

**ERIE RETAIL SALES:  
A DISAGGREGATED APPROACH**

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# ERIE RETAIL SALES: A DISAGGREGATED APPROACH

## I. INTRODUCTION

In August of 1995 Randy Risjan undertook a research project analyzing retail sales in the Erie economy, and how retail sales relate to income and employment. At that time, data were only available up until the year 1993. Because of the lapse of time since the study was last done, this report aims to update the data collection that was begun by Risjan, as well as to look at his study in more detail. More specifically, the business cycles of the individual retail industries are studied and compared to both income and the overall retail sales. These six disaggregates include general merchandise, food, automotive, furniture, eating and drinking, and drug. It is important to note that these six areas are not the only contributors to total retail sales.

When Risjan began his analysis he studied three possible sources for collecting retail sales data. The most detailed database was the Census of Retail Trade, which is released every five years by the U.S. Census Bureau. While the data from the Census Bureau is the most accurate because it does not use estimation or sampling, the time lag makes it difficult to use it for current research purposes. Two more frequent databases that were considered are sales tax data and *Sales and Marketing Management* magazine's Survey of Buying Power. Risjan discovered that the sales tax data would underestimate actual retail sales because several retail items are excluded from the tax, including unprepared food, clothing, and drugs (Risjan 9). The Survey of Buying Power, which includes most 2-digit industries but only one 3-digit industry for Erie, had less industrial detail when compared to the other two sources. However, it is published annually and is much more accurate than sales tax data.

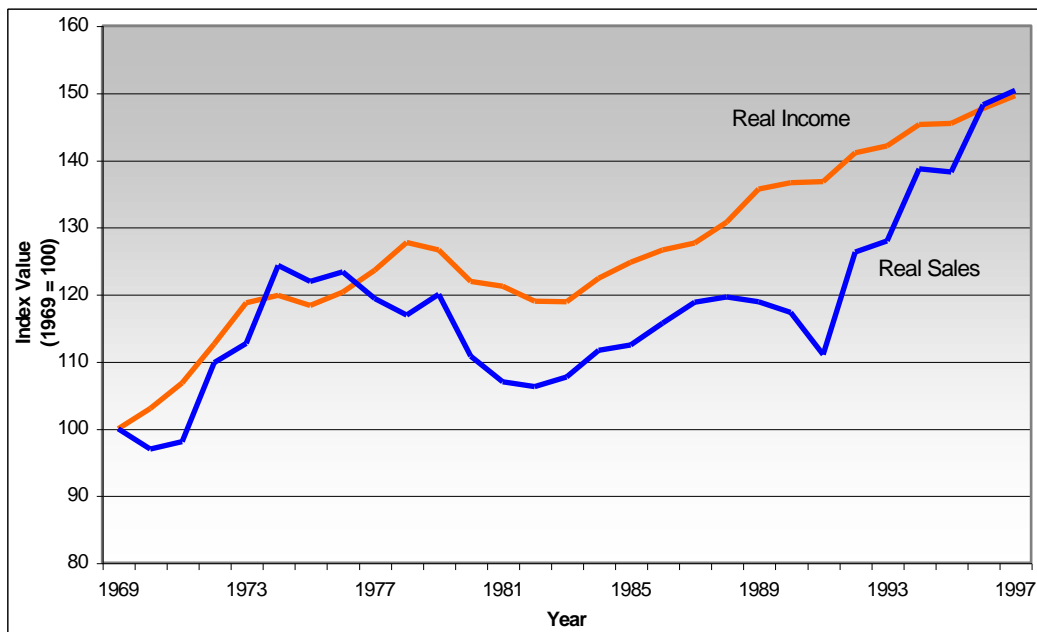
## II. ERIE RETAIL SALES THROUGH TIME

### A. Comparison of Retail Sales and Income

For the Erie MSA in general there seems to be a positive relationship between retail sales and aggregate income. This assumption is supported by a correlation of 85.2% between the two variables. During the period from 1969 until 1997, real Erie retail sales and real aggregate income<sup>1</sup> followed each other very closely, as shown in Figure 1. The starting and ending dates of 1969 and 1997 were chosen because of the availability of data on aggregate income from the Bureau of Economic Analysis.

Although retail sales overall closely follow changes in income, this correlation varies over time. During some periods, retail sales moved in the opposite direction from real income. For example, in 1973 real income in Erie peaked and then fell until 1975. However, total retail sales continued to rise until 1974, and stayed above real income through 1976. Another variance occurred between 1989 and 1991 when real income leveled off, but retail sales fell rather dramatically. Still, the most recent data show income and retail sales at very similar levels. These examples are all illustrated in Figure 1.

Figure 1: Real Erie Income and Retail Sales, 1969 = 100



A slowdown in income appeared to affect Erie retail sales dramatically. For example, a drop in real income from 1978 to 1983 resulted in a dramatic decline in retail sales. There is also a cyclical effect that should be taken into consideration.

<sup>1</sup> The process for adjusting nominal data to provide real data is presented later in section III.

## **B. Total Retail Sales**

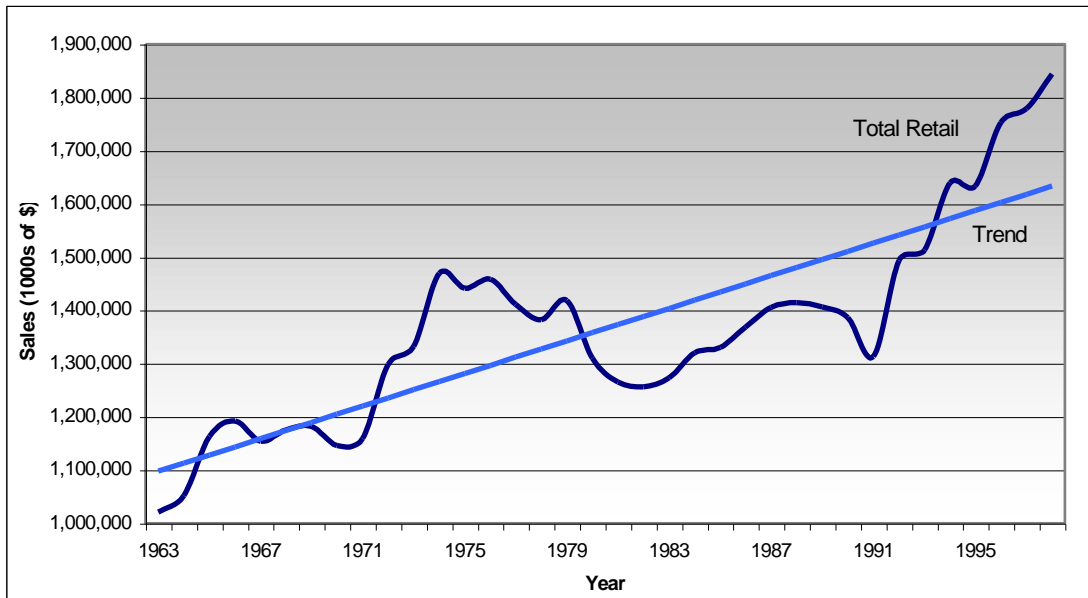
### **1. Cycle Analysis**

Detrending data in a series is important so as to identify cyclical effects. This is accomplished by running regression analysis on Erie retail sales. In this example a linear trend line was added. All regression analysis found in this paper is carried out using linear trend lines as opposed to quadratic or higher degree polynomial trend lines. Figure 2 shows total retail sales for Erie as well as the linear trend line. The trend line was found to have the following equation:

$$\begin{aligned} \text{Total Sales} &= 1,082,402 + 15,308.05 * \text{time} \\ &\quad (t = 29.34) \quad (t = 8.81) \\ &\quad R^2 = .695 \\ &\quad n = 36 \quad (1963 = 1) \\ &\quad (\text{Dollar amounts in 1000s}) \end{aligned}$$

This equation indicates that the trend of the series is upward sloping and increasing at a rate of \$15,308,000 per year from 1963 to 1998. T-statistics greater than 2 insure that the values are statistically significant. The  $R^2$  value, which varies from zero to one, measures the goodness of fit of the trend line to the actual data. An  $R^2$  of .695 indicates that retail sales tend to deviate from trend somewhat.

Figure 2: Total Retail Sales, Actual and Trend (1963-1998)



To determine the turning points in a cycle it is helpful to calculate how far the values deviate from the trend line. The formula for calculating percentage deviation is shown below:

$$\% \text{ Deviation} = [(\text{Actual value} - \text{Trend value}) / \text{Trend value}] * 100$$

Example calculation: Erie Retail, 1963

$$\begin{aligned} \% \text{ Deviation} &= [(1,021,016 - 1,097,711) / 1,097,711] * 100 \\ &= -6.99 \% \end{aligned}$$

Percentage deviation from trend indicates how far above or below trend retail sales were for the given year. These values are useful when calculating the amplitude, or the amount that the series deviates from trend at the turning points. The turning points for Erie retail sales data are shown in Table 1 below.

Table 1: Erie Retail Turning Points

<u>Peaks</u>	<u>Troughs</u>
1966	1971
1974	1982
1987	1991

These turning points vary slightly from those determined by Risjan because the data added in recent years resulted in a different trend line. The new trend line produces different values for the percentage deviations, which generate slightly different turning points. Table 2 shows the percentage deviation values, and Figure 3 shows the deviations graphically.

Figure 3: Percentage Deviation from Trend, Total Erie Retail Sales

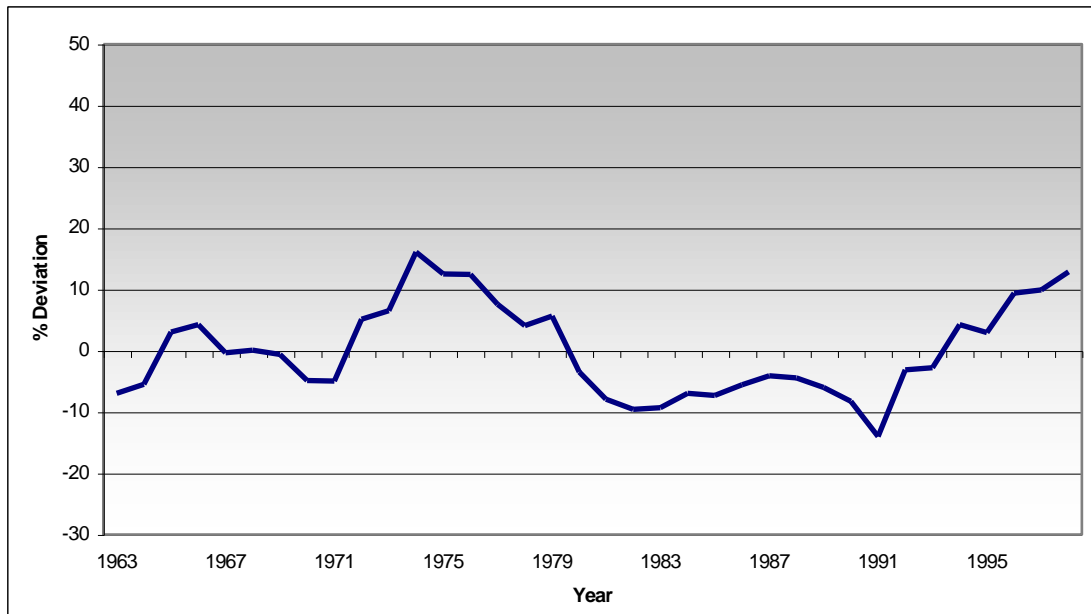


Table 2: Real Erie Retail Sales and Deviation from Trend

<u>Year</u>	<u>Actual Sales (1000s)</u>	<u>Trend Value (1000s)</u>	<u>% Dev.</u>	<u>Absolute Value of Deviation</u>
1963	1,021,016	1,097,711	-6.99	6.99
1964	1,052,042	1,113,019	-5.48	5.48
1965	1,162,994	1,128,327	3.07	3.07
1966	1,192,417	1,143,635	4.27	4.27
1967	1,154,593	1,158,943	-0.38	0.38
1968	1,174,813	1,174,251	0.05	0.05
1969	1,182,384	1,189,559	-0.60	0.60
1970	1,146,077	1,204,867	-4.88	4.88
1971	1,159,402	1,220,175	-4.98	4.98
1972	1,298,385	1,235,483	5.09	5.09
1973	1,332,189	1,250,791	6.51	6.51
1974	1,469,473	1,266,099	16.06	16.06
1975	1,441,712	1,281,407	12.51	12.51
1976	1,458,380	1,296,715	12.47	12.47
1977	1,411,649	1,312,023	7.59	7.59
1978	1,382,035	1,327,331	4.12	4.12
1979	1,418,481	1,342,639	5.65	5.65
1980	1,310,226	1,357,947	-3.51	3.51
1981	1,264,873	1,373,256	-7.89	7.89
1982	1,256,000	1,388,564	-9.55	9.55
1983	1,273,223	1,403,872	-9.31	9.31
1984	1,320,158	1,419,180	-6.98	6.98
1985	1,329,979	1,434,488	-7.29	7.29
1986	1,368,540	1,449,796	-5.60	5.60
1987	1,405,139	1,465,104	-4.09	4.09
1988	1,414,511	1,480,412	-4.45	4.45
1989	1,406,083	1,495,720	-5.99	5.99
1990	1,386,822	1,511,028	-8.22	8.22
1991	1,312,889	1,526,336	-13.98	13.98
1992	1,493,162	1,541,644	-3.14	3.14
1993	1,513,268	1,556,952	-2.81	2.81
1994	1,639,368	1,572,260	4.27	4.27
1995	1,633,959	1,587,568	2.92	2.92
1996	1,752,890	1,602,876	9.36	9.36
1997	1,778,503	1,618,184	9.91	9.91
1998	1,844,018	1,633,492	12.89	12.89

