catalogs. In principle, the schedule could depend on time or more exotic factors such as the consumer price index. Similarly, the companies could issue catalogs

with prices that expired more frequently (say every three months). However, given conventions followed by these firms, this fact should be interpreted as saying that over half the time when the firms consider adjusting their price they choose to leave it alone; more often than not the firms prefer not to adjust their current price.

Turning to specific entries in Table 1 it is important to remember that the Orvis Fishing Hat and Light Cahill Fly are often only advertised once per year. Note also that the statistics on the time between price changes were calculated using the conservative assumption that all prices prevailing in Fall 1987 would change in the Spring 1988. Even so the average time between price changes is about 15 months.

The last four columns in the Table provide further information on the duration of long spells. These columns reveal that none of the items had their longest spell during the mid- to late-1970's. This is the first of many indicators that will show that during times of higher inflation long spells of constant prices are less common. The table shows that long spells have not disappeared. Periods of more than 2 years of unchanging prices still occur.

With the information on durations in hand, I now turn to analyzing the size of the price changes. The two panels in Figure 1 give a variety of statistics concerning the size of price changes. For each item, the top panel shows the average (absolute) size of the price changes. The lower panel provides information on the distribution of the size of the changes. For example, for the Orvis binoculars roughly five percent of the changes were less than one percent in

magnitude, while roughly 14 percent were between one and two percent and another 14 percent were between two and three percent. Thus about one third of all of the changes were less than three percent in magnitude. Nevertheless, about one fifth of the changes for the Orvis binoculars were more than 15 percent in magnitude.

Overall the heterogeneity in the size of the changes, both across time and items, is striking. As the top portion of the Figure shows, the mean change for each of the various items is between 4 and 18 percent, with the average over all items being about 9 percent. However, as the bottom panel shows there also tend to be both large and small changes for the same item at different times. Price changes of less than a dollar for a thirty dollar item are quite common, yet as Table 1 shows this same type of item would be prone to spells of no change at all for periods exceeding a year. Conversely, prices also regularly change by more than 15 percent between periods.

To further investigate the nature of the changes, I next study the extent to which changes across items are synchronized. Figure 2 shows the timing of price changes. Each symbol in the figure marks the periods when a price changed. The figure highlights the fact that price changes were much more frequent from the late sixties to early eighties; during periods of higher average inflation, price changes were more common.

The figure also supports the evidence in Table 1 that as inflation has subsided during the mid-eighties, the frequency of price changes has slowed as

well. At this point, it is too early to tell whether prices before and after the seventies are equally rigid. The figure also suggests that the timing of price changes across items is not particularly highly synchronized. Formalizing this impression is a bit difficult: Given the discrete nature of changes, standard correlation statistics are uninformative. Accordingly, I use a measure of association described by Fleiss ([1973] pp. 42-43) that accounts for this discontinuity. Intuitively, this association measure is derived by checking whether changes and non-changes for one series are sufficiently aligned with changes and non-changes for the second series so as to reject the hypothesis that the two sets of change series are independent. Therefore, in addition to providing a measure of association that is scaled between -1 and 1, the statistic also facilitates testing whether price changes for any pair of series are independent. I view lack of independence as a very weak benchmark since with semi-annual data I would expect business cycle factors to induce some common movements across most items.

Surprisingly, using the changes of the raw semi-annual data it is not possible to reject the hypothesis of independence among most of the series--only 12 of the 66 potential pairwise comparisons were sufficiently correlated so that the hypothesis of independence could be rejected. (To save space these results are omitted). One possible explanation for this finding may be that changes are indeed synchronized but not contemporaneously timed; for instance, changes for similar items may regularly occur within a year but not coincide exactly. Moreover, for

some of the more seasonal goods comparisons using semi-annual data may be slightly misleading. To investigate these suspicions, I annualized the data so that changes that occur within the same year will be treated as identical (i.e., if any price change occurred within a given year, the observation for the year is coded as a one, otherwise it is coded as zero.) Since there are two ways to group adjacent Fall and Spring seasons, I used two different definitions of a year: one corresponding to the standard calendar year, the other corresponding to the fashion cycle that runs from Fall of one year through the Spring of the following year.

Table 2 reports the correlations, with the entries above the diagonal corresponding to the fashion year calculations and entries below the diagonal pertaining to calendar years. Cases where the hypothesis of independence can be rejected are highlighted with boldfaced-type. Even with these annualized data, where the importance on common macroeconomic shocks for price changes should be magnified, there is surprisingly little correlation between most of the goods; depending on the convention used to group the observations, there are either 6 or 9 significant associations between the 66 pairwise comparisons.

In some cases, the short length of the sample and the associated lack of precision may be responsible for the insignificance of the correlations. However, the lack of synchronization is evident for many of the items where synchronization might have been most expected. (The correlations among the items that one might naturally group together are highlighted by boxes in the table.) For example,

one cannot reject the hypothesis that the price changes for the identical blankets being sold by Orvis and Bean are independent. The same conclusion follows for the associations among the three chamois shirts and for the connections between the fishing gear. Collectively, these results suggest that there is very little synchronization between the price changes across items.

At this point I have established the three basic facts mentioned in the introduction: that prices are adjusted infrequently, by differing amounts, and although prices are more likely to change during periods of high overall inflation, the synchronization of changes across goods is generally low. These findings should not be surprising since they are implicit in the only other empirical work using U.S. data, Cecchetti [1985,86]--although Cecchetti did not emphasize the presence of many small changes.⁹ His results are for magazine newsstand prices, which some skeptics have argued may be atypical because subscriptions and advertising, not newsstand sales, produce the majority of magazine revenue and magazines on the whole are a small ticket item. My data are immune to these criticisms and reaffirm Cecchetti's findings.

IV Interpreting the Facts in Light of Existing Models

I now relate these basic findings to the standard models of price-setting. One difficulty in the exercise is that there is no consensus, baseline model from which to start; in contrast to say the consumption literature, where the permanent-income/life-cycle model is generally accepted as a benchmark, there is no widely accepted canonical model of dynamic price-setting in a uncertain environment.

Thus, the embryonic state of the theory concerning price rigidity forces me to consider a host of models rather than intensively testing a specific model.

In some cases, these models are sufficiently well-developed that they contain parameters which could in principle be estimated using the catalog data. However, in these cases the models could almost always be rejected without the need for any estimation. Accordingly, I have expanded the set of theories under consideration to include some explanations for price rigidity which are not well-enough specified to cleanly formalize. This choice means that it is not possible to proceed with a complete set of tight hypothesis tests. While this is an uneasy compromise, I view it as the only productive approach, since it would serve little purpose to focus exclusively on the glaring empirical deficiencies in the few models that are tractable enough to rigorously analyze.

A short-hand description of the collection of theories I consider is given in Table 3. As a starting point, it is useful to make a distinction between theories explicitly aimed at explaining nominal price rigidity and theories which apply to real price rigidity. As McCallum [1986] and Ball and Romer [1990] emphasize, many commonly cited reasons for rigidity in fact apply to real price rigidity rather than nominal price rigidity. As a crude rule of thumb, the two types of theories can be distinguished by those which can and cannot explain why prices are not indexed. However, as Ball and Romer [1990] demonstrate, if there is rigidity in real prices, then only a small amount of nominal rigidity may be needed for the nominal sluggishness to be important. Thus while much of my discussion will focus on

nominal rigidity, there are good reasons to also consider models of real rigidities.

The theories that clearly apply to nominal rigidity generally posit a direct cost to changing prices--thereby making indexing prohibitively expensive. One issue highlighted by these catalog data is the difficulty of identifying the costs which inhibit adjustment. For instance, since the catalog layouts are typically redesigned between seasons, there would appear to be no additional costs to changing the prices each season; similarly, the key decision makers at each company claim to review their prices at least every season, so that the fixed cost of reviewing the prices is incurred each period. Moreover, even if these reviewing costs were significant and not borne every six months, it would still be difficult to explain why price-setters do not adopt an indexing strategy as a rule of thumb. I see no a priori reason why the firms could not find some sort of price index for each item and make the default price change from period to period be linked to that index. Apparently, this hypothetical alternative pricing strategy is dominated by a strategy that calls for absolutely no indexing.

