

“Understanding Inventory – Stay Curious!”

Introduction

The State of the U. S. Business Logistics System is extraordinary. Last year, our business logistics costs declined by \$33 billion compared to 2000. This was the first decline since 1991. Logistics costs were equal to 9.5 percent of nominal gross domestic product during 2001. That is a record low in the history of the data. (*Figure #1*)

The slowdown that began in our economy as the third quarter arrived in 2000 continued for the entire year of 2001. The National Bureau of Economic Research officially announced that our economy went into recession in March, 2001. Second quarter GDP growth was scarcely measurable. A negative growth rate occurred during the third quarter. Although slight, fourth quarter real GDP growth of 1.4 percent was surprising, especially since it followed the September 11 terrorist attacks. The real story achieved by our logistics profession during 2001 was the significant reductions of inventory. Note the bottom line in Figure #1. Inventory investment was reduced during all four quarters of 2001. Even more remarkable, note that the changes in inventory were also negative during the third and fourth quarters of 2000. So, we have experienced six consecutive quarters of declining inventory investment! We have worked hard in order to understand what is going on regarding inventory investment and what it means to the profitability of U. S. businesses. We will present what we have learned thus far. We confess that we have much more to learn. We have a lot of work to do. As most of you know, we have previously reported that we do not expect future reductions in transportation costs. We will explain why compliance with the Environmental Protection Agency’s new standards for

diesel engine emissions will make it unlikely that we will be able to maintain our current level of transportation productivity. Future reductions in business logistics costs will have to come from managing inventory investment more efficiently. We intend to “stay curious” about inventory for the balance of this year and probably for some time in the future. *(Figure #2)*

Co-Sponsors

This report is co-sponsored by Cass Information Systems, Inc. and ProLogis. Built upon a solid foundation for over 95 years in business, Cass continues to renew and transform itself to meet current business challenges. Today, Cass Information Systems, Inc. consists of four business units. Our Cass Commercial Bank unit has been in business since 1906. It is a member of the Federal Reserve System and together with Cass Transportation Information Systems is subject to five levels of independent audit. The Cass Transportation Information Systems business unit is the largest provider of freight invoice payment and information services in North America. Our Ratemaker[®] business unit is a hosted rating application that securely stores, maintains, and retrieves all client-negotiated freight rates for shippers and carriers. Ratemaker supports all transportation modes, all geographies, and all currencies around the world. Cass Utility Information Services unit has become the leading back-office provider of energy information in North America. Utility transactions increased by 43 percent during 2001 as the unit became profitable well ahead of plan. *(Figure #3)*

As they are integrated operationally, the four business units of Cass Information Systems, Inc. are safe, secure, and under control. A data management survey of 600 Chief Information Officers and Information Technology Directors by PricewaterhouseCoopers in 2001 revealed a critical need for better information. 75 percent of all respondents reported having significant

business problems as a direct result of defective data. Only 15 percent of all respondents are “very confident” about the quality of the data their company receives from supply chain participants. That is the business of Cass. We deliver timely, accurate information. We do it consistently and in great detail. *(Figure #4)*

The Cass Transportation Index appears most weeks in Traffic World News Magazine. This index shows the monthly trends in customer shipments and freight dollars processed for the Cass customer base. As a result of our weak economy, Cass experienced a 14 percent decrease in freight dollars processed and an 8 percent decrease in the number of shipments processed during 2001. *(Figure #5)*

Nevertheless, Cass stayed on course as our Financial Highlights reflect. Total revenue increased by 6.2 percent. Diluted earnings per share increased by 6.4 percent. This was accomplished in the face of eleven reductions in interest rates. The Federal Funds rate was 6 ½ percent at the beginning of 2001. At year-end, it stood at 1 ¾ percent. The extreme pressures placed on managing loan and investment portfolios in this environment cannot be underestimated. *(Figure #6)*

ProLogis is the world’s largest provider of distribution facilities and services, with over 200 million square feet and 1,700 facilities owned, operating, and under development throughout North America, Europe, and Japan. ProLogis continues to expand the industry’s first and only global network of distribution facilities with the objective of building shareholder value. This is accomplished through the ProLogis Operating System[®] and their commitment to being “The Global Distribution Solution” by providing exceptional corporate distribution facilities to meet customer expansion and reconfiguration needs globally.

In 2001, ProLogis delivered a total return; including dividends; of 3.1 percent. Return on assets increased from 10.9 to 11.3 percent. Return on equity increased from 15 to 16 percent. Funds from operations increased by 6.3 percent, prior to non-recurring charges. ProLogis recycled over \$1.2 billion in capital in 2001, largely through contributions of development properties into ProLogis property funds. This structure allows the company to fund development without issuing new public equity, expanding assets under management while generating significant asset and property management fees. ProLogis developed 14.8 million square feet of new distribution space in 2001. *(Figure #7)*

The ProLogis Operating System[®] is a proprietary management and customer service delivery system that tightly integrates four groups of professionals, providing a single point of contact for customers and establishing the foundation for ongoing relationships. The Market Services Group offers in-depth knowledge of local conditions, infrastructure, and government regulations, allowing the members of this team to be the market experts for clients.

The Global Development Group creates build-to-suit facilities to meet specific customer requirements and develops industry-leading, master-planned distribution parks. The ProLogis Solutions Group, and its partners, provide services such as network design and optimization, site selection and incentive negotiation, inside-the-box facility layout and material handling equipment procurement and implementation. The Global Services Group focuses on building relationships with the largest global users of distribution space, bringing together resources from the other groups to enable quick, cost-effective solutions to customers' distribution requirements. *(Figure #8)*

Some other interesting facts about ProLogis begin with \$7.5 billion of real estate assets under management, including development. ProLogis has more than 3,500 customers leasing

distribution facilities in twelve countries located on three continents. The company's strategic position in the seven largest logistics markets account for 52 percent of their North American portfolio. The seven largest logistics markets include Chicago, Dallas, Atlanta, The San Francisco Basin, Los Angeles, New Jersey's I-95 corridor, and a hybrid Midwest market that combines Indianapolis, Columbus, and Cincinnati, Ohio.

Since entering Europe in 1997, ProLogis has developed leading positions in France, Poland, the Netherlands, and the United Kingdom. ProLogis has a growing presence in Spain, Italy, Germany, and Belgium. Last year, ProLogis expanded into Japan with a build-to-suit project for DHL. It is their 19th facility for DHL, which demonstrates the power of the ProLogis Operating System[®]. ProLogis has extensive land positions in Europe and North America to support an additional 86 million square feet of development. (*Figure #9*)

Agenda

Here is our agenda. We will examine the cost of the U. S. business logistics system during 2001 in twelve line items of detail. We will review the trends in transportation, inventory, and total logistics costs during the past 21 years. Will update the expenditures managed by third party logistics service providers as reported by Armstrong & Associates. We will explain the conventional macroeconomic indicators of inventory efficiency. We will repeat what we learned about the change to the North American Industry Classification System which we distributed to you last August. We observed then that retail inventory accounted for most of the change between the former Standard Industrial Classification System (SIC) and the new North American Industrial Classification System (NAICS). We will explore a study of inventory levels, which is continuing to be developed by The Ohio State University's Supply Chain

Management Research Group under the direction of Professors LaLonde and Ginter. With the help of our colleague Roger Urban, we will offer some views about the strategic and marketing implications of holding higher finished goods inventory. Then we will summarize and move to the question period. (*Figure #10*)

The Business Logistics System – 2001

During 2001, the cost of our business logistics system declined to \$970 billion, or the equivalent of 9.5 percent of nominal Gross Domestic Product (GDP). The average investment in all business inventory including agriculture, mining, construction, utilities, services, manufacturing, wholesale, and retail trade declined to \$1.44 trillion. Inventory investment during 2001 was \$38 billion lower than it was in 2000. The cost of carrying inventory during 2001 includes interest at the annualized commercial paper rate of 3.8 percent. The cost of taxes, obsolescence, depreciation, and insurance follow the Alford-Bangs Production Handbook formula that has been used in this methodology since its publication in 1973. The cost of warehousing was flat and is an estimate based on the expenditures for public warehousing reported by the Commerce Department's Census Bureau.

Transportation costs are the preliminary estimates published by the Eno Transportation Foundation. Trucking costs increased by \$10 billion, or only 2.7 percent. That was lower than the 3.4 percent growth in nominal GDP. Motor carriers reported that trucking tonnage was down between 5 to 10 percent depending on the market segment. The profitability of trucking companies declined because of under utilization, higher insurance, and fuel costs. BBT Capital Markets reports that 60,000 owner/operator businesses went bankrupt during the past two years. The current market for truck service reminds us of the poem which the late Malcom McLean

wrote 50 years ago. “May the day never come when the rising sun sees rates below cost and freight hauled for fun.” The extended trucking industry now faces compliance with a new EPA standard for heavy duty diesel emissions by October 1. The implications are huge. EPA originally estimated that compliance costs with the new standard would be \$320 million. They now acknowledge that compliance costs will approach \$2 billion, an increase by a factor of six! The increase in engine costs will be at least \$1,500. One manufacturer will accept a penalty cost of \$5,000 per engine to market its existing engine. An increase in fuel costs per mile of two cents is likely. The real “wild card” is engine performance and reliability. There is a report that Werner Transportation inspected the new EPA standard engine after 200,000 miles of operation. It resembled a five year old engine after one million miles of operation. The EPA has understated “the costs.” That calls into question “have they overstated the benefits?” The Department of Justice is researching the economic impacts of the standard. We suggest that the public policy question is “how robust are the health benefits of the standard?” The Americans for Safe and Efficient Transportation will hold a meeting here in Washington on June 19 to develop support for longer tractor trailer combinations and heavier six axle vehicles. Without a legislative consensus on vehicle length and weight, we will not see any improvement in the productivity of our trucking industry. Trucking has an 82 percent share of our nation’s freight bill. Consider that trucking accounts for 50 percent of U. S. total logistics costs and you will understand the challenge to our productivity.

Rail costs increased by \$2 billion or 5.6 percent during 2001. Improvements in intermodal services reliability has enabled railroads to capture some long haul traffic from truckload carriers. The railroads also managed to increase rates selectively on non-competitive traffic. That is becoming a subject of proposed legislation. Railroads are capital and labor

intensive. Our view is that railroads are entitled to earn returns that are comparable to their customer base. The cost of domestic and international transportation by water increased \$2 billion. We round these numbers to the nearest billion dollars. Water transportation costs benefited from the effect of rounding more than an actual increase. Oil pipeline transportation revenue was flat. Domestic and international airfreight transportation costs declined by \$3 billion. The economic deregulation of trucking within 41 states that became law in 1995 has really paid off as Federal Express, United Parcel, Airborne, and BAX have increased their ground transportation operations in second day delivery. Domestic freight forwarder revenues, after payments to linehaul carriers, increased by \$1 billion. Shipper related costs combine the loading and unloading of transportation equipment and the operation of traffic departments. Logistics administration is imputed at 4 percent of total logistics costs following the methodology that we have consistently employed since its original publication in 1973.