Mean of Percentage Deviation:

6.47

Range of Percentage Deviation:

30.05 (-13.98 to 16.06)

## 2. Amplitude

The amplitude of the cycle is a measure of the percentage deviation from trend. With the data for Erie retail sales, the amplitude was calculated for both the overall cycle as well as for different phases. The average amplitude for the cycle was found by taking the average deviation at the peaks and subtracting the average deviation at the troughs. The formula for overall amplitude is shown below:

$$\begin{aligned}\text{Amplitude} &= \% \text{ Deviation at Peak} - \% \text{ Deviation at Trough} \\ &= 5.43 - (-9.50) \\ &= 14.93\end{aligned}$$

Another method of calculating amplitude is to find the range from each peak to the following trough as well as the ranges from the troughs to the peaks. The average of these amounts can then be used to determine the amplitude. Tables 3 and 4 show the results of both of these methods.

Table 3: Average Overall Amplitude, Total Sales

<u>Average</u>	<u>Amplitude</u>
Peak	5.43
Trough	-9.50
Total	14.93

Table 4: Amplitude for Phases

<u>Average</u>	<u>Amplitude</u>
Peak-Trough	-14.93
Trough-Peak	13.27

Table 3 indicates that, on average, peaks in the cycle tended to be 5.43% above trend and troughs tended to be 9.50% below trend. Table 4 means that the average recession (peak-trough) saw a 14.93% drop in real retail sales, while the average recovery phase (trough-peak) saw an increase of 13.27% in real retail sales.



## C. Real Income

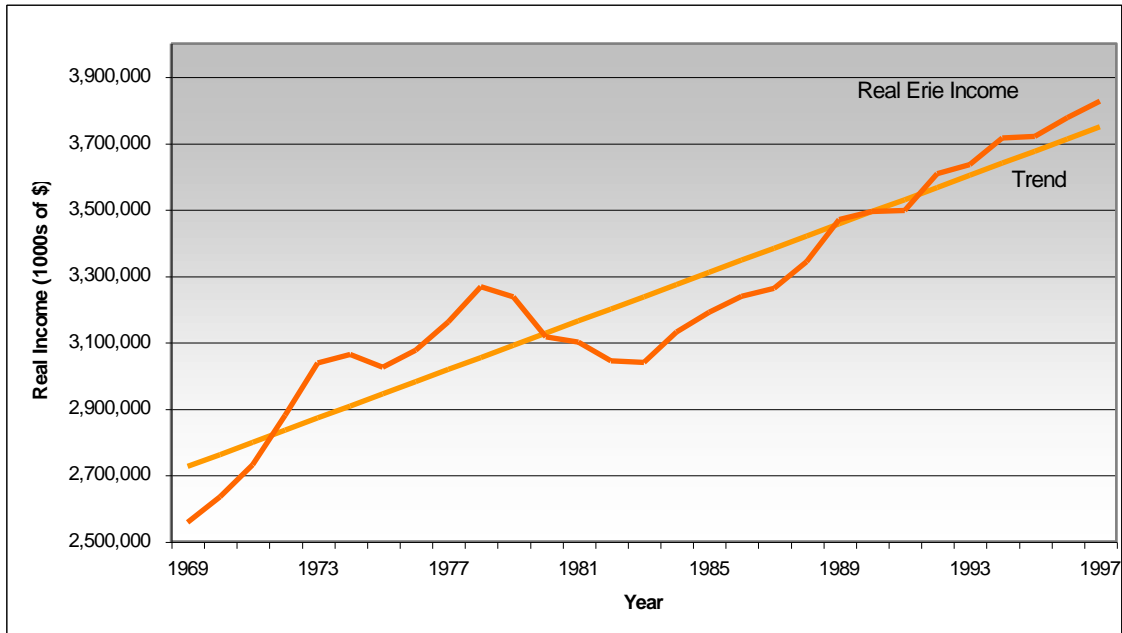
### 1. Cycle Analysis

It is also possible to analyze the real income series to compare to total retail sales. For example, a linear trend line can be added to the income data with the following equation:

$$\begin{aligned} \text{Real income} &= 2,689,171 + 36,556.58 * \text{time} \\ &\quad (t = 60.93) \quad (t = 14.23) \\ &\quad R^2 = .882 \\ &\quad n = 29 \quad (1963 = 1) \\ &\quad (\text{Dollar amounts in thousands}) \end{aligned}$$

This equation shows that the trend of real income in Erie is increasing by \$36,556,580 annually from the years 1969 to 1997. These results are statistically significant since the t-statistics are greater than two. Also, the  $R^2$  value of .882 indicates a close fit between the actual income data and the linear trend line. Figure 4 represents real Erie income with its trend line.

Figure 4: Real Erie Income and Linear Trend (1963-1997)



Calculating the percentage deviation from trend for the income data is useful so that comparisons can be made to total retail sales. These values are also important when calculating the amplitude of the income cycle. Table 5 lists the percentage values from real income, which are shown in Figure 5.

Figure 5: Percentage Deviation from Trend, Real Erie Income

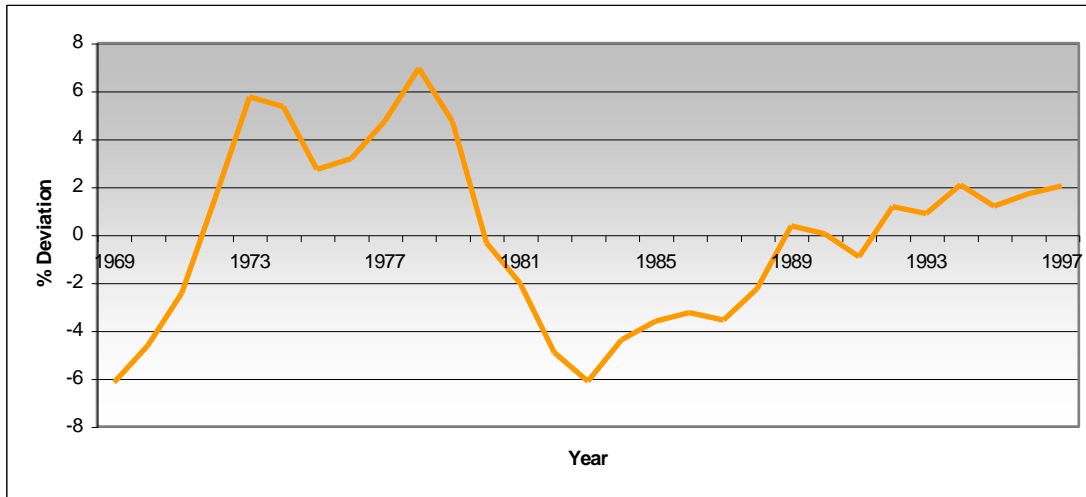


Table 5: Real Erie Income and Deviation from Trend

<u>Year</u>	<u>Real Income (1000s)</u>	<u>Trend Value (1000s)</u>	<u>% Dev.</u>	<u>Absolute Value of Deviation</u>
1969	2,557,714	2,725,728	-6.16	6.16
1970	2,634,884	2,762,284	-4.61	4.61
1971	2,730,869	2,798,841	-2.43	2.43
1972	2,880,409	2,835,397	1.59	1.59
1973	3,037,284	2,871,954	5.76	5.76
1974	3,064,333	2,908,511	5.36	5.36
1975	3,025,753	2,945,067	2.74	2.74
1976	3,076,434	2,981,624	3.18	3.18
1977	3,161,183	3,018,180	4.74	4.74
1978	3,267,459	3,054,737	6.96	6.96
1979	3,237,720	3,091,294	4.74	4.74
1980	3,117,346	3,127,850	-0.34	0.34
1981	3,100,308	3,164,407	-2.03	2.03
1982	3,043,755	3,200,963	-4.91	4.91
1983	3,039,933	3,237,520	-6.10	6.10
1984	3,130,893	3,274,076	-4.37	4.37
1985	3,191,280	3,310,633	-3.61	3.61
1986	3,238,685	3,347,190	-3.24	3.24
1987	3,263,593	3,383,746	-3.55	3.55
1988	3,343,275	3,420,303	-2.25	2.25
1989	3,470,077	3,456,859	0.38	0.38
1990	3,494,706	3,493,416	0.04	0.04
1991	3,497,733	3,529,972	-0.91	0.91
1992	3,608,763	3,566,529	1.18	1.18
1993	3,635,093	3,603,086	0.89	0.89
1994	3,715,776	3,639,642	2.09	2.09
1995	3,720,451	3,676,199	1.20	1.20
1996	3,776,548	3,712,755	1.72	1.72
1997	3,825,819	3,749,312	2.04	2.04

Mean of Percentage Deviation: 3.07  
 Range of Percentage Deviation: 13.13(-6.16 to 6.96)

## 2. Amplitude

Using the established income turning points found by Risjan in 1995, which are listed in Table 6, the average amplitude of the income cycle is shown in Table 7. The same technique was used to calculate the amplitude of the income cycle that was illustrated earlier for retail sales. Risjan's turning points are still current since Erie has not experienced any income peaks or troughs since that time.

Table 6: Erie Income Turning Points

<u>Peaks</u>	<u>Troughs</u>
1973	1975
1978	1983
1989	1991

Table 7: Average Overall Amplitude

<u>Average</u>	<u>Amplitude</u>
Peak	4.37
Trough	-1.42
Amplitude	5.79

When compared to the real Erie income, the retail sales cycle experiences a much greater deviation from trend, with an amplitude over two and half times more severe than that of Erie income. Retail sales also have a wider range of percentage deviation than real income, with a 30.05% range as opposed to the 13.13% range of real Erie income.

### D. Elasticity

While amplitude is a measure of the cyclical variation of a variable from trend, elasticity is a measure of the percentage change in one variable in comparison to the percentage change of another variable. It is a useful way to look at two different variables and see how they relate. In this case, the two variables are retail sales and income. An overall income elasticity calculation for the time period using real retail sales and real aggregate income results in an elasticity of 1.02. Using nominal data the result was 1.01.

This time period can also be broken up according to turning points in the real income data. These time periods lend themselves to elasticity calculations, the results of which are shown below in Table 8. For example, the elasticity of total retail sales over the period from 1969-1973 was .68. This means that if income went up by 1%, total retail sales went up by .68%. An elasticity less than one indicates that the demand for the good is inelastic. An inelastic good is one whose sales are not affected greatly by income. On the other hand, total retail sales from 1978-1983 had an elasticity of 1.13. An elasticity amount greater than one indicates that the good is elastic and will be influenced significantly by a change in income. The greater the elasticity amount, the more responsive the good is to changes in income. A negative elasticity means that demand and income move in opposite directions. For example, the elasticity of total retail sales was -8.32 from 1989 to 1991. This means that a drop of 1% in income would result in an increase of 8.32% in retail sales.