One potential resolution to these puzzles is given by Mankiw [1985] and Akerlof and Yellen [1985]. These authors observe that the cost to a monopolistically competitive firm of a slightly miss-set price is second-order. So, if there are small relabelling or "menu" costs involved in revising prices they may be enough to inhibit continuous adjustment of prices. While this explanation is appealing, the difficulty of identifying these menu costs (or in Akerlof and Yellen's terms, explaining why nominal rules of thumb dominate simple indexing schemes)

is still disturbing.

Nevertheless, assuming that price adjustment is indeed costly, there are two branches of the literature that can be pursued. The first class of explanations, which I will call target/threshold or (S,s) models, posit that a firm trades off the costs of letting inflation erode its optimal price with the cost of changing prices. With a fixed cost of changing prices and a predictable amount of inflation, the firm will not adjust its nominal prices until the accumulated inflation drives the real price below a (pre-specified) lower limit. Once the limit is crossed, the nominal price will be reset to a higher level. Allowing for cost and demand shocks will imply that nominal prices should be set to keep the real price within a range that varies over time.

The usual motivation for these type of models is that they are plausible and sometimes even optimal (depending on the exact specification of the model); ironically, the Sheshinski and Weiss [1977] paper, which is responsible for much of this literature, began with a quote describing the pricing problem facing mail-order catalog companies to motivate the usefulness of this class of models. My data strongly contradict many of the key implications of the simpler versions of these models.

For instance, the simplest target/threshold models operate under the assumption that price adjustments should occur only in one direction and should all be of the same size. These one-sided (S,s) models therefore can be trivially rejected since about 8 percent of the price changes are decreases. A further

problem is the substantial differences in the sizes of the changes. A slightly more realistic version of the model would allow for both increases and decreases but keep the size of changes in each direction fixed. Again, such two-sided (S,s) models can be overwhelmingly rejected due to the variations in the size of the changes. Unfortunately, finding closed form solutions for more general target/threshold models where both the limit prices and the return price are time varying is very difficult.

Assuming one was going to move towards an (S,s) model with time-varying thresholds and target points, what would it need to do to fit the data? The most straightforward approach would be to try to approximate the data using a sequence of (S,s) models with fixed band widths. For instance, if some periods were characterized by mostly large price changes, while others were well-described as having mostly small price changes, then combining models that alternated between having a wide and narrow set of bands might work. The logic of the (S,s) model suggests that the band width operative at any particular time should be related to the overall expected level of inflation.

To see the intuitive link between the size of price changes implied by a target/threshold model and the expected level of inflation, suppose that a firm had an equilibrium policy in place that was optimal given the cost of changing prices and the prevailing, expected inflation rate. The optimality of this policy would imply that the firm would be indifferent between more frequent adjustments and more time away from its instantaneously optimal price. If the underlying inflation

rate is expected to increase, the old price rule will no longer be optimal: holding the previous price bands fixed, the new higher expected inflation rate will necessitate more frequent (costly) price adjustments. In this situation the firm would always want to readjust its trigger prices so that it increases both the expected deviation from the optimal price and the frequency with which it must adjust prices. Hence when expected inflation increases, the average size of its price changes should increase (see Tsiddon [1987] for a formal argument along these lines).

This implication is investigated in Figures 3a-3c, which display both the size and timing of the price changes. Specifically, the figures simultaneously show the time between changes for each item and the size of any changes when they occur. The scaling across the figures and the items is uniform so that all changes are directly comparable; price decreases are represented by downward bars.

The data from figures suggest that the size of price changes is not very closely tied to the overall (observed) level of inflation: changes are more frequent during the 1970s but not systematically larger when compared to the 1950s, 1960s or late 1980s. Indeed, for most of the items, the average price change during the 1968 to 1982 period, when CPI inflation averaged about 7.5 percent per year, appears to be about the same as the average price increase over the pre-1968 and post 1982 period, when average inflation was about 2.5 percent.¹⁰ Since realized inflation in the U.S. is well-approximated by a random walk (Ball and Cecchetti [1990]), lagged inflation and expected inflation should coincide, so that this result is another troubling for simple (S,s) models.

The links between the between the average sizes of price changes and the actual rate of inflation are further pursued in Table 4. The table contrasts the average size of the price changes for each item during the 1968 to 1982 "high inflation" period and with those from the remaining "low inflation" periods--the comparisons are informative so long as one accepts the premise that the expected or core rate of inflation differed across the two periods. The numbers in parentheses below each of the entries in the table represent the number of changes included in the averages. Obviously, for the items that entered the study in the late sixties and early seventies there is limited information available concerning pricing patterns in a low-inflation environment. Nevertheless, the table demonstrates that the average magnitude of the price changes between the two periods is approximately equal. A formal Wilcoxon ranks test for equality of the median change between the two periods confirms this claim. (I use a non-parametric test since the distribution of price changes appears to be very non-normal.) The last column of Table 4 shows the probability that the median change in the two periods is equal. For none of the items is it possible to reject the assumption of equality at any of the usual significance levels. For the joint test that the median change across all goods is equal in the two periods, I fail to reject at the 75 percent significance level.

The lack of association between the average size of the price changes and core inflation strongly challenges the simple, tractable versions of the (S,s) theory. The most obvious challenge will be to explain the interspersing of the large and

small price changes that occur even during periods of high inflation. There are several ways that this might be handled within the context of more complicated (S,s) models.

One possibility is to assume that demand conditions shift to make the desired band width narrower, so that an immediate small price change has a large benefit. I am unaware of any work that has taken this approach. However, in principle, any shift in the demand or cost environment that periodically reduced the desired band width could give rise to small adjustments.

Alternatively, the variations in the sizes of the price changes could be handled by introducing a time-varying cost to changing prices. This approach seems to be the direction in which the literature is heading. For instance, Benabou [1990], expanding on his 1988 model, has made some progress with this type of setup. He considers how consumers' search behavior interacts with the level of inflation to generate endogenous fluctuations in the degree of competitiveness. In his model, shocks which increase competition decrease price dispersion and thus can generate a motive for small price adjustments, even at high levels of inflation. Unfortunately, the Benabou model is sufficiently complex that it can only be analyzed using simulations; "testing" the model does not seem possible at this point. Hopefully, further work along these lines will yield an enhanced (S,s) model that can fit these data.

The other leading alternatives to the target/threshold model are models where prices are assumed to adjust at fixed intervals. Under this view, prices are

not continuously reset because either the necessary information is not available or the costs of high frequency changes are prohibitive. Given that these companies are now issuing many catalogs per year (Bean was sending out over 20 per year by the end of the sample) it would be unrealistic to assume that prices could be intelligently readjusted with each catalog. Even leaving aside the confusion it would create for customers, it is probably difficult to process sales data quickly enough to justify continually fine-tuning prices. So this model explains why prices are posted for non-trivial periods of time. However, it does not explain why the actual period of time between changes for the same good is so variable. From Table 1, the large standard deviations for the number of months between price changes present a strong challenge to the simplest timing model.

A more sophisticated timing based model would relax the assumption that all prices for every item are revised in tandem. Presumably a natural extension would focus on the synchronization of changes for similar items. In particular, a robust implication of the timing model seems to be that for items where either information (about costs or demand) or characteristics of the consumers and suppliers is similar, price changes should be correlated. In my sample there are four natural groupings of items where these conditions are likely to hold: the two identical blankets, the three nearly identical shirts, the two types of leather shoes and the three fishing items. As mentioned in the last section, it does not appear that changes among these goods are tightly synchronized even at the annual frequency. Only for the two types of shoes is it possible to reject the hypothesis that the price

changes are independent.