(Figure #11)

Figure #11 in your press kits shows the detailed cost of the business logistics system during the past 21 years. It is too crowded to display on the screen but it is the most important exhibit in this presentation, so please take time and study it carefully. *(Figure #12)*

Here is how the trends appear graphically with 1981 serving as the base. Transportation costs have declined by 24 percent during these 21 years. All of that decline occurred during the 1980s, following the end of economic regulation. Transportation has been on a plateau of about 6 percent of nominal GDP since 1991. Inventory carrying costs have declined by more than 60 percent during these 21 years as faster and more reliable transportation allowed U. S. businesses to invest in less inventory and consolidate it into fewer locations. We believe that we have benefited from better forecasting, systems, and communications in managing inventory. With

the record low achieved during 2001, total logistics costs have declined by more than 40 percent during these 21 years. It is clear that inventory efficiency is now the driver. The focus of everyone managing in logistics has to be on inventory investment. (*Figure #13*)

Third Party Logistics

The segment within the \$970 billion of logistics expenditures made by manufacturing and distribution businesses that continues to receive the most attention is the third party logistics services segment. This research is updated annually by our colleague Richard Armstrong. He is the internationally recognized expert on the third party logistics industry. The 10th annual edition of “Who’s Who in Logistics? Armstrong’s Guide to Global Supply Chain Management” is now available. 3PL services grew by 24 percent in 2000. In 2001, the total contract logistics market grew by 7.4 percent. Lower growth is a direct reflection of our economic slowdown, which led us into recession. When you consider the fact that expenditures for truck transportation grew by only 2.7 percent during 2001, the 7.4 percent growth reported by third party logistics services providers is attractive. The 13.3 percent growth rate reported by 3PLs in the Value-Added Warehouse/Distribution segment really looks good. The April issue of Distribution Center Management reports on how warehouse management systems and supply chain event management systems are being integrated to improve the visibility of inventory. Improving the visibility of inventory for their customers can be a value added benefit for 3PLs in the warehouse/distribution segment.

Inventory Investment

We have often said that logistics is the management of inventory in motion or at rest. Inventory is in motion during transportation. Inventory is at rest awaiting production into finished goods or in distribution at the final point of sale. We have said that the logistics manager has the primary responsibility for the investment, condition, and location of inventory. That is still true regarding raw material and work in process inventory. But, we are learning that the management of finished goods inventory is also a marketing activity with strategic implications. That is a significant change in our previous analysis that was presented in our first twelve "State of Logistics Reports." It is very important to reserve the right to know more tomorrow than you do today. We shall try our best to clearly explain what we have recently learned. (*Figure #14*)

We begin with the macroeconomic indicators. Here is the ratio of business inventory investment to nominal gross domestic product. It has declined from 24 percent in 1981 to 13 percent in 2001. This solid trend reflects continuous effort and progress in lowering inventory investment. (*Figure #15*) Here is the monthly inventory/sales ratio that we displayed last year. It includes only manufacturing, wholesale, and retail trade. The data reflects the old Standard Industrial Classification System methodology, which dates back to the 1930s. You will observe the reduction in months of supply between 1991 and 1999. The economic slowdown began 2000. The ratio increased from a record low of 1.31 months of supply in March, 2000 and gradually increased to 1.36 months of supply as the year 2000 came to a close. (*Figure #16*)

The Change to the North American Industry Classification System

In July, 2001, the Department of Commerce's U. S. Census Bureau began the switch to the North American Industry Classification System now known as NAICS. According to the U. S. Census Bureau, the "New NAICS" industries catalog the many ways our economy has changed. Some recognize high-tech developments such as fiber optic cable manufacturing, cellular communications, and computer software reproduction. Some reflect new business, like paging and environmental consulting. Still, others account for changes in the way business is done, like bed-and-breakfast inns, warehouse clubs, telemarketing bureaus, and credit card insurance.

The immediate effect of the switch to NAICS was an increase in the months of supply. For example, the March, 2000 1.31 months of supply reported under the SIC system increased to 1.37 months of supply after the switch to the NAICS. (*Figure #17*)

What accounts for the spread? The Manufacturers' Inventory/Sales Ratio shows very little spread between NAICS and the SIC basis. You can see that the trends actually overlap during 1992, 1995, and 1998. (*Figure #18*)

The Wholesalers' Inventory/Sales Ratio had even less spread between SIC and NAICS. In many years, the trends are identical. So the answer to the spread between SIC and NAICS has to be in the retail inventory of finished goods. (*Figure #19*)

The Retailers' Inventory/Sales ratio accounts for almost all of the difference in months of supply between NAICS and the SIC basis. That is all finished goods inventory. That should have told us something when we distributed these changes to you in August of last year. It may have foreshadowed what we recently learned about finished goods inventory. We confess that we do not know. We have much more to learn. (*Figure #20*)

Here is the inventory to sales ratio for manufacturing, wholesale, and retail trade under the new North American Industry Classification System for the past three years. We have already explained that the value of inventory investment was reduced for six consecutive quarters between July, 2000 and December, 2001. But, sales were so weak we struggled between 1.42 and 1.45 months of supply inventory for most of 2001. We were not making any progress. Then the fourth quarter inventory liquidation kicked in and we ended the year at 1.4 months of supply.

What we have learned from this exercise is that looking at the macroeconomic references, which we have used for the past 20 years, no longer tells us very much. This is especially true when the Department of Commerce frequently adopts new methods and sources for measuring economic activity. In 1987, they increased the value of wholesale inventory because of the 1986 Tax Reform. In 1996, Commerce switched from fixed-weighted price indexes to chain-weighted index. In 1999, Commerce reclassified investment in software as a final good. That changed the inventory data retroactively back to 1959. Now we have the switch to NAICS and changes in the National Income and Product Accounts will not be fully implemented until 2003. So we have to look elsewhere to really understand what is going on in inventory investment. *(Figure #21)*

The Findings of The Ohio State University

Supply Chain Management Research Group

Fortunately, we now have better indicators of inventory efficiency. How it has happened is an interesting story. ProLogis intends to become the “Global Distribution Solution” for the 1,000 largest users of warehouse space. They have had an intensive internal research effort to identify the “Global 1,000” for many years. ProLogis has succeeded in currently serving about

half of the Global 1,000 Companies by providing distribution facilities in multiple markets. In January, 2000, ProLogis indicated an interest in supporting independent research to identify these 1,000 largest users in the world. The Supply Chain Management Research Group of The Ohio State University was selected to undertake this research. The Group is directed by Professors Bernard J. LaLonde and James L. Ginter. Dr. LaLonde has served as the Raymond G. Mason Professor and directed Ohio State's academic program in logistics as it reached national prominence. Professor Ginter has served as chair of the Marketing Department at Ohio State. Much of his work has focused on corporate strategy and quantitative modeling. In my formative years as a student at New York University, I was told that I would be fortunate to meet, know, and work with a good teacher. Bud LaLonde and Jim Ginter are great teachers. Professors LaLonde and Ginter employ an administrative assistant and several MBA and Ph.D. candidates each semester to undertake executive research assignments. *(Figure #22)* The Group used the COMPUSTAT database compiled by Standard and Poor consisting of financial reports for all publicly traded U.S. companies. They also used databases from Business Week and Forbes for information on private companies and databases in Europe and Asia to satisfy the global requirements of ProLogis. Inventory investment and turnover rates were used to generate activity and distribution space requirements. The project was completed in May, 2001 and is currently being used by the ProLogis Global Services Group. *(Figure #23)*

Having the benefit of inventory data available for the years 1979 to 1999 in hand, the Group proceeded to explore what it could learn beyond the research needs of ProLogis. They focused on the Securities and Exchange Commission Form 10K data for approximately 8,000 U. S. publicly traded companies. Inventory was stratified into raw materials (RM), work in process (WIP), and finished goods (FG). They focused on the ratio of inventory to cost of goods

sold (COGS) instead of sales to eliminate the effects of and variability due to gross margin. They also eliminated companies with sales under \$100 million in 1999.

The companies were grouped into 14 industries and 91 sectors. Consistent with the trends in inventory efficiency that we have observed in the macroeconomic data, nearly all industries have reduced the ratio of raw material inventory to cost of goods sold and work in process inventory to cost of goods sold. But, in 9 of the 14 industries, the ratio of inventory investment in finished goods to cost of goods sold has either increased or has not changed during the 21 years between 1979 and 1999. This research is listed on the Group's website at <http://fisher.osu.edu/supplychain> under the title "An Historical Analysis of Inventory Levels: An Exploratory Study." Dr. Ginter has observed that companies have greater control over their internal process allowing them to control raw materials and work in process through lean manufacturing. But, finished goods inventories are driven at least in part by their customers and their marketing organization. (*Figure #24*)

The Group has now included the inventory financial data reported to the Securities and Exchange Commission for 2000. There was no significant change during 2000 compared to the 21 year period between 1979 and 1999. The industries who have managed to reduce the ratio of finished goods inventory to cost of goods sold include automotive parts, computers/electronics, industrial durables, paper/packaging, and pharmaceuticals. Here is the graph displaying the efficiency of all three categories of inventory for the computers and peripherals sector in relation to cost of goods sold during the 22 years between 1979 and 2000. Professor LaLonde refers to this performance as "the Dell effect." The leadership of Dell and their suppliers in producing computers made to order has driven their competitors to improve. Obsolescence accounts for 40 percent of inventory carrying cost in general. But, we know that the cost of obsolescence in the

computers and peripherals sector is much higher given the constant unswerving productivity in the technology sector. Maintaining the lowest possible level of finished goods inventory is crucially important here. But, note the increase that occurred during 2000 as demand declined. Business Week Magazine refers to this as the “tech wreck.” (*Figure #25*)

The industries where the ratio of finished goods inventory to cost of goods sold has either increased or has not changed during this 22 year period includes apparel, textiles, chemicals, electrical/mechanical equipment, food products, furniture/home furnishings, medical products, consumer packaged goods, and the retail/wholesale trade. Here is the graph displaying the ratio of raw material, work in process, and finished goods to cost of goods sold in the apparel sector. Note that finished goods inventories increased between 1996 and 1999 when our economy was strong. Professor LaLonde calls this “the Wal-Mart effect.” Wal-Mart is famous for holding low inventories but they make it clear their suppliers have to hold inventory in order to maintain their positions in Wal-mart’s distribution system. (*Figure #26*)

Perhaps the greatest surprise during this 22 year period is the performance of the food sector. There has been little if any decrease in raw material, work in process, or finished goods inventory in relation to cost of goods sold during the past 22 years. This despite all of the reports that we have read regarding collaborative planning, forecasting, and replenishment of inventory during the past seven years. We had the benefit of the 1995 pilot test between Wal-Mart and Warner Lambert regarding Listerine followed by collaborations between Wegmans Food Markets and Nabisco and Kmart and Kimberly Clark. We believe that Mr. Clifford Lynch has written the seminal book on logistics outsourcing. Nothing comparable was available previously and it represents an original contribution to management thought. Interestingly, Cliff was the Vice President of Distribution for Quaker Oats and the President of Trammell Crow Distribution

Services before becoming a consultant. After reading our second invitation to this meeting, he sent us a copy of the Grocery Manufacturers of America E-Business Issue 2002 Forum publication. It reports how The Grocery Manufacturers engaged KJR Consulting to study the adoption rate of collaborative planning, forecasting, and replenishment, also known as CPFR. For purposes of the study, CPFR was defined as those collaborative business practices that enabled trading partners to have visibility into one another's critical demand, order forecasts, and promotional forecasts through a systematic process of shared brand and category plans, exception identification, and resolution. The study found that CPFR adoption rates have been much slower than expected. Companies with the greatest CPFR experience now say that they intend to use this initiative selectively, not universally, with every trading relationship or every product. KJR Consulting also reported there is confusion about where vendor managed inventory ends and CPFR begins. So the claims being made about the food producers inventory efficiency are not even supported by the trade, namely the grocery distributors. It is also clear that the data in the financial reports submitted by Grocery Manufacturers to the Security and Exchange Commission do not support the claims about more efficient inventory investment that are being made by consultants, logistics software vendors, and others to the working press. We recommend that you in the working press "Stay Curious."