Table 8: Elasticity

	Total <u>Retail</u>	General <u>Merch</u>	<u>Food</u>	<u>Autos</u>	<u>Furniture</u>	Eating & <u>Drinking</u>	<u>Drug</u>
1969-1973	0.68	-0.29	0.61	0.92	0.72	-5.33	0.39
1973-1975*	-21.65	-61.68	-26.11	-21.41	1.91	NA	-21.32
1975-1978	-0.52	-1.70	-0.88	1.57	-1.14	-0.92	-1.50
1978-1983*	1.13	2.31	2.80	3.17	0.31	-1.45	-1.04
1983-1989	0.74	-0.05	2.59	1.61	0.31	1.89	3.87
1989-1991*	-8.32	-1.04	-10.56	-17.87	9.46	-14.96	13.94
1991-1997	3.78	3.32	2.11	10.62	-1.01	-0.39	-10.66

\*Periods of Recession

Erie also experienced three recessions over this time period. The elasticities of retail sales during these recessions are also shown in Table 8. The end points selected when calculating this elasticity go from the peak of the cycle to the following trough. For example:

$$\text{Elasticity} = (\% \text{ change in Retail Sales}) / (\% \text{ change in Income})$$

Example calculation: Total Retail for 1969-1973

$$\text{Elasticity} = 12.67\% / 18.75\%$$

$$= .68$$

### **E. Timing**

Turning points in retail sales, when compared to turning points of the overall economy, could possibly be used as an indicator. If retail sales turn before the economy, they would be considered a leading indicator. If retail sales turned after the economy, they would be a lagging indicator. Table 9 gives the years of the turning points for income and retail sales in the Erie economy.

Table 9: Turning Points

Income Peak	Income Trough	Retail Peak	Retail Trough	Retail Sales
		1966		
			1971	
1973		1974		Lagged by 1 year
	1975			
1978				
	1983		1982	Led by 1 year
1989		1987		Led by 2 years
	1991		1991	Coincident

The timing of the turning points for Erie income and retail sales do not seem to follow a set pattern. Retail sales can lag at one peak and lead at the next. The pattern is not sufficient to say that overall retail sales either lead or lag income consistently.

The timing at the troughs is a little clearer, with retail sales leading in 1982 by one year and turning at the same time in 1991. This relationship at the troughs suggests that retail sales are somewhat of a leading indicator for the Erie economy. When retail sales in Erie begin to turn up it is a sign that income may also be increasing. However, this conclusion is based on only two observations and cannot be used with great certainty.

### **III. THE RETAIL DISAGGREGATES**

#### **A. The Disaggregates**

While it is useful to look at the total retail sales for the Erie MSA, the patterns in each of the retail sections also have a story to tell. As determined by the Survey of Buying Power, there are six main sectors that make up the retail industry in Erie: general merchandise, food, automotives, furniture, eating and drinking, and drug. These different sectors make up different percentages of the industry and have very different cycles. It is important to remember that these six disaggregates are not the only sectors that make up total retail sales.

Table 10 provides the descriptions for the SIC codes in the Retail trade industry. The two-digit and three-digit codes provide greater industrial breakdown and clarify which specific businesses fall under the disaggregated industries. Knowing what is included under each of the sectors makes a significant difference. For example, the definition for industry 57 is furniture and home furnishing stores. However, if you look at the three digit industries that fall under this category, this sector also includes appliances and computer stores. Without looking closely at the industry definitions, it seems natural to assume that this sector contains only home furnishing stores. It is also important to understand the definition of the auto sector. The three-digit industries in this category include not only new and used car dealers as can be expected, but also service stations, boat dealers, recreational vehicle dealers, and motorcycle dealers. One of the disaggregates that is different from the others is drug stores. This sector is actually a three-digit industry while the others are two-digit industries.

Table 10: Standard Industry Codes, Retail Trade

<b>52</b>	<b>Building materials and garden supplies stores</b>
521	Lumber and other building materials
523	Paint, glass, and wallpaper stores
525	Hardware stores
526	Retail nurseries, lawn and garden supply stores
527	Mobile home dealers
<b>53</b>	<b>General merchandise stores</b>
531	Department Stores
533	Variety stores
539	Miscellaneous general merchandise stores
<b>54</b>	<b>Food stores</b>
541	Grocery stores
542	Meat and fish (seafood) markets
543	Fruit and vegetable markets
544	Candy, nut, and confectionery stores
545	Dairy products stores
546	Retail bakeries
549	Miscellaneous food stores
<b>55</b>	<b>Automotive dealers and service stations</b>
551	New and used motor vehicle dealers
552	Used motor vehicle dealers
553	Auto and home supply stores
554	Gasoline service stations
555	Boat dealers
556	Recreational vehicle dealers
557	Motorcycle dealers
559	Automotive dealers, not elsewhere classified
<b>56</b>	<b>Apparel and accessory stores</b>
561	Men's and boys' clothing and accessory stores
562	Women's clothing stores
563	Women's accessory and specialty stores
564	Children's and infants' wear stores
565	Family clothing stores
566	Shoe Stores
569	Miscellaneous apparel and accessory stores
<b>57</b>	<b>Furniture and home furnishings stores</b>
571	Furniture and home furnishings stores
572	Household appliance stores
573	Radio, television and computer stores
<b>58</b>	<b>Eating and drinking places</b>
581	Eating and drinking places
<b>59</b>	<b>Miscellaneous retail stores</b>
591	Drug and proprietary stores
592	Liquor stores
593	Used merchandise stores
594	Miscellaneous shopping goods stores
596	Nonstore retailers
598	Fuel dealers

Source: U.S. Census Bureau website (<http://www.census.gov>)



## **B. The Retail Database**

Table 11 lists the sales figures in nominal terms, as they are published in the Survey of Buying Power. However, to make comparisons between the different years, it is important to look at the data in terms of real sales. To compensate for inflation over the three decades it is necessary to adjust the data by using the Consumer Price Index (CPI), which can be obtained at the U.S. Bureau of Labor Statistics website at <ftp://ftp.bls.gov/pub/special.requests/cpi/cpi.ai.txt>. To convert a value from nominal to real involves dividing the nominal amount by the CPI value. The yearly average CPI values are used for the annual calculations. It is necessary to divide the CPI value by 100 to show the number in decimal terms rather than as a percentage. The resulting amount can then be called “1983 dollars” since the base year for the CPI is 1982-1984. An example calculation is shown below:

$$\text{Real} = \text{Nominal} / (\text{CPI value for given year} / 100)$$

Example Calculation: 1963 Drug Sales in real dollars

$$\begin{aligned} \text{Real 1963 Drug Sales} &= \text{Nominal 1963 Drug Sales} / (1963 \text{ CPI Value}/100) \\ &= \$ 9,777,000 / (30.6/100) \\ &= \$ 31,951,000 \end{aligned}$$

After doing the conversion it is clear that \$9,777,000 in 1963 is the equivalent of \$31,951,000 in 1983.

Sales for each of the disaggregates for the years 1963 until 1998 are shown in Tables 11 and 12, and real sales are pictured in Figure 6. It is important to note that data for the eating and drinking sector were not collected during the years from 1970 until 1974, and that starting in 1995 data were not collected for the drug sector.

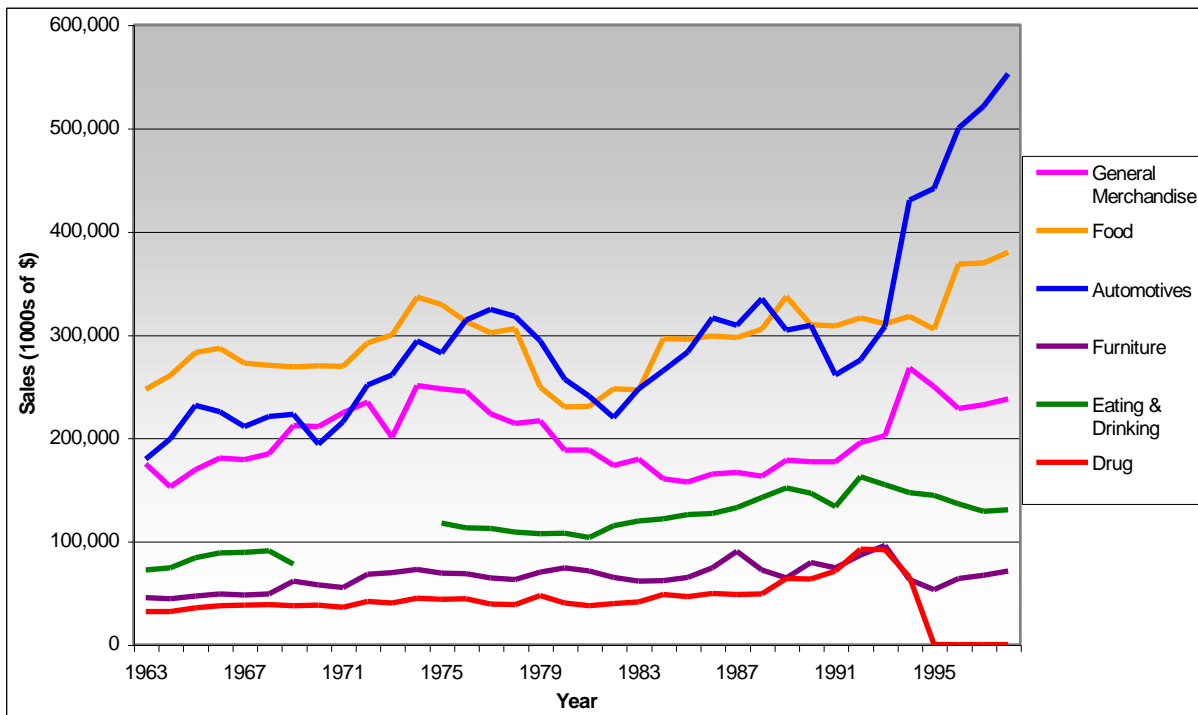
Table 11: Nominal Erie Retail Sales  
(In thousands of dollars)

		53	54	55	57	58	591
	<u>Total</u>	<u>General</u> <u>Mdse</u>	<u>Food</u>	<u>Automotives</u>	<u>Furniture</u>	<u>Eating &amp;</u> <u>Drinking</u>	<u>Drug</u>
1963	312,431	53,505	75,582	55,008	13,864	22,027	9,777
1964	326,133	47,345	80,780	61,796	13,765	22,973	9,947
1965	366,343	53,383	89,031	73,031	14,790	26,435	11,289
1966	386,343	58,454	92,978	73,110	15,876	28,752	12,155
1967	385,634	59,832	90,969	70,521	16,046	29,726	12,715
1968	408,835	64,271	94,110	76,812	17,025	31,637	13,384
1969	433,935	77,774	98,648	81,784	22,551	28,558	13,845
1970	444,678	81,864	104,774	75,273	22,392		14,766
1971	469,558	90,841	109,094	87,343	22,434		14,692
1972	542,725	98,083	121,960	104,973	28,457		17,408
1973	591,492	89,043	132,973	115,957	30,945		17,971
1974	724,450	123,505	165,744	144,935	35,888		22,254
1975	775,641	133,160	177,095	151,926	37,224	63,178	23,538
1976	829,818	139,500	177,827	178,884	39,026	64,351	25,127
1977	855,459	135,246	182,952	196,746	39,125	68,264	23,911
1978	901,087	139,446	199,617	207,272	40,999	70,961	25,111
1979	1,029,817	157,156	180,822	213,555	51,100	78,008	34,608
1980	1,079,626	155,191	189,609	211,555	61,085	88,973	33,297
1981	1,149,770	171,042	209,744	218,310	64,875	94,115	34,096
1982	1,212,040	167,236	238,930	211,973	62,935	111,179	38,437
1983	1,268,130	178,809	245,519	246,783	61,294	119,342	41,126
1984	1,371,644	166,859	307,557	275,509	64,271	126,401	50,205
1985	1,431,057	169,249	318,335	304,999	70,095	135,421	49,874
1986	1,499,920	180,758	327,284	346,443	81,602	139,224	54,311
1987	1,596,238	189,116	337,823	362,600	102,531	150,448	55,218
1988	1,673,366	192,659	361,290	396,084	85,298	168,356	57,920
1989	1,743,543	221,142	417,617	377,442	79,706	188,296	79,202
1990	1,812,577	231,088	404,625	403,586	103,993	191,226	83,004
1991	1,788,155	240,886	420,105	355,544	101,126	182,161	96,657
1992	2,094,906	274,416	443,758	386,380	121,349	228,307	129,618
1993	2,186,672	291,919	448,528	444,869	138,331	223,557	132,882
1994	2,429,544	396,696	471,336	637,855	93,331	217,558	96,769
1995	2,490,154	380,600	465,788	673,248	80,604	219,838	
1996	2,750,285	358,893	577,646	784,040	100,767	213,552	
1997	2,854,497	372,215	592,993	836,424	107,899	206,844	
1998	3,005,749	387,958	618,983	900,252	116,248	213,125	