The asynchronization of the changes is even more surprising given that the price levels for comparable items tend to be aligned. For instance, the Orvis price-setters explicitly stated that they were matching Bean's price moves for the Hudson Bay blankets. Figure 4 verifies this claim and also highlights the peculiar nature of many of the price changes. Between the Spring of 1980 and the Fall of 1982, Bean's price for the Hudson Bay Blanket moved from \$110 to \$111 to \$112 to \$131 to \$132 to \$145. After the Fall of 1982, the price remained at \$145 for another 18 months. The corresponding Orvis prices were \$110, \$110, \$131, \$136, \$136 and \$136--the price stayed at \$136 for another two years. Clearly this sequence of changes will be difficult to explain using a standard timing model.

The remaining explanations I discuss tend to be incomplete "models" for rigidity. For instance, most of these explanations are not completely enough developed to identify parameters that could be estimated. Similarly, many of these explanations have a difficult time explaining why nominal rather than real prices are slow moving. On the other hand, as Blinder [1991] points out, these explanations are often mentioned in informal discussions about rigidity. Moreover in light of the Ball and Romer [1990] result of the interactions between real and nominal price rigidity, any evidence related to real price rigidity can be thought of as complementary to the investigation of nominal rigidities.

Again, there are two general classes of theories. The first set are based on

differing assumptions regarding costs and markups. The simplest model posits that marginal cost is flat and that markups are acyclical, so that markup pricing generates rigid prices. A competing theory assumes that marginal cost is increasing in output, but markups are procyclical so that prices are acyclical. (See Rotemberg and Woodford [1991] for a survey.) Finally, a third possibility is that prices are marked up on the basis of the historical acquisition costs, rather than the prevailing cost of obtaining goods. Unfortunately, the bottom line is that each of the theories implies that prices should be rigid, so to distinguish among the theories, one must make some additional assumptions about costs or demand. Given that I have no reliable quantitative data on costs or demand, catalog data are not particularly well-suited to distinguishing among these theories.¹¹

If we are willing to assume that costs are similar for the identical and nearly identical items in the sample, the blankets and shirts, then the lack of synchronization of price changes suggests that markups cannot be constant; if cost movements are synchronized but price movements are not, there must be variation in markups. This asynchronization could be explained if the firms are slow to pass through cost changes or if markups are time-varying. Making any further inferences to distinguish between the remaining two explanations would require stronger assumptions.

The final set of explanations for price rigidity which I consider are based on customer-market considerations. The first candidate theory, typically associated with Okun [1981], holds that firms have implicit agreements with their customers

that lead the firms to moderate price increases. (Again, this theory presumably should apply to real, rather than nominal prices.) While this theory is difficult to test without precise data on costs and demand, there are several aspects of the price change statistics that seem at least weakly supportive.

First, if firms were raising prices when demand increased, one might expect more price increases in business cycle booms than in business cycle downturns. Okun argues that firms' desire to encourage continuing relationships mitigates the tendency to exploit surges in demand. For these data, there is no tendency for prices to change more often during (NBER) business cycle expansions than contractions--price changes occur about 30 percent of the time during expansions and about 34 percent of the time during contractions.

Second, Okun talks at length about the importance of "fairness" in pricing and why price increases which are attributable to cost increases are easier to justify. If one assumes that cost increases are more common when inflation is high (or can be more credibly cited as having occurred), this reasoning might predict that price changes should increase with the level of inflation. The notion that high inflation periods are periods of many price increases, rather than larger price increases, is one of my basic findings. I conclude that to the extent that these data are relevant to the Okun customer market hypothesis, they seem to support it.

A second customer market explanation for rigidity focuses on the strategic aspects of the pricing decision. With such a small sample of overlapping items,

this data set is not the best one to use in studying the "coordination failures" hypothesis. As already mentioned, in the case of the blankets, the Orvis prices were being set to keep them aligned with the Bean prices. However, this description of the pricing strategy is incomplete since the gap between the two prices fluctuated. Figure 5 graphs the prices of the three chamois shirts. Again there is some support for the existence of a strategic element to the price patterns. On the one hand, the price levels of the three shirts tend to systematically be ranked with the Orvis shirt being most expensive and the Bean shirt being least expensive. This pattern likely reflects a conscious marketing decision by the firms—notice also that the Orvis price for the blanket tended to systematically exceed the Bean price. On the other hand, the timing of the price changes are not coordinated and the gaps between the prices fluctuate. Overall, the evidence is mixed. There is no simple strategic model that captures the price dynamics, yet there are some clear patterns in the data. A more complete evaluation will require a larger data set.

The final customer based explanation I consider was proposed by the price-setters at Orvis and REI. They suggested that there are certain nominal thresholds, price points, which firms are reluctant to exceed because doing so would lead to a considerable loss in sales. More formally, a price point is a price where a firm believes its marginal revenue curve is discontinuous because its customers care about nominal magnitudes. This explanation is different from the standard kinked demand story of price stickiness. The firm may be reluctant to exceed a threshold

even if there is no strong competition. For instance, for a monopolist, a price increase from 19.95 to 20.25 might have a very different effect than an increase from 20.50 to 20.85. The presence of a competitor is likely only to reinforce a firm's reluctance to change a price.

There is no tight theoretical justification for this story, although it is similar in spirit to the explanation for rigidities posited by McCallum [1986]. McCallum suggested that the use of non-indexed prices is done for convenience. He argues that inflation uncertainty in the U.S. has generally been low, so that the gains from indexation would be low enough that the mere cost of continually calculating real prices is sufficient to deter firms from indexing. The analogy here is that buyers may use rules of thumb when searching for items and comparing prices.

McCallum's convenience argument can be used to explain why the rules would likely be formulated using nominal prices. If firms are aware of this practice they may set prices so as to exploit the use of the rules; if a firm know some customers do not even consider buying a shirt that costs more than \$20, then if the firm has any discretion in setting the price it will prefer to charge \$19.95 instead of \$20.05.

Having described these pricing points, the natural question is whether they are observable and empirically significant. In the working paper version of the paper, Kashyap [1990], I provided a number of calculations to assess this question. The results were mixed and for brevity sake, I merely summarize the main findings. I begin by noting that the static distribution of prices is not uniform.

Prices endings between 41 to 50 cents or 75 to 00 cents are much more common than prices ending between 01 to 40 or 51 to 74. (This is a widely documented finding, see Friedman [1967]). The bunching of price endings is also more pronounced during low inflation periods than high inflation periods. These facts about the static distribution, however, are irrelevant for macroeconomists unless they have dynamic implications.

To investigate the dynamic consequences of the price points, one needs to be more specific about how to define a price point. This is difficult since there is clear danger of circularity in using the data to learn about the price points and then testing the model with the same data. Ideally, one would use different data sets to identify the price points and to study their consequences. With only one data set and a presumption that the high and low inflation periods may differ, my options are limited. My approach was to use very simple rules to identify the price points, with the hope that these rules were sufficiently straightforward that it would be clear that the results have not been rigged.

The rules on which I settled assigned thresholds every fifty cents for the low price items (the hat and the shoe) and every dollar for the more expensive items.¹² Operationally, this meant that prices in certain ranges were considered to be at price points. The fifty cent price range was defined as all prices which end between 40 and 50 cents. For instance, prices of \$12.45 and \$4.50 would both considered to be at a fifty cent threshold. The dollar price point encompasses only those prices which end between 75 and 100 cents. Given these admittedly

ad hoc cutoffs several tests were carried out. (See Kashyap [1990] for a more extended discussion of what follows).