Another unexpected finding made by The Ohio State University Supply Chain Management Research Group deals with gross margins. Intuition would suggest that companies who maintain high levels of finished goods inventory would be burdened by lower gross margins. But, the opposite turns out to be true. Companies who maintain high levels of inventory turn out to have higher gross margins. That is an arresting finding. They apparently hold high levels of inventory because they can afford it. That may be counter-intuitive, but being

counter-intuitive and being right is how money is made. It explains why ProLogis succeeds by focusing on the Global 1,000 largest users of warehouse space. Nearly all of their facilities distribute finished goods.

More research is needed in order to understand why finished goods inventory levels have not declined. We speculate that product proliferation is a driver. For example, when Coke added lemon flavor to their beverages, they created 58 new inventory items of diet, regular, bottles, and cans. In addition, the shift in distribution power from manufacturers to mega-retailers, such as Wal-Mart and Costco Wholesale, require manufacturers to maintain adequate levels of finished goods inventory to ensure reliable service and consistent availability for an expanding range of products. Costco only holds 4,000 stock keeping units of inventory. If you succeed in getting into distribution with Costco, you have to protect and defend your position against tough competition. So, higher finished goods inventory may reflect sound brand management and market strategy. Consolidation may also be a factor. The number of companies that are included in the food sector has ranged from 49 to 30 during the past 22 years. *(Figure #27)* We need only look to the food companies who are clients of Cass Information Systems, Inc. to understand the implications of consolidation.

The role of Cass as a fiduciary and the commitment of ProLogis to maintain confidentiality require both sponsors to be cautious here. We can report that Cass Information Systems, Inc. has been processing the transportation and warehousing transactions of a major global consumer product company for more than 20 years. ProLogis has been working with this company in Europe and North America and has helped them optimize their manufacturing and distribution system for a range of cost and service scenarios. Studies of the location, size, and design of facilities have followed. In addition to providing facilities, ProLogis will provide

leasing and maintenance of materials handling and storage equipment. A ProLogis alliance company is providing inside “the box” engineering services. A white paper or case study is being prepared jointly by the consumer product company and ProLogis for presentation later this year, after the current limitations regarding confidentiality are removed. It will include a plan to reduce stock, keeping units of finished goods inventory significantly. We believe that consolidation has been a factor driving finished goods inventory. Only time will tell what the results will be after these major changes are implemented. Without overstating the case, we like their chances. Transaction data and optimization models produce reliable results for the planning of distribution networks. Success requires execution and this is a company that has always executed well. *(Figure #28)*

Strategic and Marketing Implications

In order to better understand what is going on regarding inventory investment, we invited Roger Urban to join us at a meeting with Ohio State University’s Supply Chain Management Research Group in Columbus, Ohio. We have worked with Roger Urban since 1975. His firm, Urban Wallace Associates, was established in 1980. He concentrates on business strategy and operational marketing issues. His client list includes manufacturers, distributors, financial services, software, transportation carriers, and logistics service providers.

Urban observes that despite the ten year plateau we have witnessed regarding transportation costs, many shippers continue to seek transportation savings. They are “buying down” in order to cut costs. This means choosing slower, less expensive transportation services. They are investing in transportation management software in response to the cost reduction claims made by software vendors. *(Figure #29)*

The TMS cost reduction strategies are rather elementary. They include the switch to slower less reliable modes, consolidation of orders into larger shipments and shipping less often. There is nothing new here. It is rather unremarkable. *(Figure #30)*

While reducing transportation costs, Urban observes that each of these strategies increases the amount of inventory held in the supply chain. The cost of holding additional inventory more than offsets any transportation savings. He concluded that in this economy cutting transportation costs is a suboptimization that produces false savings. *(Figure #31)*

We have focused on The Ohio State University's research capabilities but we should also acknowledge the "school up north" that is the birthplace of our logistics profession. That school is Michigan State University. To be sure, Michigan State is where Bud LaLonde earned his Ph.D. Mr. Urban agrees with Michigan State University's Global Logistics Team that logistics is now the management of continuous change. Agility, accommodation, and flexibility are the keys to survival for supply chain managers. The emphasis is on constant adjustment today, not optimizing on yesterday's data. To illustrate his point about flexibility, he related a hypothetical conversation between Siemens Corporation and a supply chain manager at Texas Instruments. "You know that inventory that you are holding for me in Germany? Yes. Well, I want it in Singapore now. But you told me to hold it in Germany. Well, that was then. This is now." *(Figure #32)* Roger Urban emphasizes that supply chains must be actively managed. As an operational marketer, Urban is no fan of optimization using yesterday's data. Continuous adjustment is the business goal. Accurate inventory information is needed in order to continuously adjust supply chains. *(Figure #33)*

Urban went on to answer why manufacturers have an increase in finished goods. He acknowledged the growing power of retailers and the power of manufacturers over their

suppliers. He believes that vendor managed inventory is really “vendor owned inventory.” The buyer has the power. The vendor must locate the inventory where the buyer wants it. To some extent, this reclassification of inventory may explain why macroeconomic measures are no longer helpful. You have to look at microeconomic measures of individual companies in order to understand what innovations are taking place. That is the real breakthrough achieved by The Ohio State University’s Supply Chain Management Research Group, as Roger Urban sees it. The Group is offering a benchmark analysis of company specific inventory performance compared to their industry peer group and the implications on corporate profitability on a service basis. Trust us. The cost of this service is a bargain at ten times the price. (*Figure #34*)

To illustrate manufacturer power, Urban references examples where the vendor owns the supplies in the manufacturer’s warehouse and is not paid until the manufacturer takes them into work in process. The seller absorbs all of the inventory risk. For example, Chrysler used to buy paint from DuPont. Chrysler had paint in their raw material inventory. The paint was reclassified into work in process inventory as Chrysler painted the car. Now Chrysler pays DuPont for each car painted! Chrysler has no paint in raw material or work in process inventory. In effect, DuPont has reclassified the sale of paint into a service. This is much more than a reclassification of inventory. This is a fundamental change in the business relationship between Chrysler and DuPont. (*Figure #35*)

To illustrate growing retailer power, Urban refers to Wal-Mart, where point-of-sale data has historically been used to reorder and replenish inventory. Wal-Mart is now testing the use of point-of-sale data to trigger vendor payment. The cost of shortage or damage now falls to the seller. Accounts payable and accounts receivable are now eliminated. (*Figure #36*)

Urban's final observation deals with the correlation between high finished goods inventory and high gross margins. His experience has been that companies with higher gross margins can afford larger amounts of finished goods inventory. They use their availability of finished goods as a marketing weapon and service advantage. They provide a high level of customer service and they get paid for it. Urban believes that managing finished goods inventory is a marketing activity and one that is becoming more important in our service intensive economy. He believes that the trends among companies in raw material, work in process and finished goods inventory are not merely reclassification. Rather they reflect innovation and change in the way that companies are doing business. We have already stated that we have worked with Mr. Urban for 27 years. His views reflect research and his hands-on, fact based experience. His analysis has always been stimulating. He concentrates on big ideas. He is comfortable walking the road alone. His views may explain why software suppliers of event-driven inventory systems are having problems breaking through. Perhaps the vendors of event-driven inventory visibility systems should be contacting marketing executives in addition to information technology and supply chain managers. These days, we do not know where the line is between marketing and logistics when it comes to the management of finished goods inventory of event driven inventory visibility systems. It is probably company specific. But, given the poor record of adoption thus far, that may be a worthwhile idea. *(Figure #37)*

Summary

Let us proceed to summarize the 13th Annual Cass/ProLogis “State of Logistics Report[®].”

1. Logistics costs declined to \$970 billion during 2001. Logistics costs were equal to 9.5 percent of nominal gross domestic product, a record low in the history of the data.
2. The source of the cost reduction was lower inventory investment and lower inventory carrying cost due to declining interest rates.
3. Logistics expenditures managed by 3PLs grew by 7.4 percent to nearly \$61 billion.
4. The macroeconomic measures of inventory efficiency are becoming increasingly difficult to analyze due to constantly changing methods and sources.
5. Fortunately, The Ohio State University’s Supply Chain Management Group has studied the efficiency of raw material, work in process, and finished goods inventory for more than 8,000 public companies based on their financial reports to the Securities and Exchange Commission. That exploratory study reveals that, while nearly all industries have improved raw material and work in process inventory efficiency, most industries have not improved the efficiency of finished goods inventory. We reviewed the performance of computer/peripheral, the apparel sector, and the foods sector.
6. There are strategic and marketing explanations for the correlation of high finished good inventory and high gross margins. We have called attention to the technology based assumption of supply chain management for the past three years. Collaboration may be oversold. The management of finished goods inventory efficiency may be over taught. We have a lot more to learn.
7. Finally, we are just beginning to understand the new innovations and business practices that may be driving inventory investment. More research will follow as The Ohio State

University Supply Chain Management Research Group completes their analysis of 2001 data later this year.

We shall close the press conference by simply repeating the theme of 13th Annual Cass/ProLogis “State of Logistics Report”[®], UNDERSTANDING INVENTORY – STAY CURIOUS!