Table 12: Real Erie Retail Sales  
Adjusted for Inflation (1982-84 = 100)  
(In thousands of dollars)

<u>Year</u>	<u>Total Retail</u>	53 <u>General Mdse</u>	54 <u>Food</u>	55 <u>Automotives</u>	57 <u>Furniture</u>	58 <u>Eating &amp; Drinking</u>	591 <u>Drug</u>
1963	1,021,016	174,853	247,000	179,765	45,307	71,984	31,951
1964	1,052,042	152,726	260,581	199,342	44,403	74,106	32,087
1965	1,162,994	169,470	282,638	231,844	46,952	83,921	35,838
1966	1,192,417	180,414	286,969	225,648	49,000	88,741	37,515
1967	1,154,593	179,138	272,362	211,141	48,042	89,000	38,069
1968	1,174,813	184,687	270,431	220,724	48,922	90,911	38,460
1969	1,182,384	211,918	268,796	222,845	61,447	77,815	37,725
1970	1,146,077	210,990	270,036	194,003	57,711		38,057
1971	1,159,402	224,299	269,368	215,662	55,393		36,277
1972	1,298,385	234,648	291,770	251,132	68,079		41,646
1973	1,332,189	200,547	299,489	261,164	69,696		40,475
1974	1,469,473	250,517	336,195	293,986	72,795		45,140
1975	1,441,712	247,509	329,173	282,390	69,190	117,431	43,751
1976	1,458,380	245,167	312,525	314,383	68,587	113,095	44,160
1977	1,411,649	223,178	301,901	324,663	64,563	112,647	39,457
1978	1,382,035	213,874	306,161	317,902	62,882	108,836	38,514
1979	1,418,481	216,468	249,066	294,153	70,386	107,449	47,669
1980	1,310,226	188,339	230,108	256,742	74,132	107,977	40,409
1981	1,264,873	188,165	230,741	240,165	71,370	103,537	37,509
1982	1,256,000	173,302	247,596	219,661	65,218	115,211	39,831
1983	1,273,223	179,527	246,505	247,774	61,540	119,821	41,291
1984	1,320,158	160,596	296,013	265,167	61,859	121,656	48,321
1985	1,329,979	157,295	295,850	283,456	65,144	125,856	46,351
1986	1,368,540	164,925	298,617	316,098	74,454	127,029	49,554
1987	1,405,139	166,475	297,379	309,190	90,256	132,437	48,607
1988	1,414,511	162,856	305,402	334,813	72,103	142,313	48,960
1989	1,406,083	178,340	336,788	304,389	64,279	151,852	63,873
1990	1,386,822	176,808	309,583	308,788	79,566	146,309	63,507
1991	1,312,889	176,862	308,447	261,046	74,248	133,745	70,967
1992	1,493,162	195,592	316,292	275,396	86,493	162,728	92,386
1993	1,513,268	202,020	310,400	307,868	95,731	154,711	91,960
1994	1,639,368	267,676	318,040	430,401	62,976	146,800	65,296
1995	1,633,959	249,738	305,635	441,764	52,890	144,251	
1996	1,752,890	228,740	368,162	499,707	64,224	136,107	
1997	1,778,503	231,910	369,466	521,136	67,227	128,875	
1998	1,844,018	238,011	379,744	552,302	71,318	130,752	

Figure 6: Real Disaggregated Retail Sales for Erie



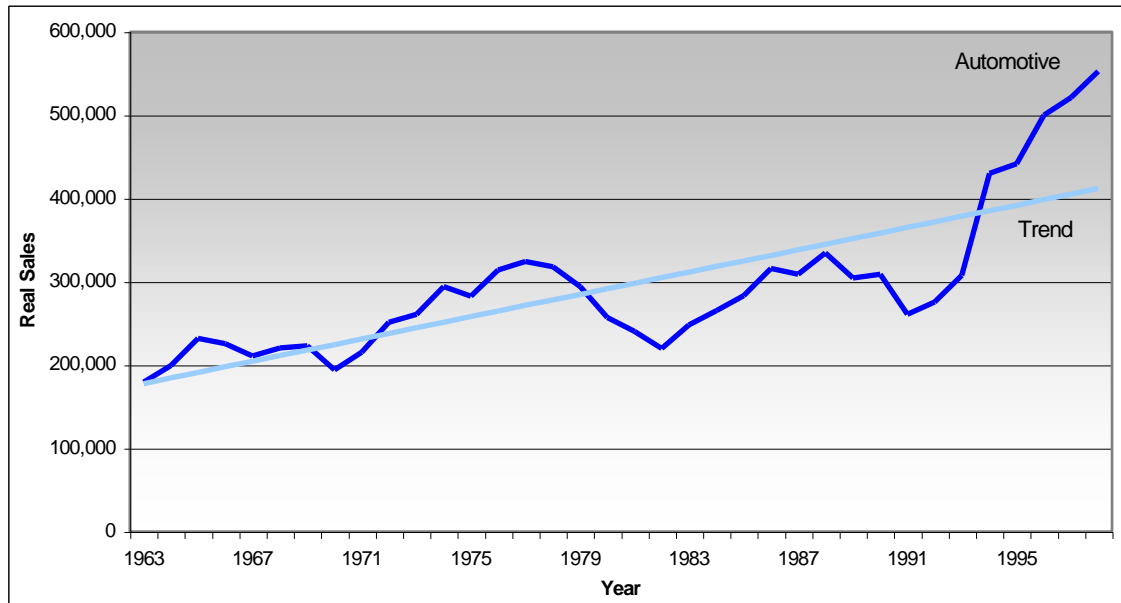
### C. Disaggregate Analysis

The majority of Erie's retail sales come from the automotive and food sectors, followed closely by general merchandise. Eating and drinking establishments were not noticeably affected by changes in the overall economy and had very little cyclical change. Similarly, the furniture and drug industries did not experience much change during recessions or upturns in the economy. It should also be noted that these three industries contribute a much smaller amount to total retail sales than the larger industries. The average retail sales from the furniture, eating and drinking, and drug sectors combined were still less than either food or automotives alone.

The disaggregated sectors of the retail industry can be analyzed just as total sales were. By detrending the disaggregated series it is possible to pick out turning points for each of the six sectors of the industry. As an example, the automotive sector will be used to demonstrate the techniques.

## 1. Cycle Analysis

Figure 7: Automotive Sales in Erie with Trend



$$\begin{aligned} \text{Automotive sales} &= 171,080 + 6,693 * \text{time} \\ &\quad (t=8.71) \quad (t=7.23) \\ &\quad R^2 = .61 \\ &\quad n = 36 \quad (1963 = 1) \\ &\quad (\text{Dollar amounts are in thousands}) \end{aligned}$$

According to the trend line, automotive sales in Erie increase at a rate of \$6,693,000 per year. This growth rate is about 1.21% of the most current sales figures for 1998. The t-statistics greater than 2 indicate that the coefficients are statistically significant. The  $R^2$  value of .61 suggests a reasonable goodness of fit of the trend line and the actual data. Only the eating and drinking and drug sector had a higher  $R^2$  value than automobiles.

The cycles of the individual disaggregates vary widely. The turning points of these cycles are chosen based on the percentage deviation from trend, which are listed in Table 13. The percentage deviations from trend for automobiles are displayed in Figure 8. To compare the deviations of the automotive sector with total retail sales, Figure 9 shows the two series together. From the graph it appears that automobiles tend to turn at nearly the same time as the total retail industry.

Table 13: Percentage Deviation from Trend for Erie Retail Sale Disaggregates

<u>Year</u>	<u>Total Retail</u>	<u>53 General Merch</u>	<u>54 Food</u>	<u>55 Automotives</u>	<u>57 Furniture</u>	<u>58 Eating &amp; Drinking</u>	<u>591 Drug</u>
1963	-6.99	-8.07	-4.80	1.12	-14.90	-8.48	15.19
1964	-5.48	-19.94	-0.35	8.06	-17.68	-8.23	10.63
1965	3.07	-11.43	7.25	21.28	-14.07	1.28	18.39
1966	4.27	-5.99	8.06	14.05	-11.46	4.45	18.96
1967	-0.38	-6.93	1.78	3.22	-14.28	2.23	16.06
1968	0.05	-4.34	0.29	4.49	-13.78	1.96	12.89
1969	-0.60	9.45	-1.07	2.25	6.97	-14.74	6.76
1970	-4.88	8.64	-1.35	-13.63	-0.75		3.98
1971	-4.98	15.16	-2.32	-6.77	-5.87		-4.20
1972	5.09	20.12	5.03	5.51	14.32		6.42
1973	6.51	2.36	7.02	6.73	15.68		0.19
1974	16.06	27.50	19.27	16.94	19.43		8.34
1975	12.51	25.60	15.94	9.41	12.22	13.05	1.91
1976	12.47	24.05	9.29	18.73	10.00	6.71	-0.09
1977	7.59	12.60	4.82	19.59	2.39	4.22	-13.21
1978	4.12	7.59	5.56	14.28	-1.37	-1.22	-17.58
1979	5.65	8.59	-14.73	3.26	9.20	-4.31	-0.68
1980	-3.51	-5.79	-21.77	-11.94	13.77	-5.60	-17.97
1981	-7.89	-6.15	-22.09	-19.48	8.36	-11.12	-25.77
1982	-9.55	-13.81	-16.97	-27.97	-2.02	-2.85	-23.10
1983	-9.31	-10.97	-17.90	-20.49	-8.51	-0.72	-22.18
1984	-6.98	-20.58	-2.07	-16.70	-8.98	-0.93	-11.05
1985	-7.29	-22.43	-2.78	-12.79	-5.13	0.77	-16.62
1986	-5.60	-18.90	-2.53	-4.71	7.33	0.02	-12.85
1987	-4.09	-18.37	-3.57	-8.64	28.81	2.58	-16.38
1988	-4.45	-20.36	-1.62	-2.98	1.88	8.47	-17.56
1989	-5.99	-13.04	7.78	-13.48	-10.06	13.91	5.30
1990	-8.22	-14.02	-1.57	-13.86	10.24	8.05	2.56
1991	-13.98	-14.24	-2.56	-28.52	1.88	-2.74	12.31
1992	-3.14	-5.42	-0.72	-25.94	17.56	16.56	43.33
1993	-2.81	-2.58	-3.19	-18.68	28.88	9.17	39.92
1994	4.27	28.73	-1.44	11.72	-16.01	2.08	-2.53
1995	2.92	19.77	-5.88	12.71	-30.11	-1.14	
1996	9.36	9.40	12.67	25.35	-15.92	-8.05	
1997	9.91	10.62	12.37	28.57	-12.79	-14.15	
1998	12.89	13.22	14.78	34.04	-8.31	-14.11	