First, if pricing points inhibit price changes, then they might also be expected to affect the sizes of price increases. Specifically, if prices which are at price points are fixed longer than other prices, then any subsequent price adjustments might be expected to be larger than average. There was weak evidence in this direction. On an item by basis there was a slight tendency for the changes after price points to be larger (but not significantly so) than usual. Collectively, across all items this pattern was also statistically significant.

A more direct test I considered was to check whether price changes that were predicted by competitors' price movements and cost shocks were less likely to occur when prices were near price points. To do this, I estimated the probability of a price change given cost changes, movements in competitors prices and an indicator of whether the firm was near a price point. The lack of reliable cost and competitors' price information means that these results should merely be considered suggestive.

Given these caveats, the results were reasonable. The models successfully predict the decision to change or not roughly 70 percent of the time. The coefficients on the cost proxies tended to be positive and marginally significant, indicating that an increase in costs increases the likelihood of a price change. Conversely, for seven of the eight items, the price points indicators have negative coefficients. The cumulative increases in the price of substitute goods, over the

period when a firm has its own price fixed, seemed to have a mixed effect on the likelihood of a price change--with the only significant results coming for the shirts. However, the bottom line was that while the price points seemed to work in the expected direction the size of the effects were insignificant.

This conclusion was partially reversed when I allowed the importance of the price point effects to shift with the level of inflation. Specifically, I split up the price threshold proxy so that there were separate regressors for the high and low inflation regimes.¹³ The period 1968-1982 was chosen as the high inflation period.¹⁴ The results were then somewhat more impressive: for all of the goods, being near a price point in the low inflation period reduced the probability of a price change, while in most cases price points were of no importance during the high inflation period. Furthermore, the importance of the price points was much more pronounced for the shirts, cap and fly. It appears that the designation of price points that I used for the three \$40+ items was too liberal: the data suggest that adjacent one dollar barriers are not nearly as important for these more expensive items.

The overall evidence on price points suggests that they may influence price adjustment, but the results are inconclusive. With more theoretical work aimed at describing the determination of the price points and a broader data set this question can be explored much more carefully.

More generally, the customer market explanations do relatively well at explaining certain aspects of the data. Unfortunately, this conclusion must be

tempered by the observation that the data are not particularly well-suited to testing these hypotheses. Furthermore, aside from the price point explanation, which is explicitly about nominal prices, these theories tend to be incapable of explaining nominal rigidities.

V CONCLUSIONS

What does one learn from this paper? The results in section 3 show that nominal prices are rigid. Starting from first principles, this fact is difficult to explain. Profit-maximizing firms would like to sell enough goods so that the marginal cost of producing the last unit of a good is just equal to the marginal revenue received from the sale of that last unit. The presence of inflation alone makes it seem unlikely that fixing a nominal price is optimal in this situation. Presumably the firm would want to continuously adjust its prices.

One way out of this puzzle is to assume that firms adjust some other non-price aspect of their product. The leading possibility is that delivery lags are varied to introduce flexibility. In the case of these standard, flagship-type catalog items, this seems less likely than usual. But more work on the importance of delivery lags and other non-price attributes seems to be called for.

The more standard response to evidence on nominal rigidities is that it is unreasonable to assume prices can be continuously readjusted for free. In this case prices can easily stay fixed. Optimizing firms will not constantly reset prices if changing prices is costly. Of course this sidesteps an important issue: why is it costly to change prices? Given that catalogs are reprinted every 6 months why

not have a rule that says prices automatically rise to cover cost increases? Even if we do not understand the fundamental reason for these costs, we can describe what they must look like. In other words, if the firms are behaving optimally in light of the constraints they face, then by observing their behavior we can infer something about these constraints.

The length of spells in these data vary considerably. Hence, the simple restrictions that lead to fixed timing of price changes do not appear to be important. In addition, the sizes of the price changes are quite different. In particular, small price changes are quite common. The combination of many periods of no change and many small changes, suggests that sometimes when small price changes do occur, the costs of changing prices must be small (or the benefits of the change must be large). At other times these costs must be larger or benefits must be smaller. Models that generate price rigidity by assuming a constant cost of changing prices in an otherwise stationary environment can not explain these data. Subsequent work in this area should involve models where either the costs of changing prices differ from period to period or the benefits are time-varying.

Models where the cost of changing prices is time varying can be derived in a number of ways. The search model proposed by Benabou [1990] seems like one promising, albeit complicated approach. Alternatively, the price point model can be pursued. It is too early to tell if either of these strategies will succeed in producing a testable model that fits the data.

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1. The mail-order business itself is now estimated to be a 50 billion dollar industry which is growing at ten percent per year. Thus, these prices would be of some interest even if they only tracked overall catalog prices.
2. Specifically, he shows that a CPI based on a collection of catalog items closely tracks the BLS CPI (as long as the goods are not undergoing big changes in quality).
3. Obviously changes in tastes can imply that the same physical good is not identical at two different times.
4. Of course not changing quality may be endogenous decision. Implicitly we assume that for these goods, quality changes are driven by exogenous forces.
5. The claim that orders are literally never backlogged is incorrect. But for these items, which the companies have carried for many years, the companies have a fairly good idea about their demand curves and stockouts are unlikely. Actual inventory data from Orvis confirm this.
6. If an item does not appear in the Orvis Fall or Spring Catalog then they may change the price in the first catalog in which it reappears, regardless of season.
7. If a customer uses an old catalog to place an order, all three companies fill the order and bill the customer for the difference.
8. The equivalence between the store and catalog prices is reassuring since Orvis and REI are expanding the number of outlets they operate and thus the percentage of total sales accruing from catalogs is falling. At the end of my sample, mail order sales accounted for over 80 percent of Beans and Orvis's total sales and roughly 20 percent of REI's total sales.
9. Danziger [1987] analyzes Israeli data for Kosher salami. However, his data are not continuously sampled through time or across sellers. Sheshinski, Tisler and Weiss [1981] study the price of noodles and instant coffee in Israel but these prices are regulated.

10. An additional visual impression that comes out of Figures 3a-3c is that during the high inflation period the variance of the size of the changes increases for some of the items. For instance, for the Orvis binoculars and the Bean chamois shirt, the 1970s and early 1980s seem to be characterized by an increase in both the number of very small and very large changes. However, across all the items where meaningful comparisons between the two inflation regimes can be made, the standard deviation of the price changes only rises during the high inflation period in five of the nine cases.

11. I did uncover the following anecdotal evidence on costs in the course of talking with the price-setters at each of the three companies. These price-setters identified cost factors as one of many factors that they considered in making their pricing decisions. However, their notion of "costs" requires some explanation. For fairly generic items, the catalog company will obtain a per-unit price quote from a wholesale vendor for an unlimited quantity of the good. This price quote would be expected to be honored by the vendor over the life of the catalog, so that the retailer would be able to have orders for additional units filled quickly at a pre-determined price. Most of the items in this study fit this description. For more specialized items, vendors tend to require a minimum order size from the retailer. In some cases, the minimums are sufficiently small that they pose no problem: a price per order of a given size will be determined and if additional units are required then they can be purchased by the retailer provided that the re-order is sufficiently large. In this case, the only difficulty is the possible delivery lag that arises if re-orders are necessary. In some cases, however, the minimum order size is sufficiently large that if the retailer stocks out, reorders are prohibitively expensive. In these cases, the catalog company will turn customers away. This scenario is most common for unusual items that have not previously appeared in the catalog.

12. Some of the items were excluded because cost proxies could not be found. For instance, no reliable producer price indices are available for bamboo and it is known that bamboo shortages have been a key factor in shifting the price of the fly rod. Similarly cost information is difficult to obtain for the binoculars. Since the binoculars have always been produced by a single West German firm, I suspect that approximating costs for this item may be particularly difficult. Finally, for the blankets (British) labor cost data were not readily available. In the case of the blankets, we have already see that competitive factors are very important and that the pricing point story may not be relevant.