13th Annual "State Of Logistics Report"[©]

Understanding Inventory - Stay Curious



**June 10, 2002
National Press Club
Washington, D. C.**

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Cass Information Systems, Inv and ProLogis Wish to Acknowledge and Thank the Following Persons and Organizations For Their Contribution to this Report”[©]

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Contributions to Real GDP Growth Rate - Quarterly

	2000		2001			
	<u>3rd</u>	<u>4th</u>	<u>1st</u>	<u>2nd</u>	<u>3rd</u>	<u>4th</u>
Real GDP	2.2	1.0	1.32	0.31	-1.33	1.39
Final Sales	2.1	1.7	3.93	0.73	0.52	3.58
Change in Inventory	-0.2	-0.5	-2.61	-0.42	-0.81	-2.19

Source: U.S. Department of Commerce

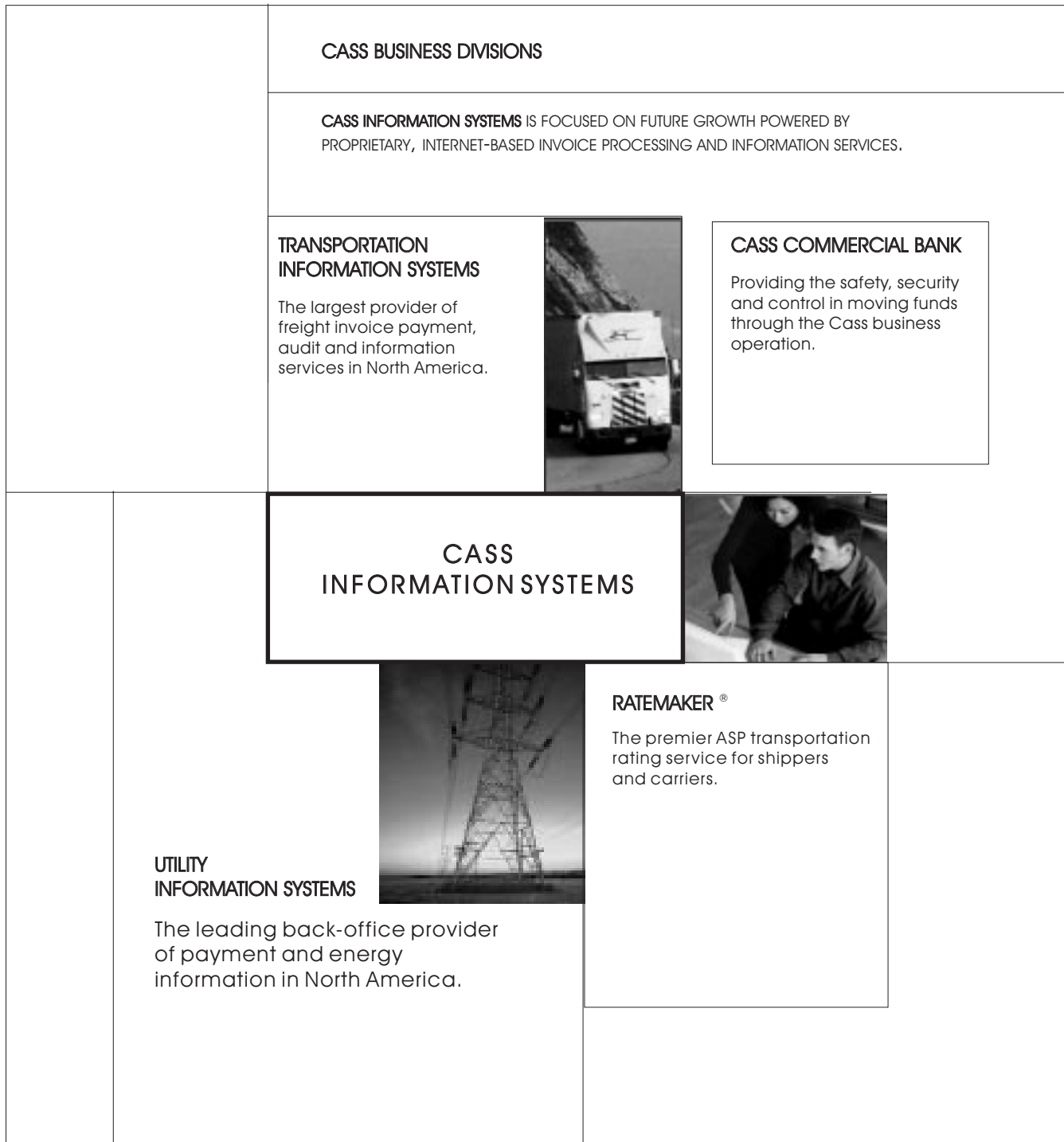


Figure # 2



Data Problems Drive The Interest In Cass Information Systems, Inc.

A data management survey of 600 Chief Information Officers and IT Directors revealed a critical need for better information.

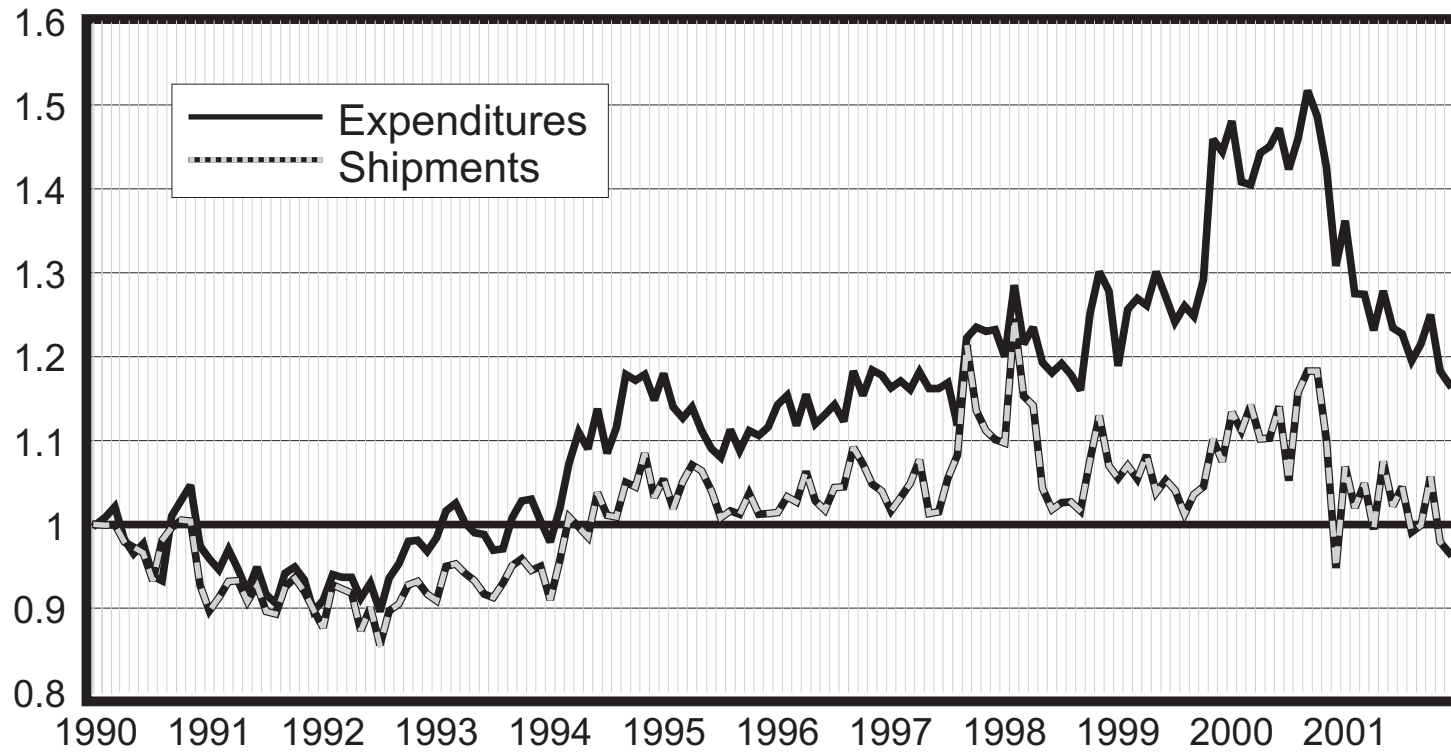
75% of all respondents reported having significant business problems as a direct result of defective data.

Only 15% of all respondents are "very confident" about the quality of the data their company receives from supply chain participants.

Source: Price Waterhouse Coopers, 2001



Freight Volume Index



Source: Cass Information Systems



Financial Highlights

	<u>2000</u>	<u>1999</u>	<u>% Change</u>
Total Revenue (\$000)	\$55,493	\$52,244	6.2%
Net Income(\$000)	\$7,025,000	\$7,147,000	(1.7%)
Basic Earning Per Share	\$2.18	\$2.05	6.3%
Diluted Earnings Per Share	\$2.15	\$2.02	6.4%
Return on Shareholder's Equity	12.86%	13.2%	(2.8%)
Invoices Paid (000)	22,527	20,507	9.9
Dollar Volume Paid (\$000)	9,180,000	8,461,000	8.5

Source: 2001 Summary Annual Report



Year 2001 Highlights

- ◆ **Delivered total returns, including dividends, of 3.1%**
- ◆ **Increased return on assets from 10.9% to 11.3%.**
- ◆ **Increased return on equity from 15.0% to 16.0%**
- ◆ **Increased funds from operations by 6.3%**
- ◆ **Recycled 1.2 billion in capital**
- ◆ **Developed a record of 14.8 million square feet of new distribution space**

Source: 2001 Summary Annual Report



The ProLogis Operating System[®]

- A proprietary property management and customer services delivery system that integrates four groups of professionals
- The Market Services Group offers in-depth knowledge of local conditions, infrastructure and government regulations
- The Global Development Group creates build-to-suit facilities and develops master-planned distribution parks
- The Prologis Solution Group provides network design and optimization, site selection, facilities layout, and materials handling equipment
- The Global Services Group builds relationships with the largest global users of distribution space



Other Interesting Facts About ProLogis

- \$7.5 billion of real estate assets under management, including development
- 3,500 customers leasing distribution facilities in 12 countries on three continents
- Strategic position in 7 largest logistics markets account for 52 percent of North American portfolio
- Leading positions in France, Poland, the Netherlands and the UK
- Growing presence in Spain, Italy, Germany, and Belgium
- Expanded into Japan with a build-to-suit project for DHL
- Land positions in Europe and North America support and additional 86 million square feet of development



Agenda

- 1. The costs of the business logistics system in 2001**
- 2. The trends in US business logistics cost between 1981 - 2001**
- 3. The expenditures managed by third party logistics service providers in 2001**
- 4. The macro economic indicators of inventory efficiency**
- 5. The change to the North American Industry Classification System (NAICS)**
- 6. The findings of The Ohio State University Supply Chain Management Research Group**
- 7. Strategic and Marketing implications of finished goods inventory**
- 8. Summary, questions and clarifications**



The U. S. Business Logistics System Cost is the Equivalent of 9.5 Percent of Current GDP in 2001

	<u>\$ Billions</u>
Carrying Costs - \$ 1.440 Trillion All Business Inventory	
Interest	55
Taxes, Obsolescence, Depreciation, Insurance	195
Warehousing	78
	<hr/>
Subtotal	328
Transportation Costs	
Motor Carriers:	
Truck - Intercity	333
Truck - Local	161
	<hr/>
Subtotal	494
Other Carriers:	
Railroads	38
Water (International 19 Domestic 9)	28
Oil Pipelines	9
Air (International 7 Domestic 17)	24
Forwarders	7
	<hr/>
Subtotal	106
Shipper Related Costs	5
Logistics Administration	37
	<hr/>
TOTAL LOGISTICS COST	970