Figure 8: Percentage Deviation from Trend, Automotives

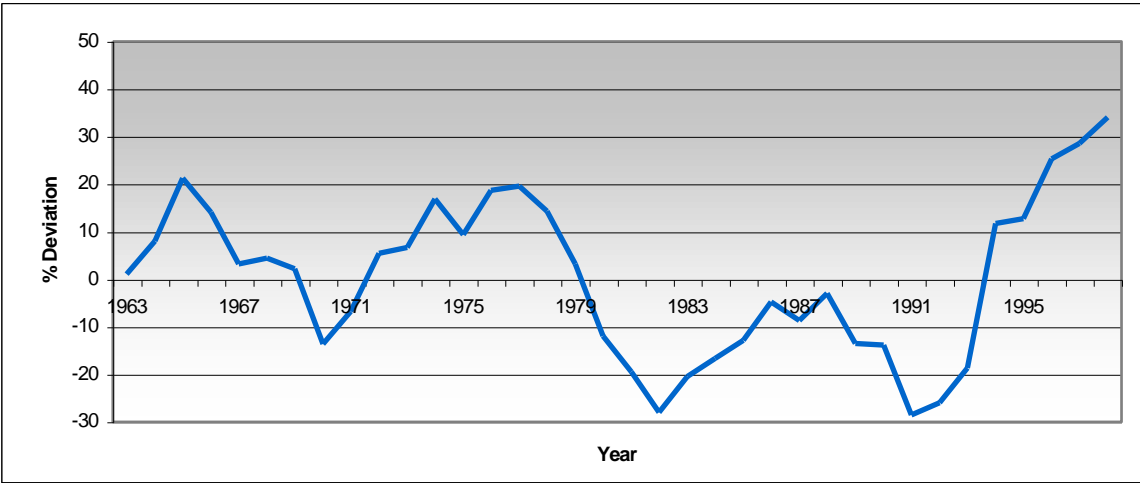
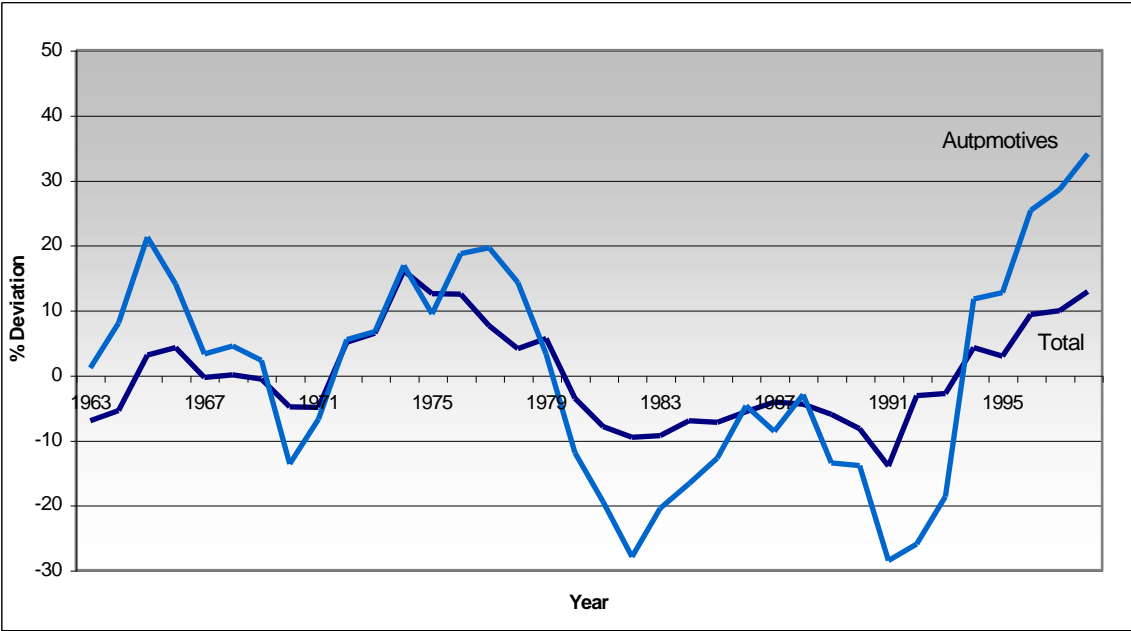


Figure 9: Percentage Deviation from Trend, Automotives and Total Retail



## 2. Timing

Table 14: Turning Points of Erie Retail Disaggregates

	Total Retail	Genl Merch	Food	Auto	Furn	Eating & Drinking	Drug
Peak	1966		1966	1965		1965	1966
Trough	1971	1964	1971	1970	1964		1971
Peak	1974	1974	1974	1977	1974		1974
Trough					1978		1978
Peak					1980		1979
Trough	1982	1985	1981	1982	1984	1981	1981
Peak	1987		1989	1988	1987	1989	1984
Trough	1991			1991	1989	1991	1988
Peak		1994			1993	1992	1992
Trough			1995		1995		

Table 14 shows the turning points for each of the disaggregates as well as for total retail sales in Erie. The automotive sector appears to have six major turning points, the same amount as total retail. The timing of the disaggregates can be compared to both the income turning points for the Erie economy and the turning points of total retail sales. Comparing each disaggregate to the income turning points shows how the sector matches up to the overall economy, while comparing them to total retail sales shows what kind of impact that particular disaggregate has on the total. The numbers listed, such as “Lag 1” or “Lead 1” indicate the number of years that the sector leads or lags the cycle it is being compared to. In Table 15, the amount indicates how many years the sector leads or lags income. For example, at the income peak in 1973 total sales lagged by one year, which means that total retail sales did not reach a peak until 1974.

Table 15: Timing of Erie Retail Disaggregates to Income  
(in years)

	Income	Total Retail	Genl Merch	Food	Auto	Furn	Eating & Drinking	Drug
Peak	1973	Lag 1	Lag 1	Lag 1	Lag 4	Lag 1		Lag 1
Trough	1975				Lag 2	Lag 3		Lag 3
Peak	1978					Lag 2		Lag 1
Trough	1983	Lead 1	Lag 2	Lead 2	Lead 1	Lag 1	Lead 2	Lead 2
Peak	1989	Lead 2		Coincident	Lead 1	Coincident	Coincident	Lead 5
Trough	1991	Coincident			Coincident	Coincident	Coincident	Lead 3



Table 16: Timing of Disaggregates to Total Erie Retail Sales  
(in years)

	Total Retail	Genl Merch	Food	Auto	Furn	Eating & Drinking	Drug
Peak	1966		Coincident	Lead 1			Coincident
Trough	1971		Coincident	Lead 1			Coincident
Peak	1974	Coincident	Coincident	Lag 3	Coincident		Coincident
Trough	1982	Lag 3	Lead 1	Coincident	Lag 2	Lead 1	Lead 1
Peak	1987		Lag 2	Lag 1	Coincident	Lag 2	Lead 3
Trough	1991			Coincident	Lead 2	Coincident	Lead 3

It is difficult to make comparisons with the disaggregated cycles because of the drastic differences in the number of turning points. For example, general merchandise has very few turning points – only three – in its cycle while the drug category has nine turning points. Some of the disaggregates match up very closely to the total sales, such as food and drug. These two sectors have coincident turning points with the total for the years 1966, 1971, and 1974.

### 3. Amplitude

Using the average deviation at the peaks and troughs for each cycle, an average amplitude can be calculated for each of the disaggregates. This technique is the same that was used for the total retail sales in section II. Table 17 lists the amplitudes for the six disaggregates in comparison to total retail sales.

Table 17: Amplitude of Retail Disaggregates

	Total Retail	Genl Merch	Food	Auto	Furn	E&D	Drug
<u>Average</u>							
Peak	5.43	28.12	11.70	12.63	22.72	10.58	11.78
Trough	-9.50	-21.19	-10.10	-23.37	-13.64	-6.93	-16.28
Amplitude	<b>14.93</b>	<b>49.30</b>	<b>21.80</b>	<b>36.00</b>	<b>36.36</b>	<b>17.51</b>	<b>28.06</b>

All six of the disaggregates have cycles more severe than that of total retail sales. Eating and drinking has the most controlled amplitude at 17.51%, but general merchandise varies greatly with an amplitude of 49.30%. This is much more severe than the 14.93% amplitude of total retail. The amplitude of Automotives is one of the more severe of the six, lower only than that of furniture and general merchandise.

It is unclear why all the disaggregated industries are more severe than total retail sales. One possibility is that some of the industries are countercyclical, in which case a severe peak in one industry may be offset by a trough in another industry. Once again it is important to remember that not all of the two-digit industries under retail sales are covered in this report. It is possible that the industries which are not covered in the Survey of Buying Power – building materials and apparel stores – are more stable and counter the cycles of the stated retail disaggregates.

As shown earlier with total retail sales, it is also possible to calculate the amplitude of the phases. Table 18 shows the average amplitude for recessions and upturns in the economy for the disaggregates and total retail. Using automobiles as an example, this table means that the average recession saw a 36% drop in retail sales. The average recovery period saw an increase of 29.11% in real retail sales.

Table 18: Amplitude for the Phases

<u>Average</u>	<u>Total Retail</u>	<u>Genl Merch</u>	<u>Food</u>	<u>Auto</u>	<u>Furn</u>	<u>E&amp;D</u>	<u>Drug</u>
Peak-Trough	-14.93	-49.93	-21.80	-36.00	-35.35	-14.53	-20.17
Trough-Peak	13.27	49.30	25.73	29.11	32.25	22.17	26.26

## IV. RETAIL INDUSTRY BREAKDOWN

### A. Summary

Now that the techniques for analyzing the retail disaggregates have been explained, this section will take each of the other sectors and explain them in more detail. Table 19 presents some of the key components of each major retail sector. The trend growth rate is determined from the slope of the trend line.

Table 19: Comparison of Disaggregates  
(Dollar amounts in thousands)

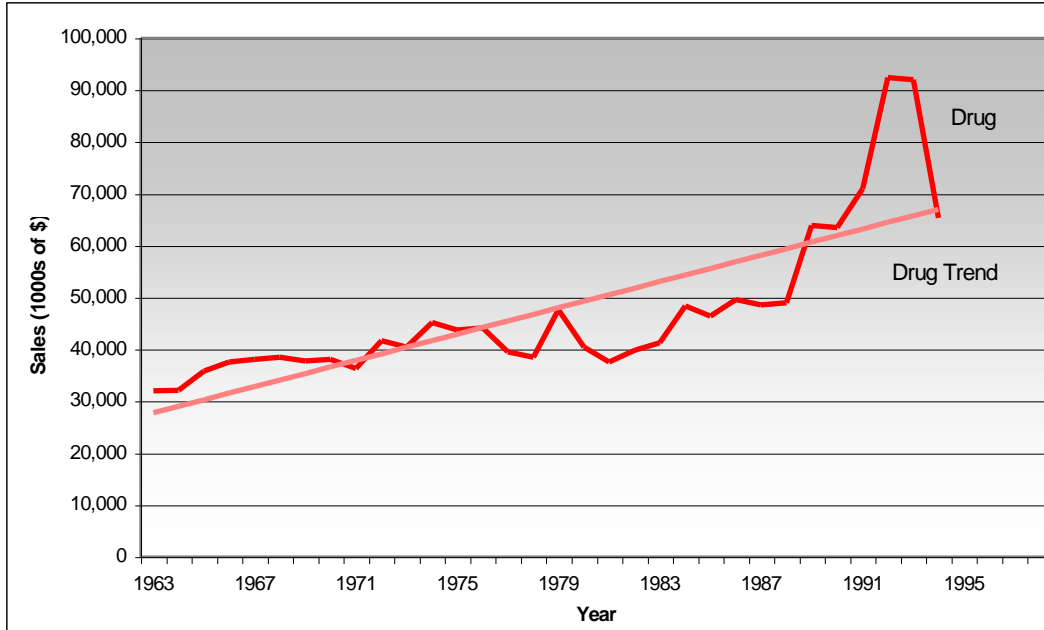
<u>Sector</u>	<u>R<sup>2</sup> Value</u>	<u>Trend Growth Rate (dollars)</u>	<u>Current Sales * (dollars)</u>	<u>Growth as % of Current Sales</u>	<u># Turning Points</u>	<u>Average Deviation From Trend (percent)</u>	<u>Average Amplitude (percent)</u>
General Merch.	0.036	572	238,011	0.24	4	13.52	49.30
Food	0.345	2,040	379,744	0.54	6	7.31	21.80
Autos	0.606	6,694	552,302	1.21	6	14.11	36.00
Furniture	0.377	701	71,318	0.98	9	11.69	36.36
Eating & Drinking	0.828	2,102	130,752	1.61	5	5.39	17.51
Drug **	0.616	1,266	65,296	1.94	9	13.28	28.06

\* Current sales data from 1998 except drug

\*\* Current drug sector data from 1994

## B. Drug

Figure 10: Drug Sales with Trend



$$\begin{aligned} \text{Drug Sales} &= 26,472 + 1,266.13 * \text{time} \\ &\quad (t = 7.68) \quad (t = 6.94) \\ R^2 &= .616 \\ n &= 32 \quad (1963 = 1) \\ &\quad \text{(Dollar amounts in thousands)} \end{aligned}$$