13. Making this type of distinction can be justified for several reasons. First, consumer search activity, which undoubtedly influences these thresholds, is unlikely to be constant. Pursuing the analogy with the McCallum explanation, if rules of thumb are responsible for thresholds then rules of thumb may be abandoned during

periods of high inflation. Similarly, changes in the sizes of cost shocks could undermine the importance price points. If costs grow more rapidly during periods of high inflation, then retailers may choose to jump from price point to price point. Finally, because prices are adjusted more frequently during periods of high inflation, a firm might expect its competitors to be more inclined to follow a price move. Hence, strategic considerations that reinforce being at a particular price point may be less relevant during high inflation periods.

14. I experimented with other definitions of the high inflation period and found that these results were robust.

Table 1
Frequency of Price Changes

Mnemonic	Item	Dates	Ave. Months Between Price Changes & (Std. Dev.)	Number of Changes	Longest Spell			
					Overall:		Since 1980:	
					Dates & Duration (months)		Dates & Duration (months)	
LLB_Shoe	Bean Hunting Shoe	53:1-87:2	11.8 (10.9)	36	59:2-63:2	54	85:2-86:2	18
LLB_Mocc	Bean Camp Moccasin	53:1-87:2	11.5 (12.8)	37	59:2-65:1	78	81:1-82:1	18
LLB_Blnk	Bean Hudson Bay Blanket	53:1-87:2	17.8 (15.0)	24	58:1-62:2	60	84:2-87:1	36
ORV-Blnk	Orvis Hudson Bay Blanket	72:1-84:2	14.2 (10.8)	11	81:2-84:2	42	81:2-84:2	42
LLB_Dbag	Bean Zipper Duffle Blanket	53:1-87:2	12.9 (9.6)	33	61:2-65:1	48	80:2-81:2	18
LLB_Shrt	Bean Chamois Shirt	53:1-87:2	12.5 (14.2)	34	59:1-65:2	84	85:1-87:1	30
ORV_Shrt	Orvis Chamois Shirt	74:2-87:2	14.7 (14.3)	11	83:2-87:2	54	83:2-87:2	54
REI_Shrt	REI Chamois Shirt	72:1-87:2	14.8 (19.7)	13	81:1-87:1	78	81:1-87:1	78
ORV_Hat	Orvis Fishing Hat	63:1-87:2	18.8 (15.0)	16	63:1-68:2	72	81:1-82:2	24
ORV_Brod	Orvis Bamboo Fly Rod	53:1-85:1	18.0 (14.9)	22	69:2-73:2	54	81:1-82:1	18
ORV_Fly	Orvis Fishing Fly	53:1-87:2	30.4 (31.6)	14	54:1-64:2	132	82:1-84:2	36
ORV_Binc	Orvis 7 inch Binocs.	66:1-86:1	11.2 (9.1)	22	68:1-71:1	42	80:1-81:2	24
All	All Items	53:1-87:2	14.7 (15.0)	273				

Table 2

Correlation and Tests of Independence for Annual Price Changes^{1,2}

(changes are aggregated to annual frequency: correlations above the diagonal apply to years starting in the Fall running through the Spring, correlations below the diagonal apply to standard calendar years).

Mnemonic	LLB_ Shoe	LLB_ Mocc	LLB_ Blnk	Orv_ Blnk	LLB_ Dbag	LLB_ Shrt	Orv_ Shrt	Rei_ Shrt	Orv_ Hat	Orv_ Brob	Orv_ Fly	Orv_ Binc
LLB_Shoe	1.0	.396	.144	.365	.215	.171	.320	-.333	.089	.325	.499	.145
LLB_Mocc	.525	1.0	.090	-.228	.262	.351	.059	.048	.535	.398	.079	-.150
LLB_Blnk	.120	.308	1.0	.158	.023	.197	-.043	.098	.033	.399	.447	-.154
Orv_Blnk	.101	ϕ	.501	1.0	ϕ	.101	.386	.350	-.337	.101	.675	.101
LLB_Dbag	.253	.160	-.200	-.228	1.0	.298	ϕ	ϕ	.204	.258	.122	.336
LLB_Shrt	.470	.662	.120	.539	.253	1.0	.251	.073	.115	.590	.286	-.275
Orv_Shrt	.365	.365	.025	.612	-.228	.318	1.0	.289	.251	-.194	.289	.158
Rei-Shrt	.222	.293	.618	.675	-.228	.222	.537	1.0	.073	-.337	.126	.048
Orv_Hat	.000	.535	.167	.101	.115	.306	.318	.545	1.0	.018	-.196	.059
Orv_Brob	.416	.495	.332	.158	.020	.284	.241	.411	.452	1.0	.362	.269
Orv_Fly	.520	.224	-.007	.537	.355	.393	.220	.126	-.196	.038	1.0	.066
Orv_Binc	.230	-.141	-.122	.101	.499	-.258	-.213	.026	.224	.206	.030	1.0
	LLB_ Shoe	LLB_ Mocc	LLB_ Blnk	Orv_ Blnk	LLB_ Dbag	LLB_ Shrt	Orv_ Shrt	Rei_ Shrt	Orv_ Hat	Orv_ Brob	Orv_ Fly	Orv_ Binc

1. Correlations between items whose changes are sufficiently synchronized to reject the hypothesis of independence are indicated in bold.

2. Note that for some of the shorter series a price change occurs every year so that the correlation is defined to be 0. Such cases are identified by ϕ's in the table.

Table 3

Generic Models/Explanations for Price Rigidity

Explicit Costs of Changing Prices:

Target/Threshold "(S,s)" Models

- i) One-sided -- fixed band width
- ii) Two-sided -- fixed band width
- iii) Two-sided -- variable band width

Time Dependent Models

- i) Fixed intervals all goods
- ii) Fixed intervals for closely related goods

Markup Based Explanations:

- i) Prices are marked up over slow moving historical costs
- ii) Marginal costs and markups are constant
- iii) Procyclical markups offset rising marginal costs

Customer Based Explanations:

- i) Implicit agreements with customers inhibit gouging
- ii) Coordination difficulties in synchronizing changes across competing firms
- iii) Price points: nominal rules of thumb used by customers

Table 4

Average Size of Price Change by Period

Mnemonic	Item	Dates	Average Absolute Percentage Price Change			Wilcoxon Ranks Test: Probability of Equal Medians
			Complete Sample (# Changes)	High Inflation Period (1968-1982) (# Changes)	Low Inflation Period pre-68, post-82 (# Changes)	
LLB_Shoe	Bean Hunting Shoe	53:1-87:2	5.5 (35)	4.9 (21)	6.4 (14)	0.18
LLB_Mocc	Bean Camp Moccasin	53:1-87:2	5.7 (36)	5.4 (23)	6.4 (13)	0.72
LLB_Blnk	Bean Hudson Bay Blanket	53:1-87:2	9.0 (23)	11.9 (13)	5.4 (10)	0.34
ORV-Blnk	Orvis Hudson Bay Blanket	72:1-84:2	13.7 (10)	13.7 (10)	n.a.	n.a.
LLB_Dbag	Bean Zipper Duffle Blanket	53:1-87:2	7.1 (32)	6.6 (17)	7.6 (15)	0.78
LLB_Shrt	Bean Chamois Shirt	53:1-87:2	4.8 (33)	5.1 (22)	4.4 (11)	0.89
ORV_Shrt	Orvis Chamois Shirt	74:2-87:2	5.3 (13)	5.0 (9)	8.0 (1)	n.a.
REI_Shrt	REI Chamois Shirt	72:1-87:2	10.0 (12)	10.0 (11)	10.0 (1)	n.a.
ORV_Hat	Orvis Fishing Hat	63:1-87:2	17.1 (15)	18.2 (11)	14.0 (4)	0.99
ORV_Brod	Orvis Bamboo Fly Rod	53:1-85:1	11.7 (21)	13.2 (12)	9.8 (9)	0.48
ORV_Fly	Orvis Fishing Fly	53:1-87:2	10.3 (13)	9.9 (9)	11.3 (4)	0.82
ORV_Binc	Orvis 7 inch Binocs.	66:1-86:1	8.4 (21)	7.6 (16)	11.2 (5)	0.15
All	All Items	53:1-87:2	8.5 (261)	8.4 (174)	7.5 (87)	0.75