Figure # 10

The Cost of the Business Logistics System in Relation to Gross Domestic Product

\$ Billion Except GDP

YEAR	NOMINAL GDP \$ TRILLION	VALUES OF ALL BUSINESS INVENTORY	INVENTORY CARRYING RATE	INVENTORY CARRYING COSTS	TRANSPOR- TATION COSTS	ADMIN- STRATIVE COSTS	TOTAL U.S. LOGISTICS COST	LOGISTICS % OF GDP	INVENTORY AS A % OF GDP	TRANSPOR- TATION AS A % OF GDP	INV. AS A % OF GDP 1989 BASE	TRAN AS A % OF GDP 1980 BASE	TOT. AS A % OF GDP 1980 BASE	GDP AS A % OF GDP 1980 BASE	TRAN AS A % OF TRAN 1980 BASE
1981	3.13	747	34.7%	259	228	19	506	16.2	8.3	7.3	100	100	100	100	100
1982	3.26	760	30.8%	234	222	18	474	14.5	7.2	6.8	87	93	90	104	97
1983	3.54	758	27.9%	211	243	18	472	13.3	6.0	6.9	72	94	82	113	107
1984	3.93	826	29.1%	240	268	20	528	13.4	6.1	6.8	74	94	83	126	118
1985	4.21	847	26.8%	227	274	20	521	12.4	5.4	6.5	65	89	77	135	120
1986	4.45	843	25.7%	217	281	20	518	11.6	4.9	6.3	59	87	72	142	123
1987	4.74	875	25.7%	225	294	21	540	11.4	4.7	6.2	57	85	70	151	129
1988	5.11	944	26.6%	251	313	23	587	11.5	4.9	6.1	59	84	71	163	137
1989	5.44	1005	28.1%	282	329	24	635	11.7	5.2	6.0	63	83	72	174	144
1990	5.80	1041	27.2%	283	351	25	659	11.4	4.9	6.1	59	83	70	185	154
1991	5.99	1030	24.9%	256	355	24	635	10.6	4.3	5.9	52	81	66	191	156
1992	6.32	1043	22.7%	237	375	24	636	10.1	3.8	5.9	45	81	62	202	164
1993	6.64	1076	22.2%	239	396	25	660	9.9	3.6	6.0	43	82	61	212	174
1994	7.05	1127	23.5%	265	420	27	712	10.1	3.8	6.0	45	82	62	225	184
1995	7.40	1211	24.9%	302	441	30	773	10.4	4.1	6.0	49	82	65	236	193
1996	7.81	1240	24.4%	303	467	31	801	10.3	3.9	6.0	47	82	63	250	205
1997	8.32	1280	24.5%	314	503	33	850	10.2	3.8	6.0	46	83	63	266	221
1998	8.78	1317	24.4%	321	529	34	884	10.1	3.7	6.0	44	83	62	281	232
1999	9.27	1381	24.1%	333	554	35	922	10.0	3.6	6.0	43	82	62	296	243
2000	9.87	1478	25.3%	374	590	39	1003	10.2	3.8	6.0	46	82	63	315	259
2001	10.21	1440	22.8%	328	605	37	970	9.5	3.2	5.9	39	81	59	326	265

Figure # 1 1

Data Sources: National Income and Products Accounts - Levels; Survey of Current Business March 2002. U.S. Statistical Abstract: U.S. Department of Commerce (NOTE) Transportation in America: Rosalyn Wilson, 2000 ENO Transportation Foundation, Washington, DC

Methodology: Business Logistics: Heskett, Ivie, Glaskowsky. 2nd Edition, 1973 The Ronald Press, New York, NY

NOTE: With the release of inventory data in April 2001, the Census Bureau began the conversion of inventory to the North American Industry Classification Systems (NAICS) replacing the former US Standard Industrial Classification System (SIC). Revisions are retroaction to 1998



Index of Business Logistics Costs As A Percent of GDP 1981 - 2001

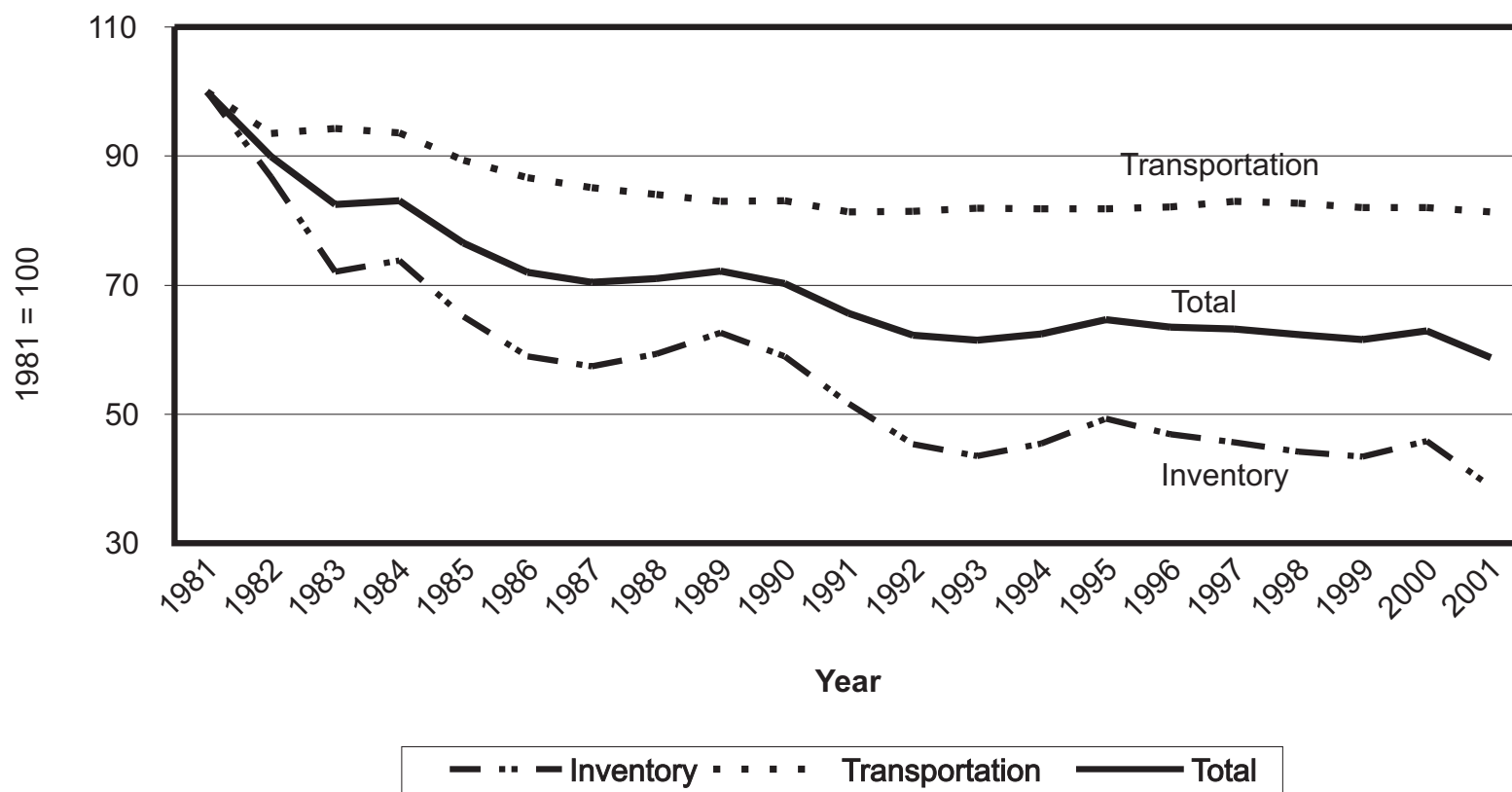


Figure # 12



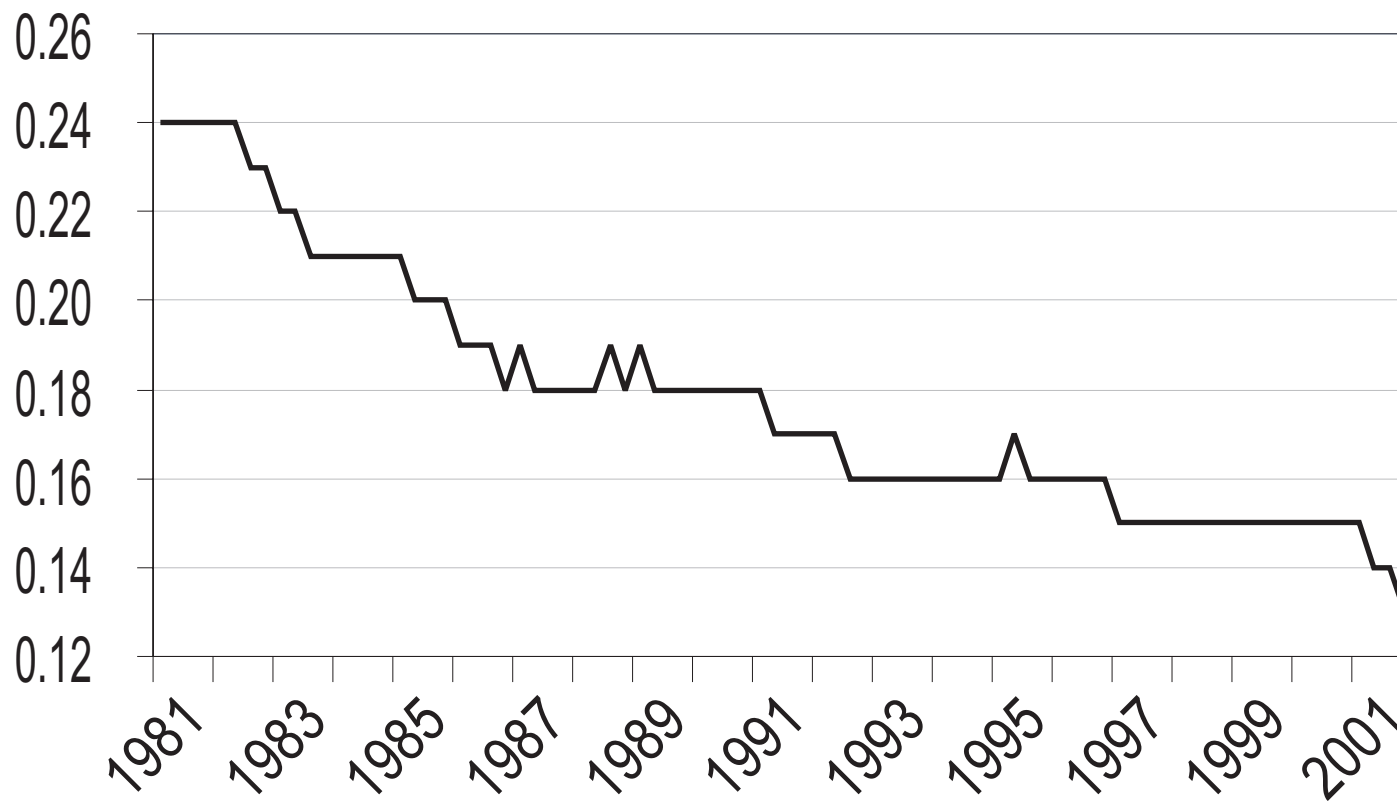
The Growing Expenditures Managed by Third Party Logistics Service Providers Exceeded \$60 Billion in 2001