Figure 11: Percentage Deviation from Trend, Drug

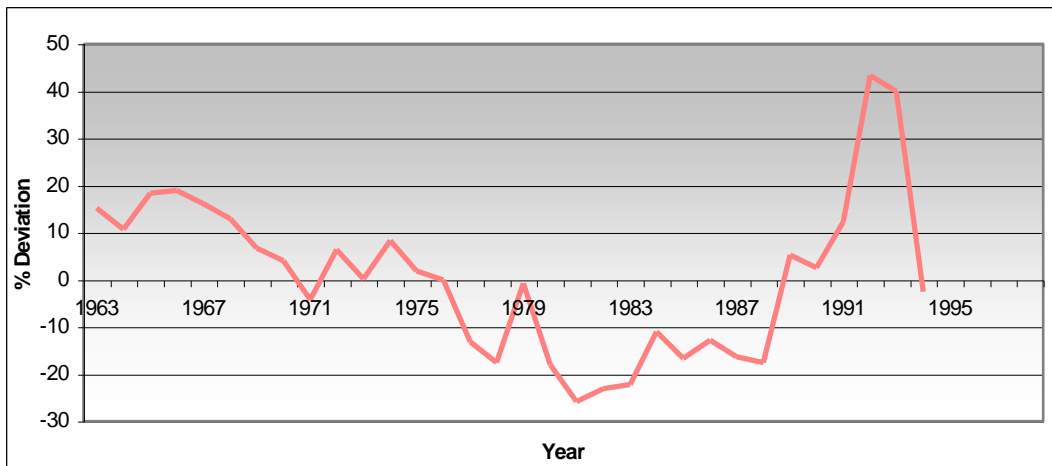
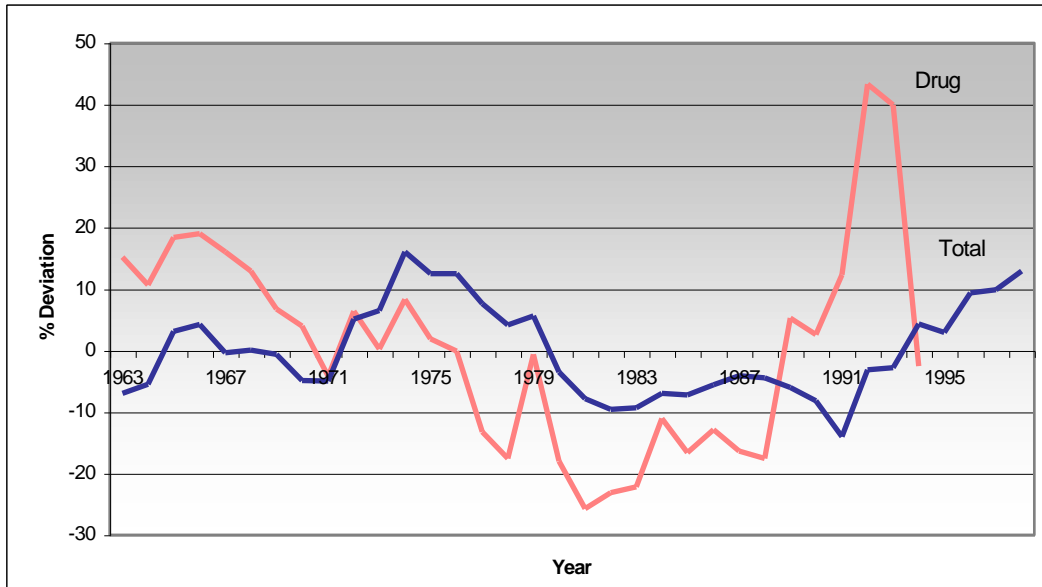


Figure 12: Percentage Deviation from Trend, Drug and Total Retail Sales



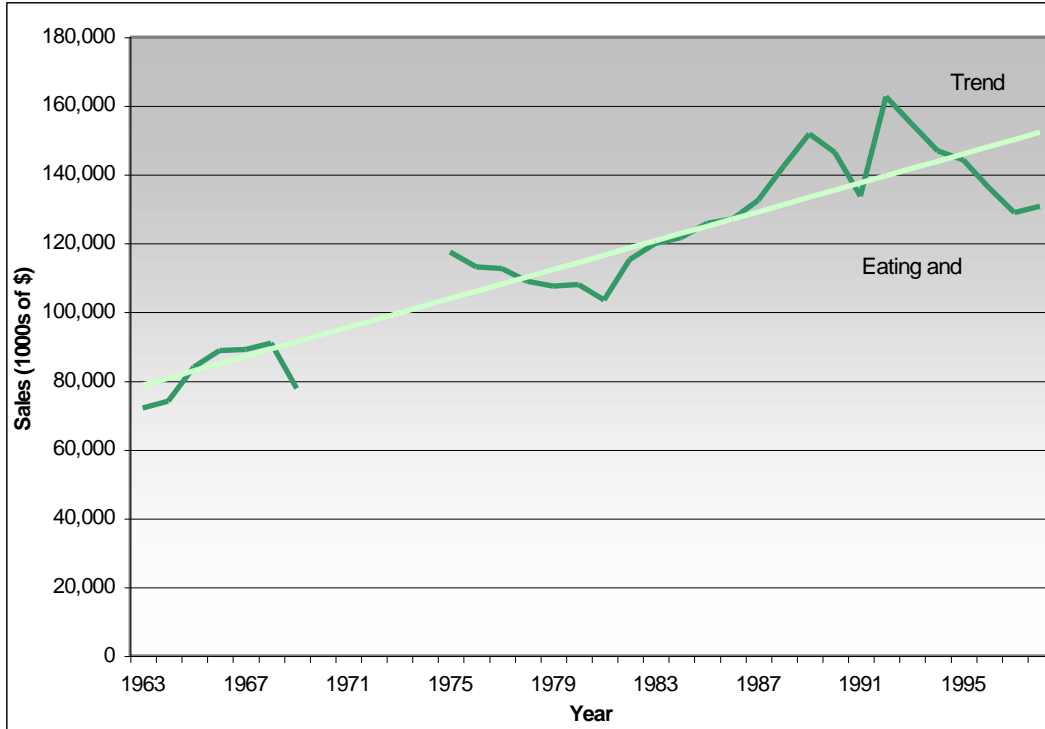
Of all the retail sectors, drugs made up the smallest percentage of retail trade. However, it also had one of the best fits to its trend line with an  $R^2$  value of .616. The amplitude of the drug cycle was also calmer than most of the others, deviating from trend on an average of 28.06%. The drug cycle was also very cyclical, experiencing nine major turning points from 1963 until 1994.

When compared to the other sectors of retail, drug sales grew at a steady pace. The trend line indicates that sales are increasing by about \$1,266,000 annually. In relative terms, automobiles, the fastest growing sector, is increasing over five times faster, but both furniture and general merchandise are growing at a slower pace. Data for drug sales were not published by *Sales and Marketing Management* after 1994.

The 1994 annual sales figures of \$65,296,000 and the trend growth rate of \$1,226,130 can be used to calculate growth as a percentage of current sales. When growth is looked at this way, drug is the fastest growing of the sectors. Trend growth was approximately 1.94% of 1994 drug sales.

**C. Eating and Drinking**

Figure 13: Eating and Drinking with Trend



$$\text{Eating and drinking sales} = 76,550.56 + 2,102.006 * \text{time}$$

$$(t = 19.11) \quad (t = 11.81)$$

$$R^2 = .828$$

$$n = 31 \quad (1963 = 1)$$

(Dollar amounts in thousands)

Figure 14: Percentage Deviation from Trend, Eating and Drinking

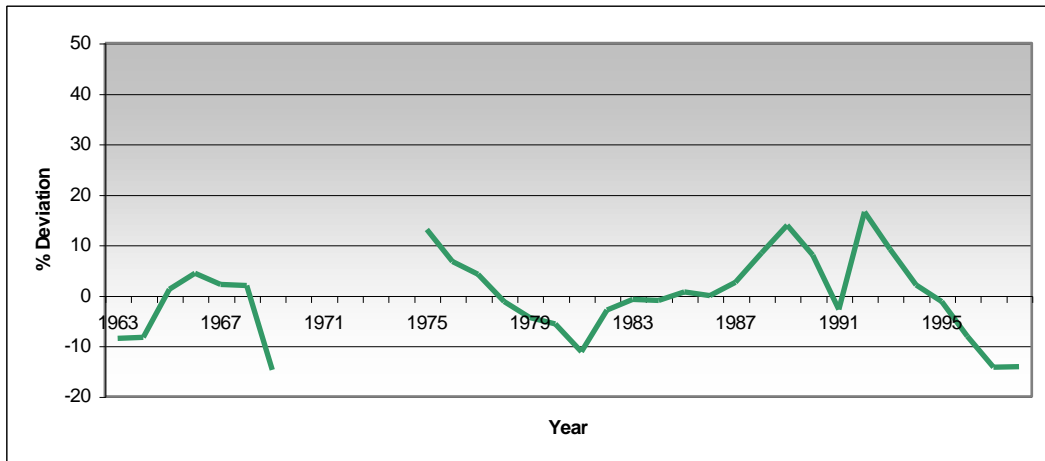
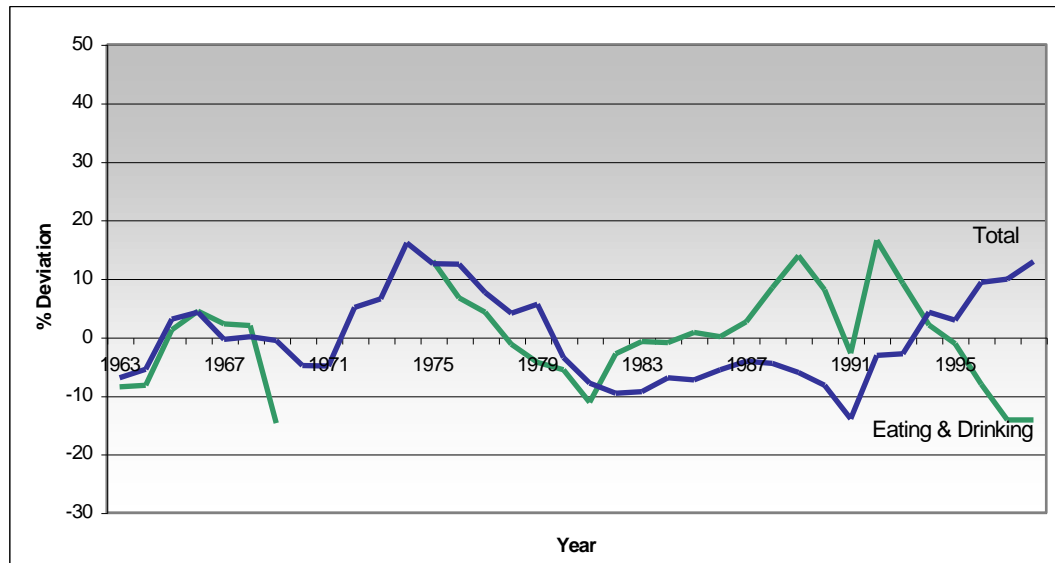


Figure 15: Percentage Deviation from Trend, Eating and Drinking and Total Retail Sales

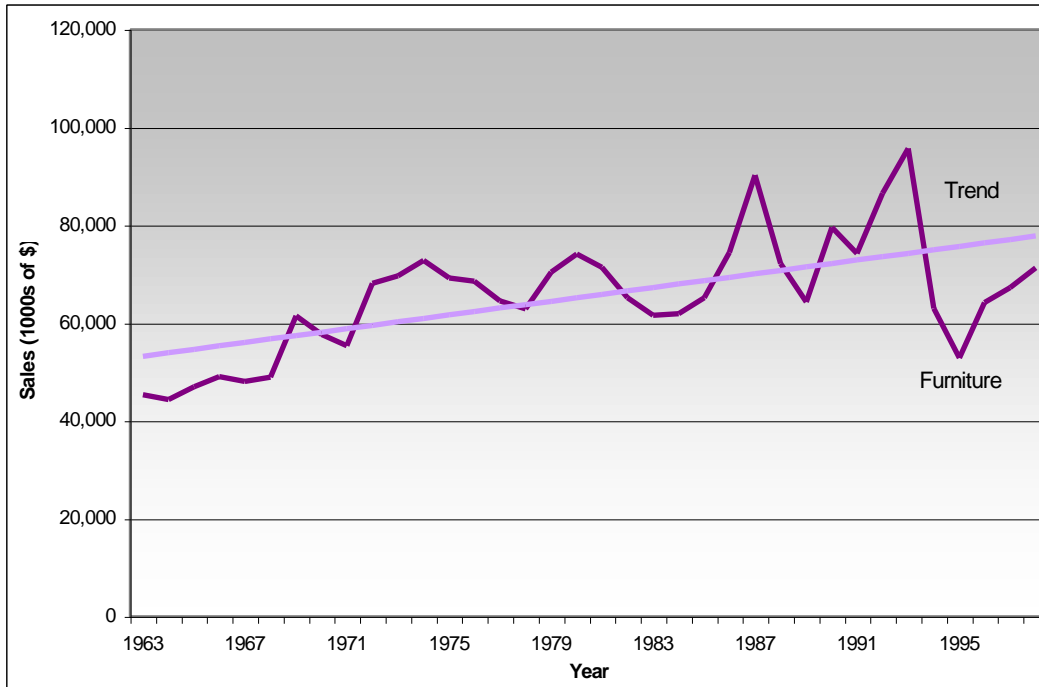


Eating and drinking sales were not greatly affected by cyclical patterns and had fairly small deviation from trend. The average amplitude of the eating and drinking cycle was 17.51%, the least severe of all the disaggregates. The trend line for eating and drinking had to be modified to account for the missing data from 1970 to 1974 when this information was not collected. Its goodness of fit was .828, which was the highest of all the six disaggregates. However, because of the missing data only five noticeable turning points could be selected.