Figure 1A
Sizes of Price Changes
 Average Absolute % Changes

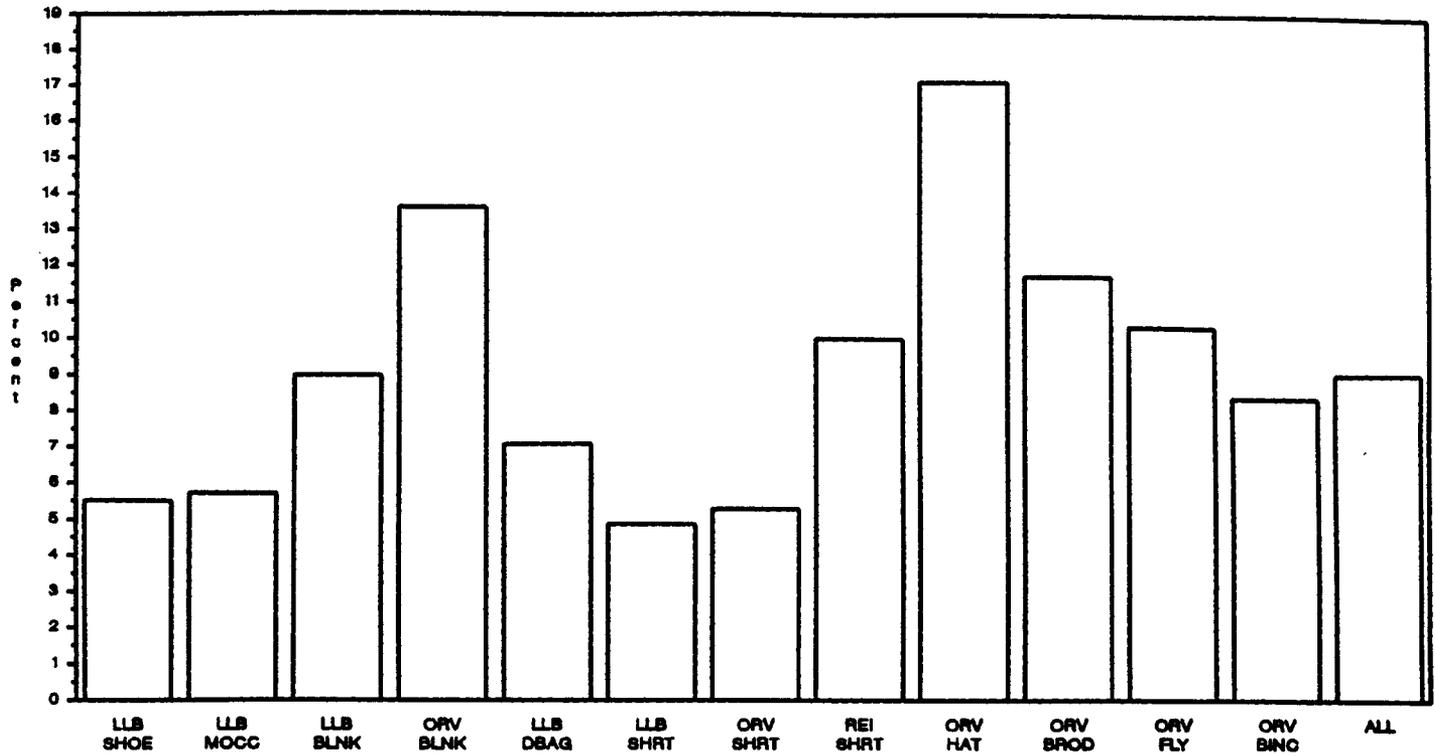


Figure 1B
Distribution of Price Changes

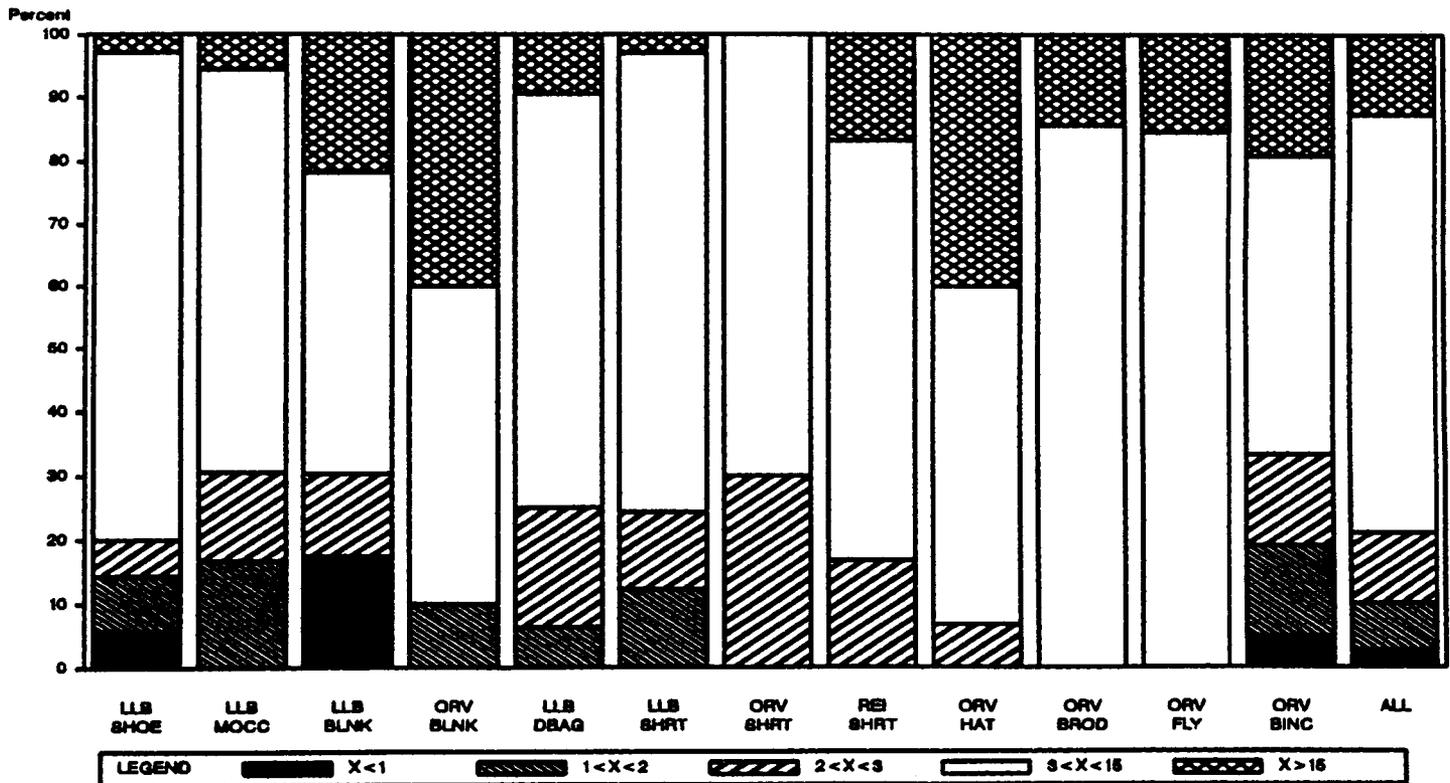


Figure 3A