<u>Third Party Service Providers</u>	<u>2001 Gross Revenues (\$ Billions)</u>	<u>Current Growth Rate (%)</u>
◆ Dedicated Contract Cartage	8.3	2.5
◆ Domestic Transportation Management	17.5	3.6
◆ Value-Added Warehouse/Distribution	15.3	13.3
◆ U.S. Based with International Operations	15.7	7.5
◆ 3PL Software	<u>4.0</u>	<u> </u>
◆ Total Contract Logistics Market	60.8	7.4

Source: Who's Who In Logistics? - Armstrong's Guide to Third Party Logistics Service Providers, Armstrong & Associates Inc. Stoughton, WI



Business Inventory to GDP Ratio



Source: U. S. Department of Commerce



Inventory-Sales Ratio

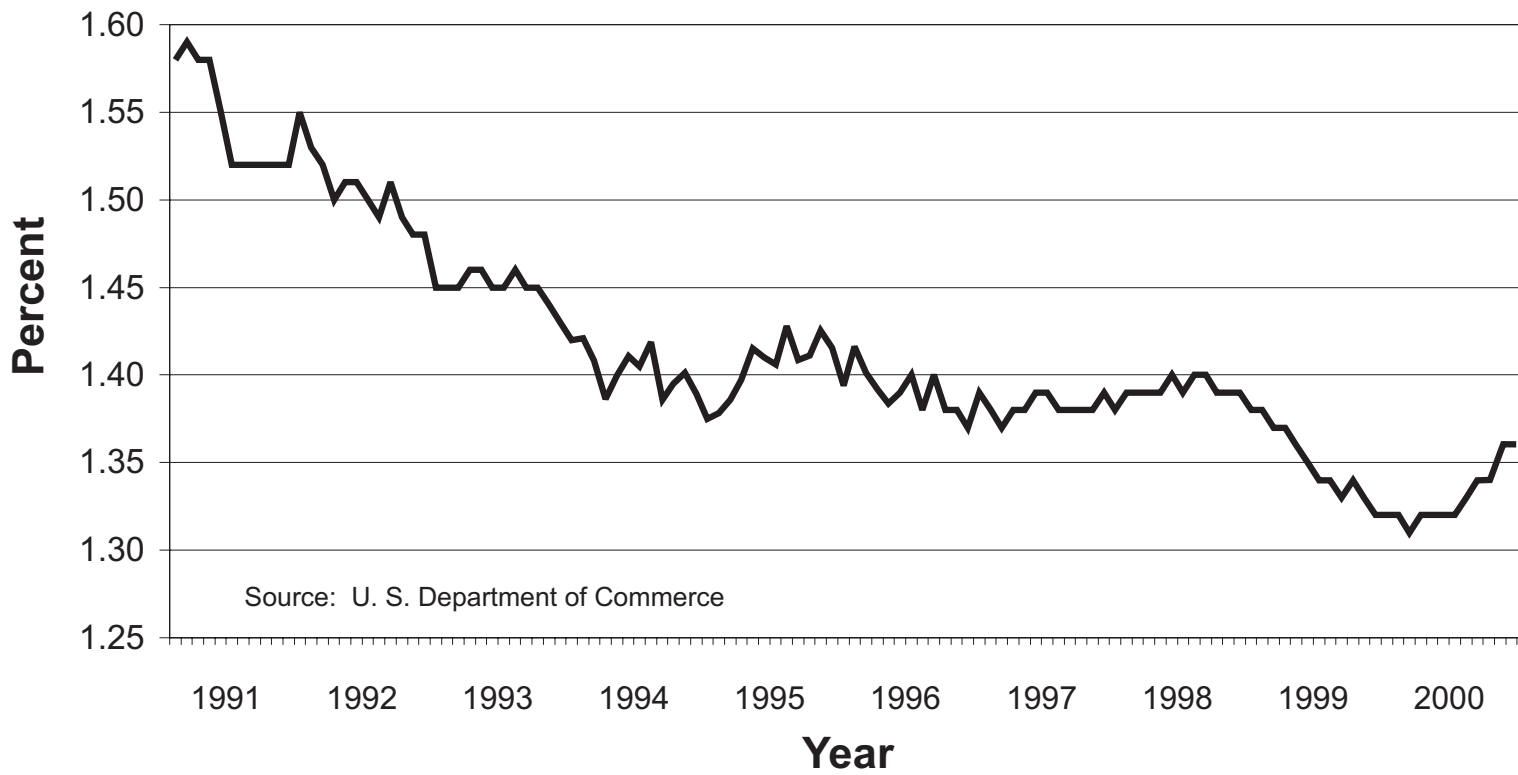
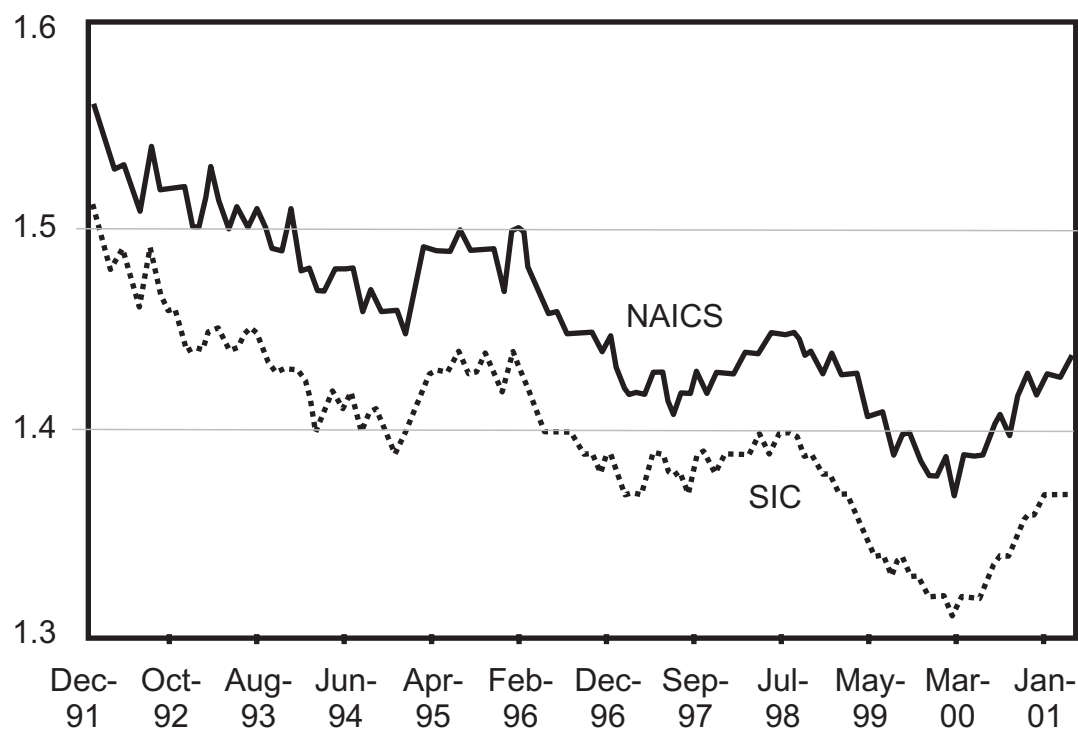


Figure #15



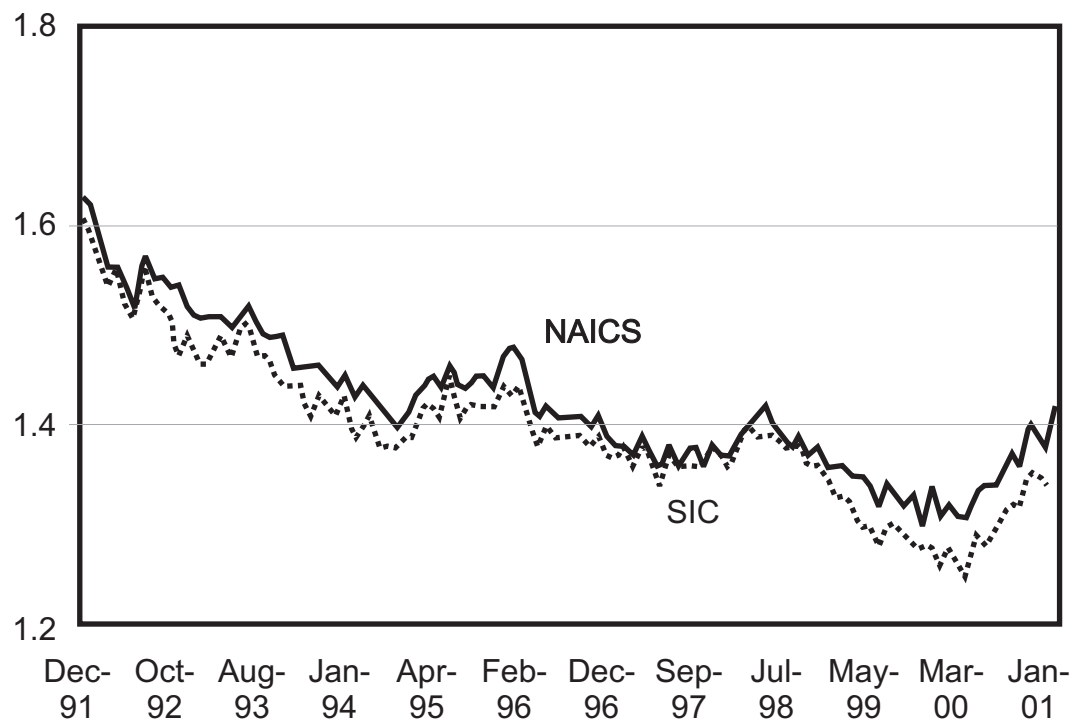
Total Business Inventory/Sales Ratio: NAICS & SIC Basis