Sales within this sector are growing at a rate of approximately \$2,102,000 per year, a growth rate second only to automobiles in relative terms. As a percentage of current sales, this growth rate is the second highest of the six disaggregates at 1.61% of 1998 eating and drinking sales. However, eating and drinking sales have been falling since 1992, and have been below trend since 1995.

**D. Furniture**

Figure 16: Furniture with Trend



$$\begin{aligned} \text{Furniture sales} &= 52,535.92 + 701.34 * \text{time} \\ &\quad (t = 16.01) \quad (t = 4.54) \\ R^2 &= .377 \\ n &= 36 \quad (1963 = 1) \\ &\text{(Dollar amounts in thousands)} \end{aligned}$$

Figure 17: Percentage Deviation from Trend, Furniture

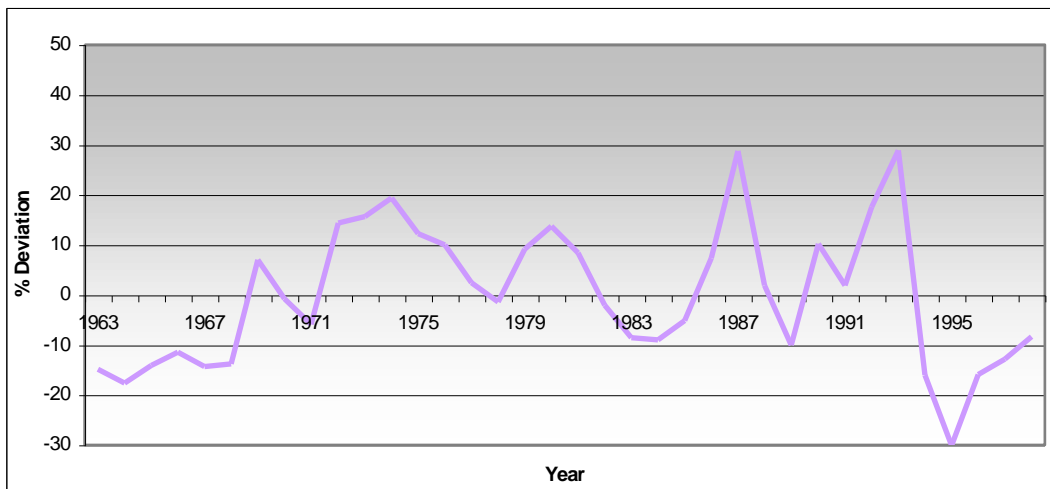
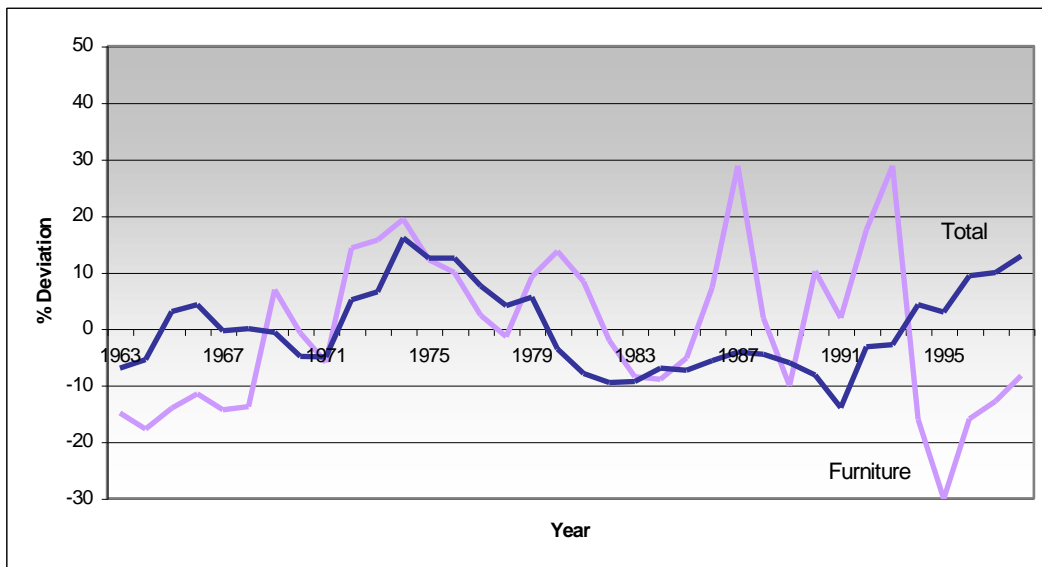




Figure 18: Percentage Deviation from Trend, Furniture and Total Retail

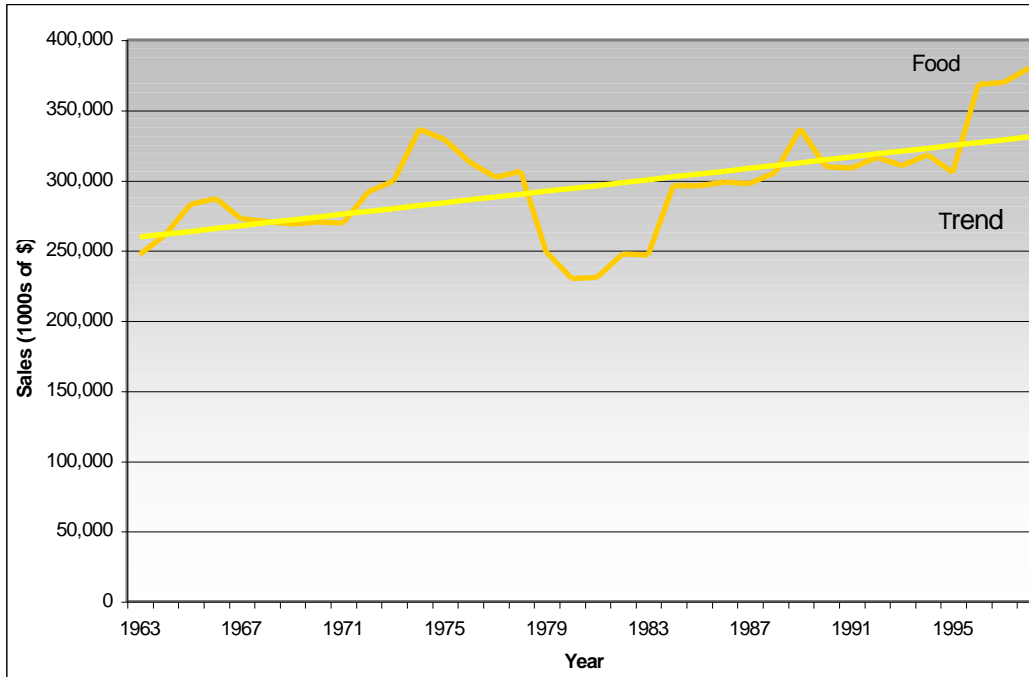


Furniture sales followed total retail sales patterns for the first two decades that were recorded beginning in 1963. However, starting in 1987 furniture appeared to have almost a countercyclical nature. When retail sales reached a slight peak in 1987, furniture sales jumped to a substantial peak and remained above trend when total retail sales experienced a trough in 1991. From 1994 until 1998 furniture was below trend while total retail began a period of gradual growth. Over the period from 1963 until 1998 the furniture cycle experienced nine major turning points, a large number when compared to the total retail sales, which only had six turning points over this period. The cycle of furniture sales also had a large average amplitude, indicating that the cycle is more severe than all other disaggregates besides general merchandise.

However, the growth rate of furniture sales is relatively slow, only increasing by a rate of \$701,000 each year. This growth of .98% of current furniture sales is on the lower end when compared to the other disaggregates. Furniture sales make up the smallest percentage of total retail sales in 1998, although drug sales would probably be lower if those data had been collected.

**E. Food**

Figure 19: Food with Trend



$$\text{Food sales} = 257,413.3 + 2,039.564 * \text{time}$$

(t = 25.15) (t = 4.23)

$$R^2 = .345$$

n = 36 (1963 = 1)

(Dollar amounts in thousands)

Figure 20: Percentage Deviation from Trend, Food

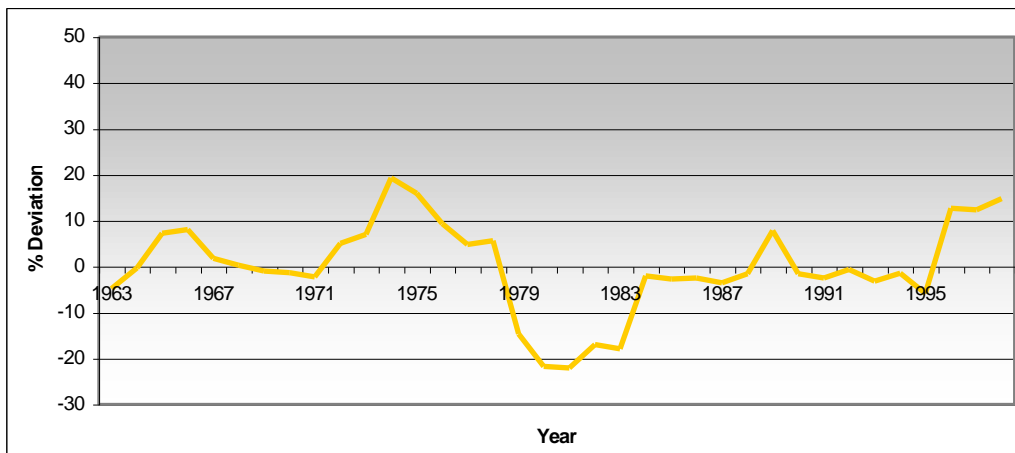
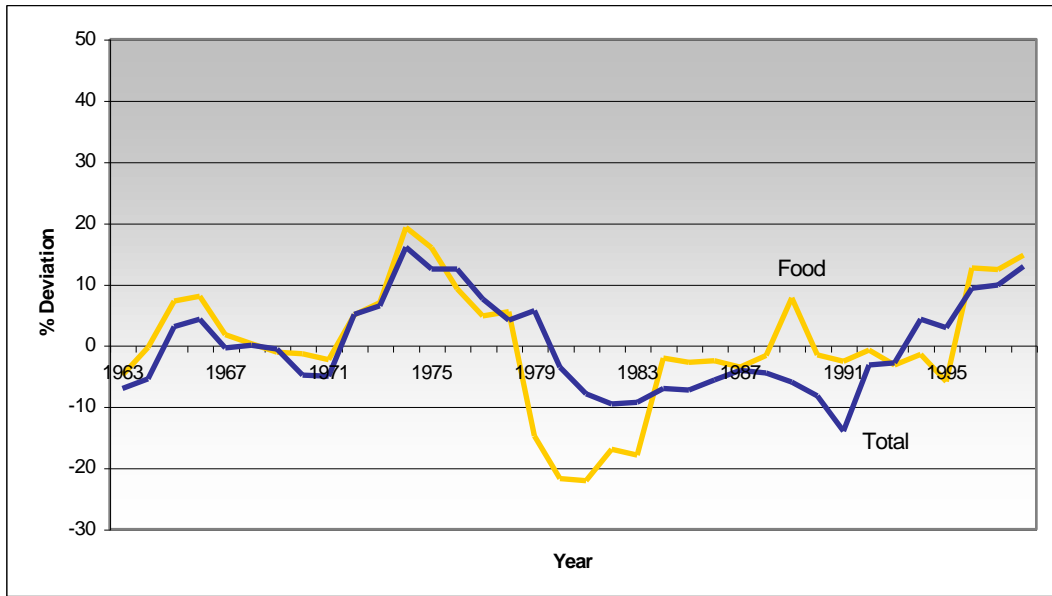