Size and Timing of Price Changes

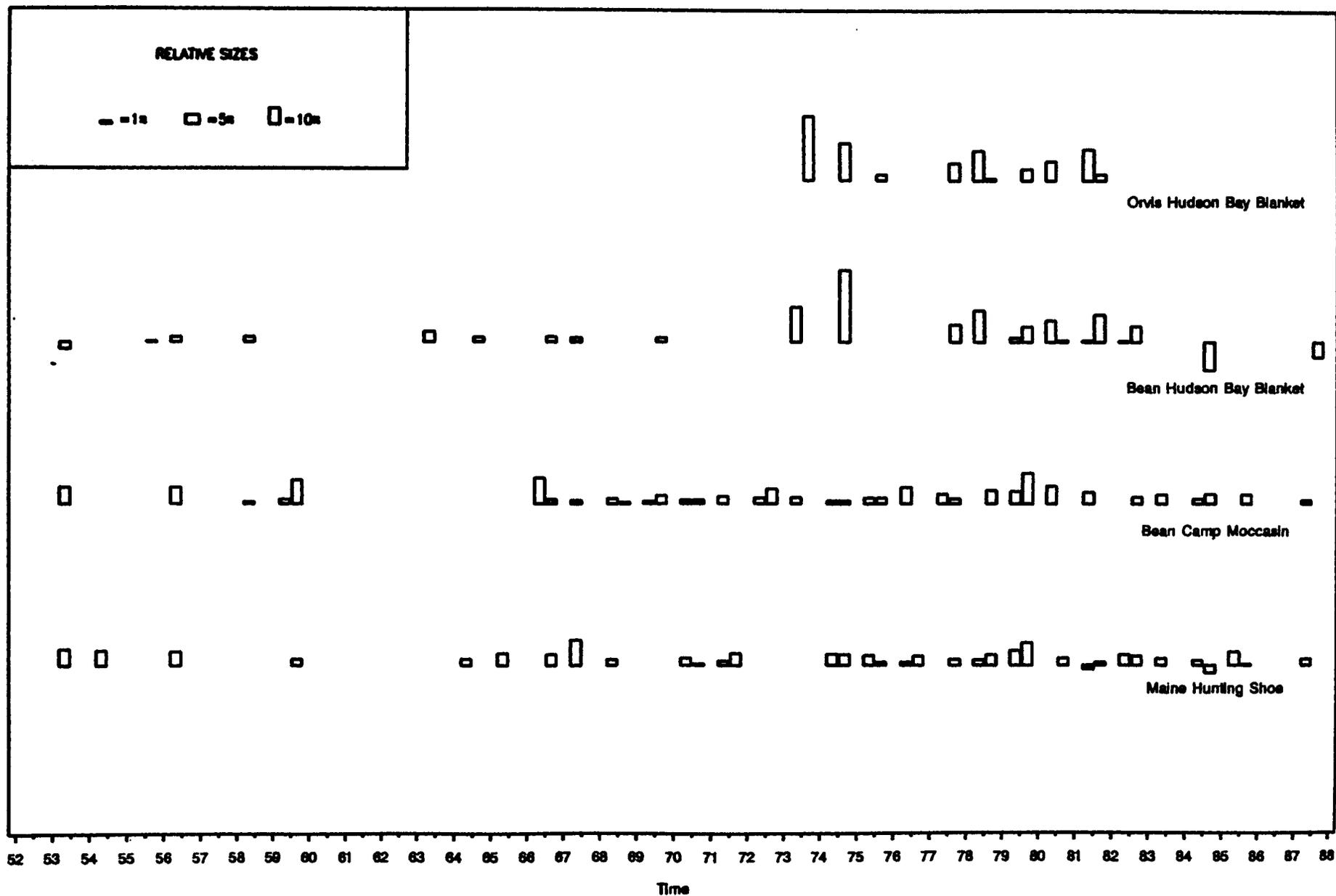


Figure 3B
 Size and Timing of Price Changes

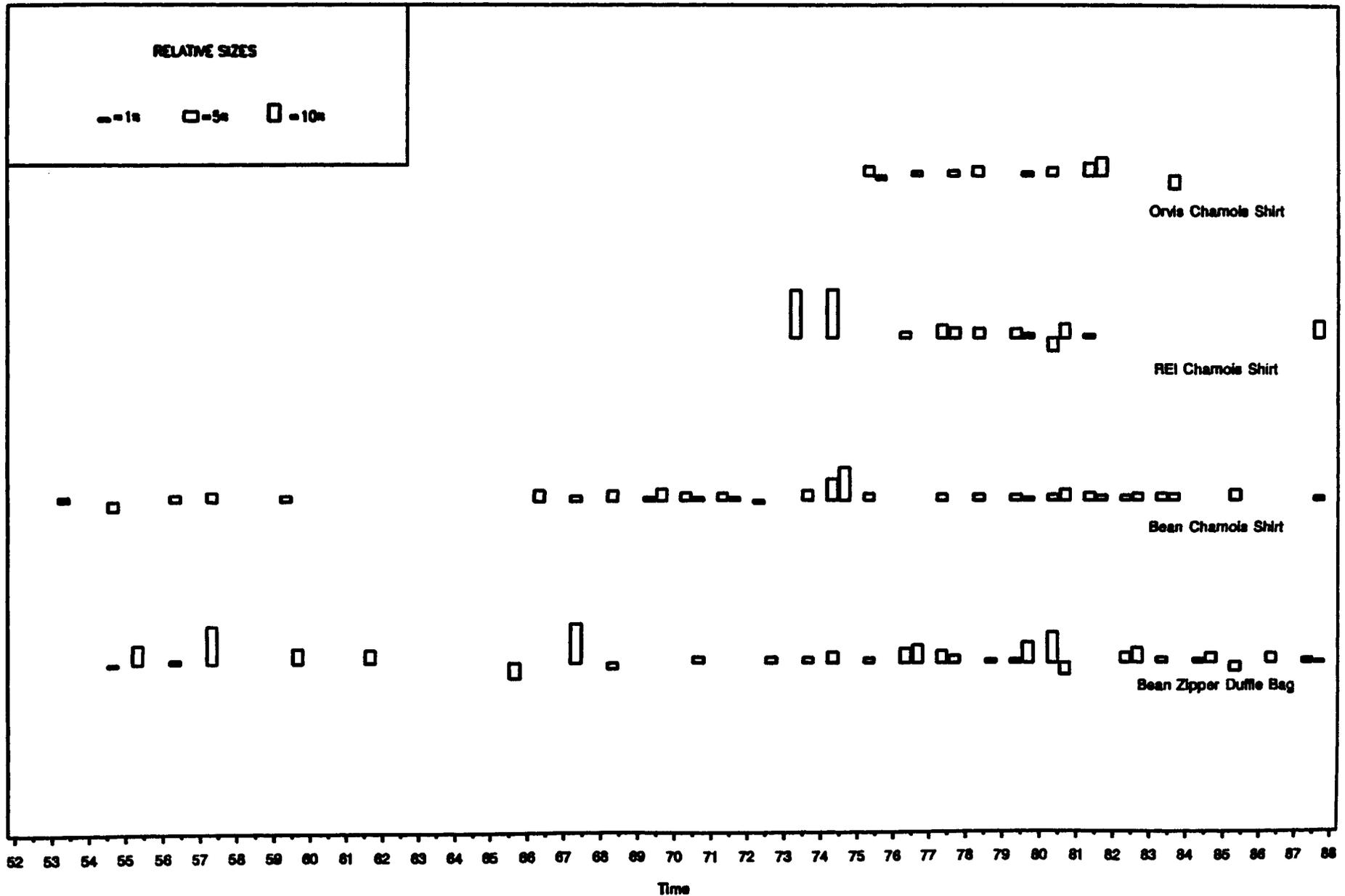


Figure 3C

Size and Timing of Price Changes