Source: Federal Reserve Bank of St. Louis



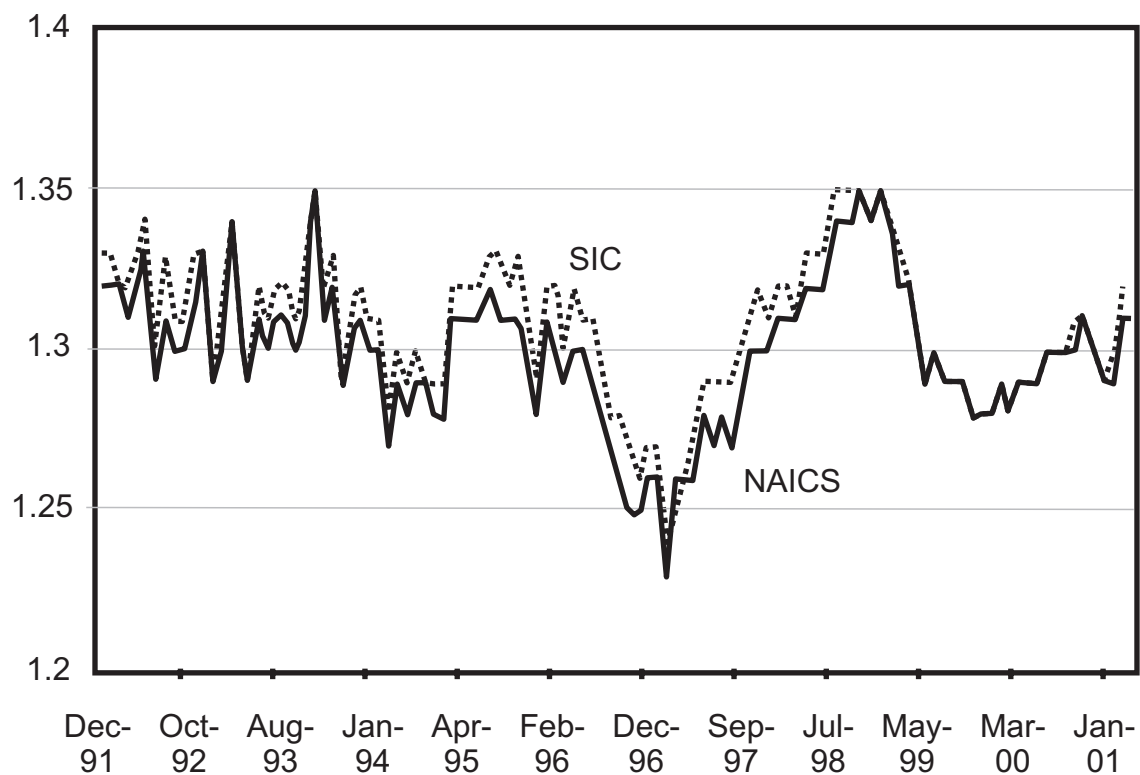
Manufacturers Inventory/Sales Ratio: NAICS & SIC Basis



Source: Federal Reserve Bank of St. Louis



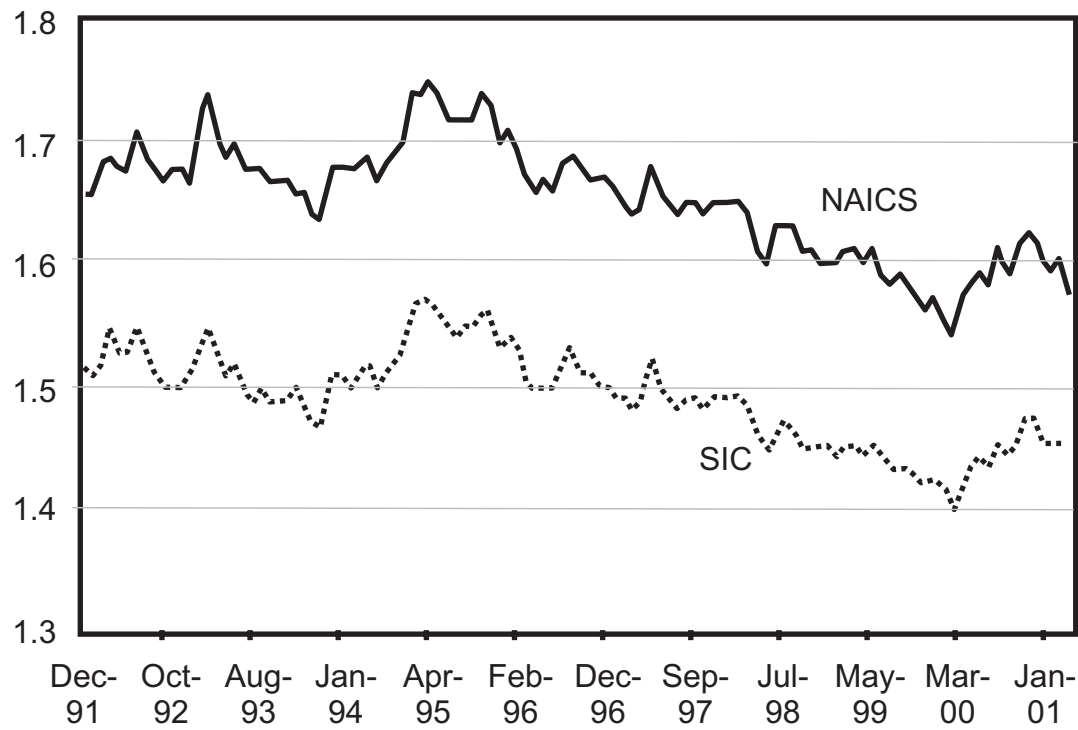
Wholesalers' Inventory/Sales Ratio: NAICS & SIC Basis



Source: Federal Reserve Bank of St. Louis



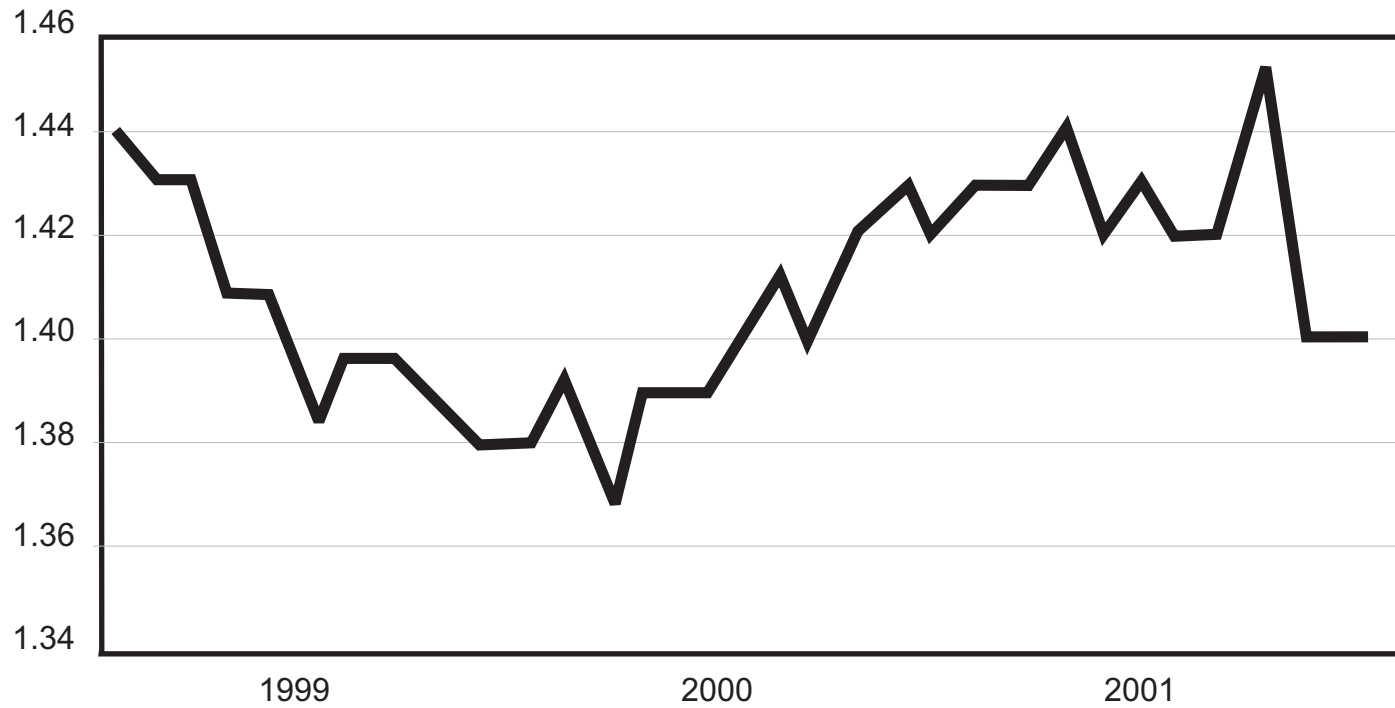
Retailers' Inventory/Sales Ratio: NAICS & SIC Basis



Source: Federal Reserve Bank of St. Louis



Inventory-Sales Ratio 3 Years



Source: U. S. Department of Commerce



The Ohio State University's Supply Chain Management Research Group (SCMRG)

- **The purpose of the Research Group is to conduct relevant business research in the area of Supply Chain Management that will be valuable to supporting organizations, students, and faculty.**
- **A joint venture directed by Professors Bernard J LaLonde and James L. Ginter**
- **Staffed by an Administrative Assistant and MBA and PhD candidates**
- **SCMRG's website is <http://fisher.osu.edu/supplychain>**



A Historical Analysis of Inventory Levels: An Exploratory Study

- **Used the COMPUSTAT database compiled by Standard and Poor**
- **Examined the annual financial reports to the Security and Exchange Commission by 8000 US Public Companies over 21 years**
- **Focused on the ratio of inventory to cost of goods sold (COGS) to eliminate the effects of and variability due to gross margins and changes or differences in gross margins**



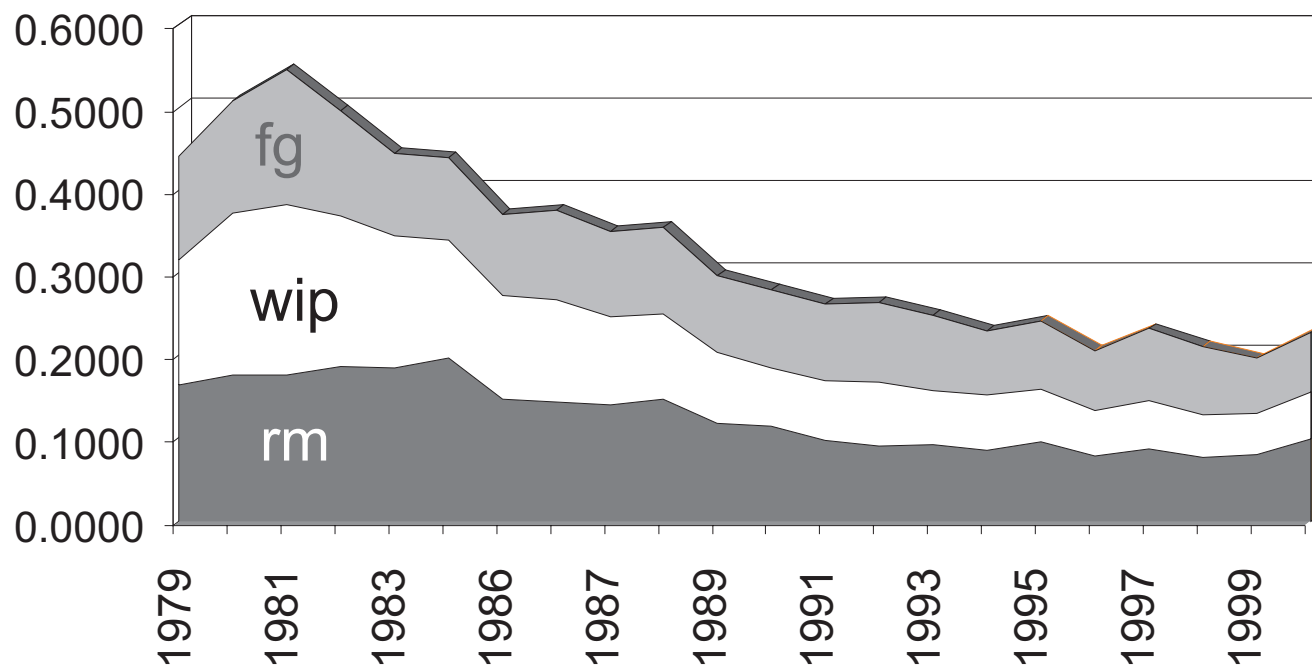
A Historical Analysis of Inventory Levels: An Exploratory Study