Figure 21: Percentage Deviation from Trend, Food and Total Retail



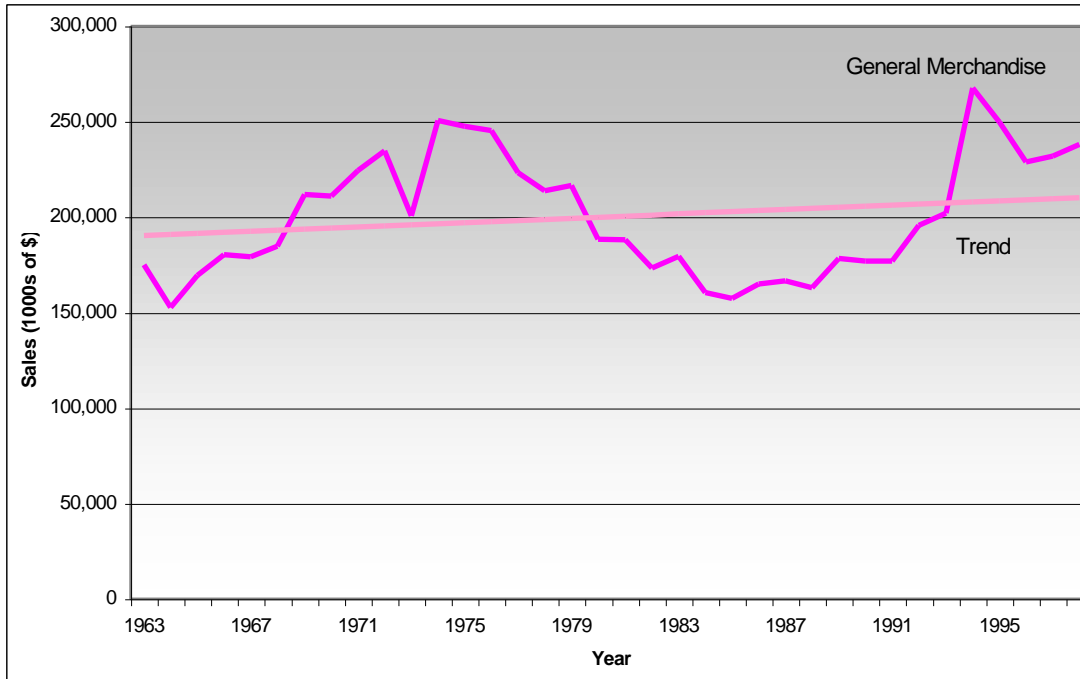
Patterns in the food sales data stand out because of how closely they followed the peaks and troughs of total retail sales. As shown in Figure 21, from 1963 until 1978 the timing of the two cycles was almost perfectly coincident. Like total retail, the food cycle experienced six major turning points from 1963 until 1998. The food sector also had a relatively low average amplitude of 21.80%; the only disaggregate with a lower amplitude was eating and drinking at 17.51%.

However, in the late 1970s and early 1980s the food cycle experienced a trough much greater than that of total retail. An isolated spike in 1989 is also noticeable, although in the late 1990s the food cycle seems to be moving more closely with total retail again.

In relative terms, food is the third fastest growing sector of the six, with a trend line indicating an annual increase in sales of around \$2,040,000. However, as a percentage of the total food sales for 1998 at \$379,744,000, the food sector is only growing by .54% of current sales. The only sector growing at a slower percentage is general merchandise at .24% of 1998 sales.

## F. General Merchandise

Figure 22: General Merchandise with Trend



$$\begin{aligned} \text{General Merchandise Sales} &= 189,623 + 572.30 * \text{time} \\ &\quad (t = 17.64) \quad (t = 1.13) \\ R^2 &= .036 \\ n &= 36 \quad (1963 = 1) \\ &\text{(Dollar amounts in thousands)} \end{aligned}$$

Figure 23: Percentage Deviation from Trend, General Merchandise

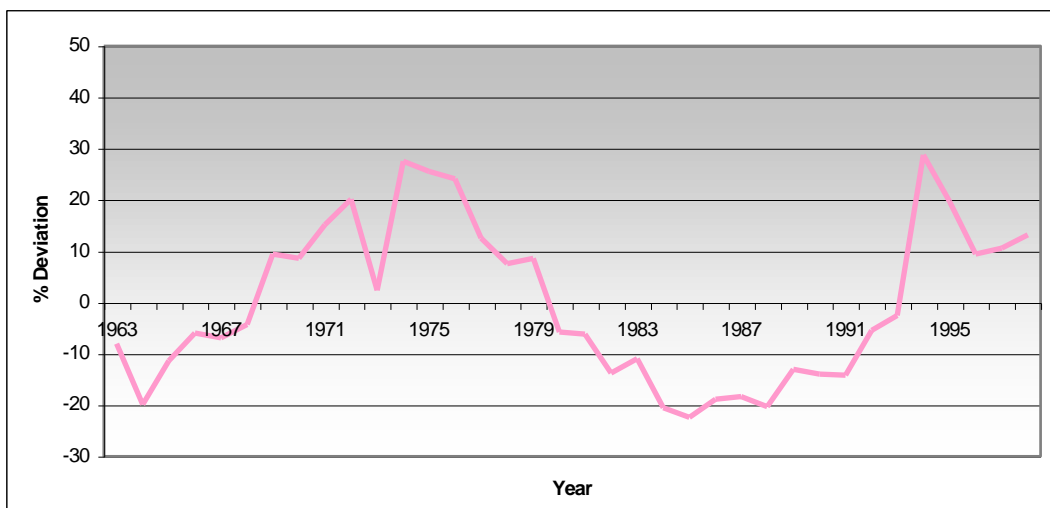
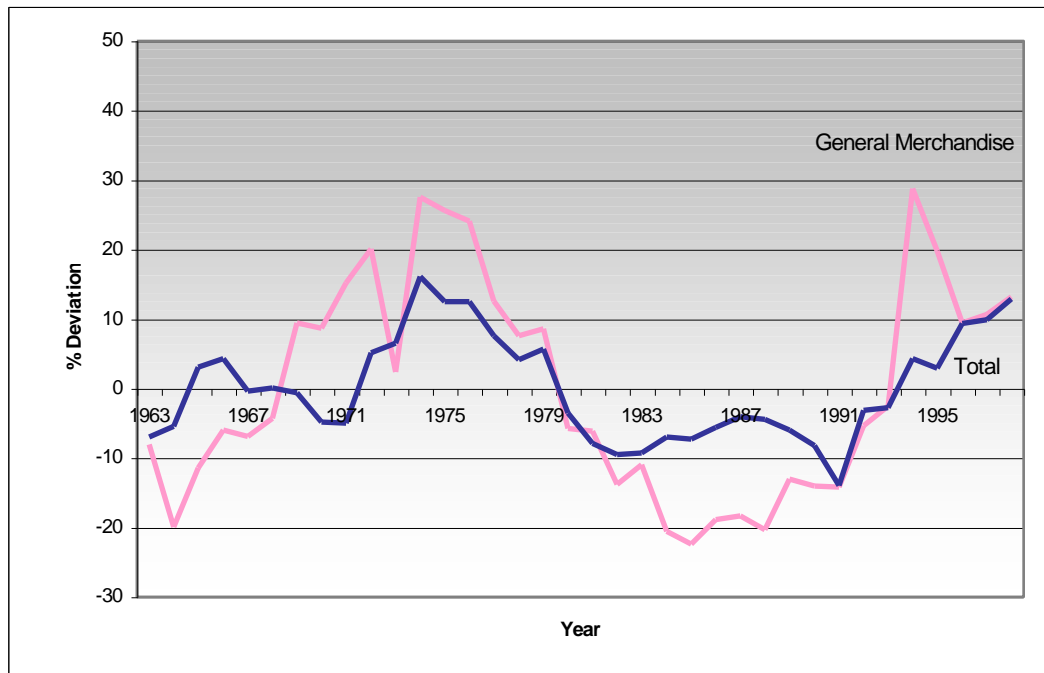


Figure 24: Percentage Deviation from Trend, General Merchandise and Total Retail



The timing of the general merchandise cycle was very similar to that of total sales, but the amplitude of the peaks and troughs was greater at 49.30%. General merchandise exhibited the most severe deviations from trend when using an average of the deviation at both peaks and troughs. Of all the disaggregates, general merchandise experienced the fewest number of turning points with only four over the period from 1963 until 1998.

General merchandise, although it is one of the three largest segments of retail sales, is growing at the slowest rate overall. The trend analysis predicts an increase of only \$572,000 annually, which is much lower than \$2,406,000, the average growth of all sectors. As a percentage of current sales, general merchandise is only increasing by .24% of its current sales level of \$238,011,000.

However, it is also important to note that the t-statistic for trend growth was low at only 1.13. In order for a coefficient to be statistically significant its t-statistic should be at least 2. Therefore, the technique used cannot guarantee that the slope is statistically significant. The slope could even be zero, which would mean a flat growth rate. Another problem with the general merchandise results is that the  $R^2$  value is only .036, a very weak fit between the actual data and the trend line.

## V. CONCLUSIONS AND EXTENSIONS

### A. Conclusions

- Real retail sales in Erie follow the trends of real income closely, especially during periods of growth.
- Retail sales in Erie are less stable than real Erie income, with both a higher deviation from trend and greater amplitude in the cycle.
- Turning points for Erie retail sales are difficult to determine because the data are only released annually. A data source that is published more frequently would probably give more accurate results.
- On average, the amplitude for total retail sales falls farther below trend at troughs than above trend at peaks.
- Unlike retail sales, the average amplitude for real Erie income is, on average, farther above trend at peaks than it is below trend at troughs.
- The amplitudes of each of the six retail disaggregates are more severe than that of the total, although the reason is unclear without data for all of the two-digit retail industries.
- The income elasticity for retail sales over the entire 36 year period is just above one, which indicates that retail sales are a luxury good bordering on being a normal good by economic standards. There is no clear pattern as to whether the elasticities for retail sales are related to cycles in the economy.
- The timing of peaks and troughs in the Erie retail sales cycle do not follow a clear pattern with Erie income and cannot be used as an indicator for the Erie economy.
- The six disaggregated industries analyzed within this report are not the sole contributors to total retail sales. There are two two-digit industries under retail trade that are not included in this study since the Survey of Buying Power does not collect the data. These two industries are 52 – building materials and garden supplies and 56 – apparel and accessory stores.
- The six disaggregates do not contribute equally to total retail sales, and automotives, food and general merchandise make up a majority of the industry's sales
- Automotives make up the greatest percentage of total retail sales, but this two-digit industry also has the highest average deviation from trend and a high degree of amplitude.

- The drug sector is the only three-digit industry that the Survey of Buying Power collects data for in Erie County. This sector makes up the smallest percentage of total retail sales, but when the growth rate is looked at as a percentage of current sales it is the fastest growing of the sub-industries. Unfortunately, data on drug sales is only available through 1994 from the Survey of Buying Power.
- Eating and drinking is one of the fastest growing sectors under retail trade. In relative terms this sector is second only to automotives; as a percentage of current sales it is second to the drug sector. Of the six sectors, eating and drinking has the lowest average deviation from trend and average amplitude.
- Furniture had a high average amplitude for its cycle as well as a large number of turning points. This sector is experiencing slow trend growth although growth as a percent of current sales is near 1%.
- Food stores is one of the more stable sectors of retail trade with a low average deviation and average amplitude. Trend growth is strong at over two million dollars annually, but a recent surge in food sales makes growth as a percentage of current sales lower.
- Results with general merchandise are less conclusive since the regression analysis did not provide clear results, which makes growth appear very slow. This sector is one of the more unstable with a high average deviation from trend and the highest average amplitude of the six disaggregated industries.

## **B. Extensions**

While this report builds on the work already started by Randy Risjan, there is still room for further development. Risjan focused his work on comparing Erie retail sales to other Erie economic activity and retail sales for the entire nation. This study took his analysis a step further by examining the six disaggregated industries in more detail. The following are other ways that this project can be expanded:

- Perform a cross-sectional analysis with other metropolitan areas based on size, similar retail sales totals, or geographic proximity. Although patterns have been examined over time, spatial comparisons are also very useful.
- Compare retail sales in Erie to the state of Pennsylvania. Risjan did some work with national data but not with state totals. The Survey of Buying Power organizes listings by state, which makes assembling the data fairly simple.
- Explore the relationship of income elasticity to other variables. The elasticities for total retail sales, as well as for each of the disaggregates for the periods of recessions and upturns in the economy, were calculated. This section could be expanded to explore the determinants of the income elasticities.

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