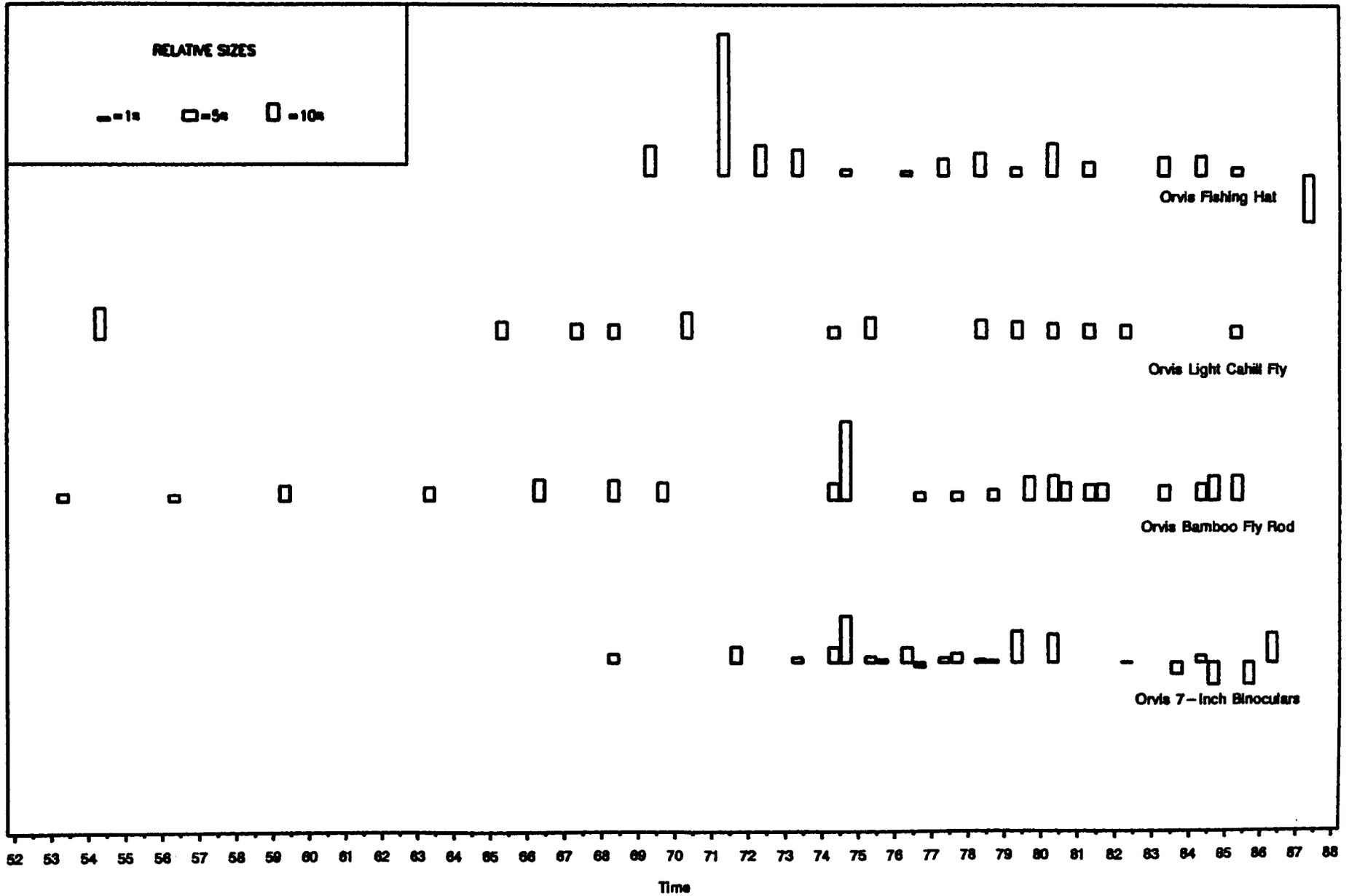


Figure 4
Hudson Bay Blanket Prices

Solid = Bean Dashes = Orvis

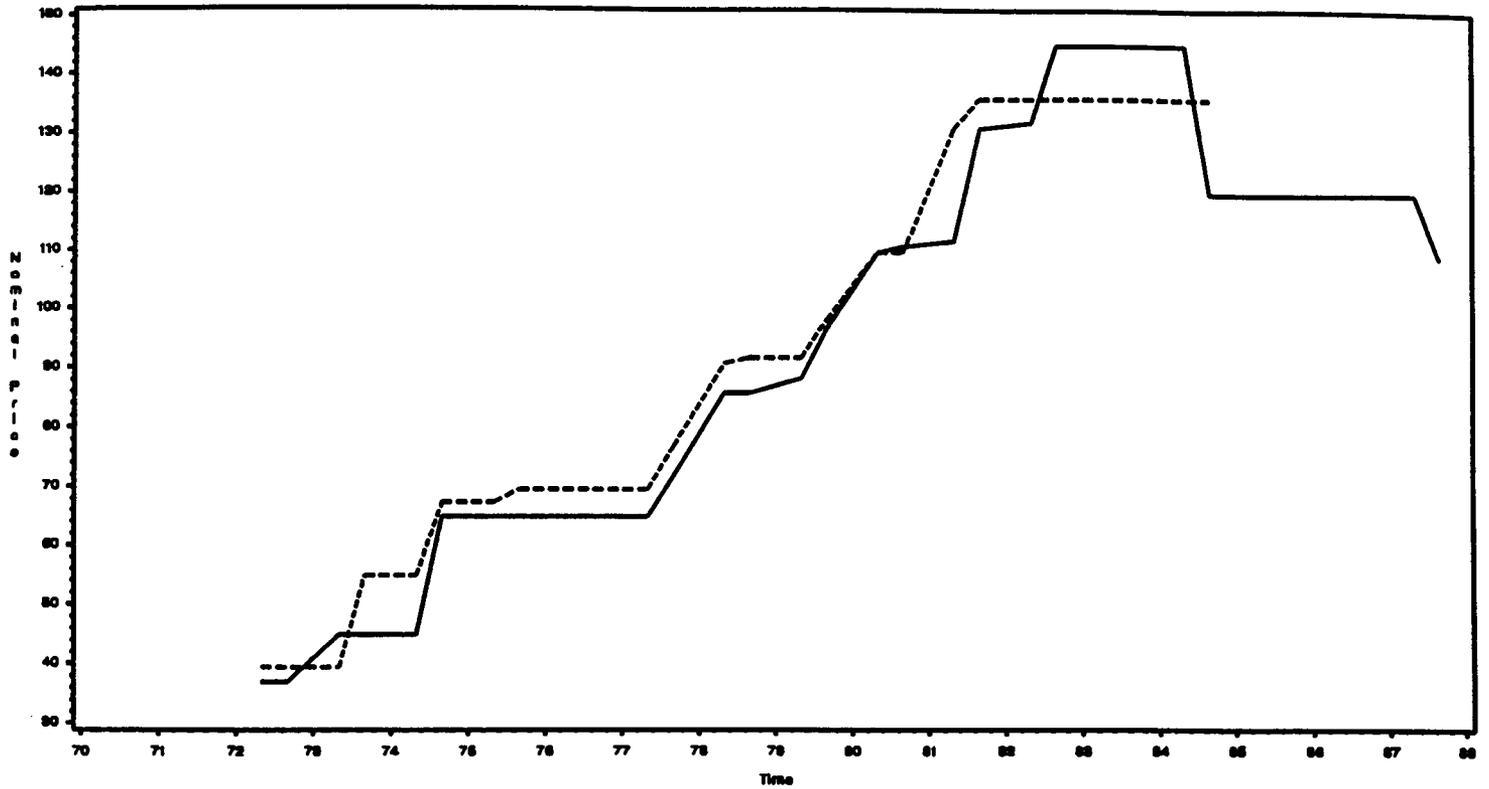


Figure 5
Chamois Shirt Prices

Solid = Bean Dashes = Orvis Dots = REI