- **Nearly all industries reduced the ratio of raw material and work in process inventories to cost of goods sold**
- **But, in 9 of 14 industries the ratio of inventory investment in finished goods to cost of goods sold has either not changed or has increased in the 21 years between 1979 and 1999**
- **Companies who maintain higher levels of inventory to cost of goods sold turn out to have higher profit margins**



Computers & Peripherals Sector

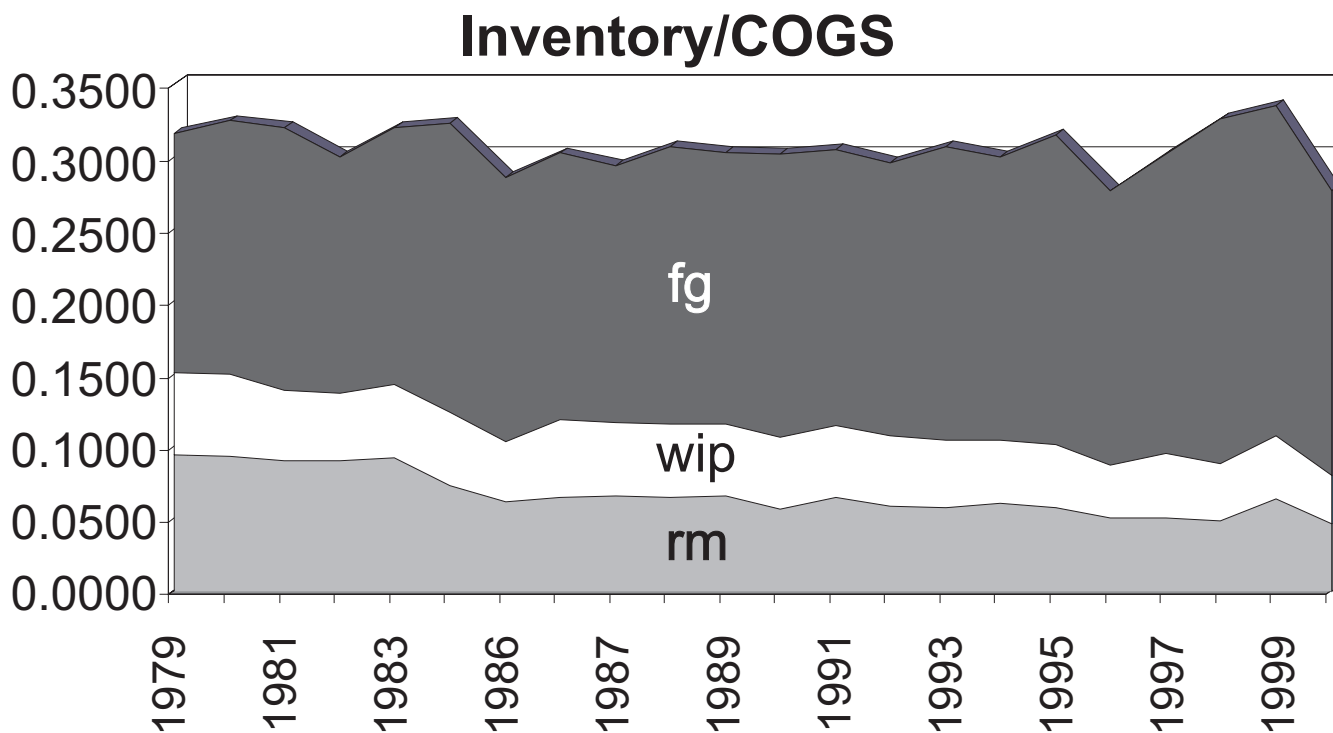
Inventory/COGS



Source: The Ohio State University Supply Chain Management Research Group



Apparel Sector

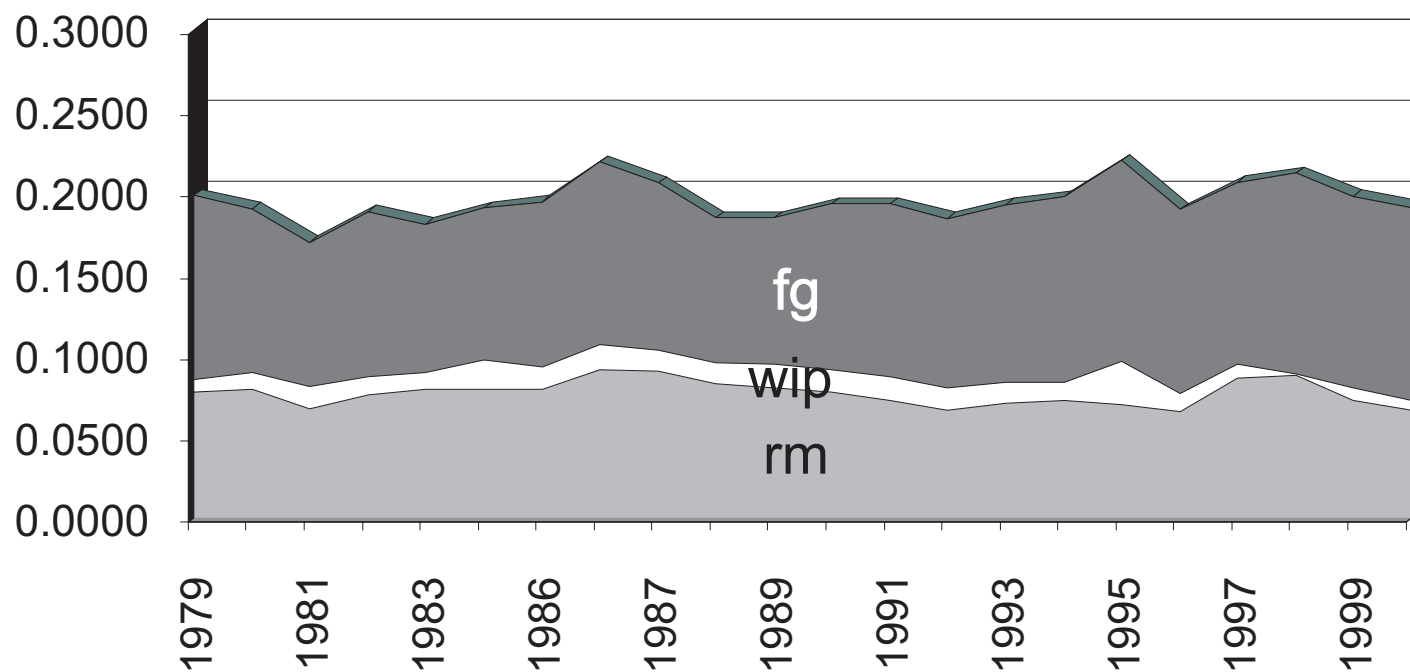


Source: The Ohio State University Supply Chain Management Research Group



Food Sector

Inventory/COGS



Source: The Ohio State University Supply Chain Management Research Group



Recent Examples of Consolidation Among Cass Clients In the Food, Home and Personal Care Industry

- | | |
|--------------------|------------------------------------------------------------------------------------------------------------------------|
| UniLever | acquired Lipton Tea, Best Foods, Ben & Jerry's, Slim Fast, Chesebrough Ponds among 20 companies during 2001 |
| Pepsi | acquired Quaker Oats and Tropicana |
| ACH Food | acquired Mazola |
| Nestle' | acquired Ralston Purina and SunMark |
| Kraft Foods | a Phillip Morris Company acquired Oscar Meyer and Life Savers |
| Smuckers | acquired Jif and Crisco |



Shippers Seek Transportation Savings

- Shippers are "buying down" in order to cut costs.
- They are choosing slower, less expensive transportation.
- Companies are using Transportation Management Software (TMS) in order to "save" money by reducing shipping costs.

Source : Urban Wallace Associates



TMS Cost Reduction Strategies

- 1. Switch to slower, less reliable modes.**
- 2. Consolidate freight into larger shipments.**
- 3. Ship less often.**

Source : Urban Wallace Associates



Actual Results Of TMS

Each of these strategies increases the amount of inventory held in a supply chain.

The cost of this extra inventory more than offsets any transportation savings.

Thus, in this economy, cutting transportation costs is a suboptimization that produces false savings.

Source : Urban Wallace Associates



Logistics Management of Continuous Change

For the foreseeable future logistics will be dominated by the challenges of managing change.

Agility, accommodation and flexibility are the keys to survival for supply chain managers.

These traits explain how the world's best firms achieve and maintain their logistical excellence.

*Source : Global Logistics Research Team at
Michigan State University*



Supply Chain Management

Because supply chain requirements and conditions are constantly changing, supply chains must be actively managed.

Optimization is irrelevant: continuous adjustment is the business goal.

Managers need up to date, accurate inventory information in order to continuously adjust their supply chains.

Source : Urban Wallace Associates



Why Increase in Finished Goods?

- Power of Retailers - Don't pay until sold or even after that
- Power of Manufacturers - Don't pay until used
- VMI - Vendor Managed Inventories
- VMI is really "Vendor Owned Inventory."
- The Buyer decides what to order, use, or return.
- The Vendor retains ownership and must locate the inventory where the Buyer wants.

Source : Urban Wallace Associates



Manufacturer Power

- Payment when part is taken into WIP.
- Transfer risk of obsolescence, waste or theft to seller.
- Chrysler pays Dupont for each car that is painted; Dupont supplies the paint.

Source : Urban Wallace Associates



Retailer Power

- Currently use Point-of-Sale (POS) data to reorder/replenish.
- WalMart is testing use of POS data to trigger vendor payment.
- Shortage or damage now fall to Seller; invoice accounts payable and accounts receivable are eliminated.

Source : Urban Wallace Associates



Correlation of High Finished Goods Inventory and High Gross Margins

Higher margins among companies holding larger amounts of finished goods inventory may be explained as follows:

Companies with higher gross margins can afford to hold larger amounts of finished goods inventory.

High margin companies use finished goods availability as a marketing weapon and service advantage.

Source : Urban Wallace Associates



Summary: The 13th Annual “State of Logistics Report”

- 1. 2001 logistics cost declined to \$970 billion and was equal to 9.5 percent on nominal GDP**
- 2. Lower inventory investment and lower inventory carrying cost drove the reduction in logistics cost**
- 3. Expenditures managed by 3PL grew 7.4 percent to \$60.8 billion**
- 4. Macro economic measures of inventory efficiency are increasingly difficult to analyze**
- 5. “An Historical analysis of Inventory Levels: An Exploratory Study” by the Supply Chain Management Research Group of the Ohio State University represent a major breakthrough**
- 6. There are strategic and marketing explanations for the correlation of high finished goods inventory and high gross margins**
- 7. Data for 2000 and 2001 will be available later this year and will be followed by more research**

UNDERSTANDING INVENTORY - STAY CURIOUS