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On-Road Carbon Monoxide and Hydrocarbon Remote Sensing in the Chicago Area in 1992

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CARBON MONOXIDE AND HYDROCARBON REMOTE SENSING IN THE CHICAGO AREA IN 1992

Final Report

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ABSTRACT

The University of Denver's remote sensor for measuring vehicle emissions (FEAT) completed five days of measurements at the intersection of I-290 (Eisenhower Expressway) and Central Avenue in Chicago, Illinois in June 1992. The location was the same as studied in 1989 and 1990 reported in ILENR/RE-AQ-90/05 and ILENR/RE-AQ-91/14 by Stedman and Bishop. In the current study, tailpipe HC and CO exhaust concentration ratios of passing vehicles were measured and then compared to data acquired previously at this location, as well as to data collected from other sites in the US and abroad. The emissions characteristics of the 1992 fleet changed little from previous years despite assurances from EPA that as fleets got newer their emissions would be reduced. Mobile source emission continue to be dominated by the 10% to 20% of the fleet which contribute over 50% of the CO and HC emissions. Comparison to fleets elsewhere in the US show very much the same pattern despite differences in inspection and maintenance programs and new vehicle standards. Comparison to fleets around the world shows that the US fleet has relatively low emissions which is attributable mostly to new vehicle emissions standards, low age, and higher socioeconomic status. Urban areas with mobile source air quality problems need to consider alternative means to target the elimination of high emitting vehicles that are driven on a regular basis.

ACKNOWLEDGMENTS

This project would not have been possible without the support, encouragement and participation of individuals from the Illinois Department of Energy and Natural Resources, the Illinois Office of Secretary of State and several other organizations which assisted us with the on-road operations and the license plate analysis. Financial assistance from ALI under contract to the API is greatly appreciated. We would also like to thank other members of the Phillipson Group at the University of Denver for their input and assistance. Also appreciated is the assistance received from other DU staff members who help maintain and improve our instruments, especially James Bean and Richard Quine.

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EXECUTIVE SUMMARY

Urban air quality does not meet the federal standards in many states. Violations of the ozone standard are believed to arise from photochemical transformation of oxides of nitrogen (NO_x) and hydrocarbons (HC). Carbon monoxide (CO) standards are primarily violated as a result of direct emissions of the gas. Mobile sources are a major factor in urban emissions inventories for NO_x, HCs, and CO.

Beyond the Federal New Vehicle Emissions standards, additional air pollution control measures taken to mitigate mobile source emissions in non-attainment areas include inspection and maintenance (I/M) programs, oxygenated fuels mandates, and transportation control measures. Nonetheless, many areas of non-attainment remained after the 1987 deadline, and some are projected to remain in non-attainment for several more years despite the measures currently undertaken.

The University of Denver remote sensor for the measurement of vehicle exhaust emissions, known as FEAT, is a non-dispersive infra-red instrument that can measure the carbon monoxide (CO), hydrocarbon (HC), and carbon dioxide (CO_2) exhaust emissions from a passing vehicle in less than a second. The system can be coupled with an SVHS video camera and VCR so that license plate information can be associated with the emissions information. The remote sensing techniques discussed in this report may have the potential to contribute to further control measures in non-compliance areas.

The purposes of this study were to compare data collected at the same roadway location to that acquired in two previous visits, to provide information for the solicitation of high emitting vehicles for further study and repair by the Automobile Research Laboratory, to develop a new set of fleet statistics, and to try observe the effects of aging on a group of vehicles with repeat measurements over the years. The results from the work by the Automobile Research Laboratory are available in a different report (Baudino, 1994). The primary focus of this report was to examine statistics from fleets of vehicles.

The emissions pattern from the Chicago fleet has changed little since 1989 when the first measurements were taken. A relatively small number of high emitting vehicles continue to dominate the fleet production of both CO and HC emissions and the fleet emissions in a given area are influenced mostly by the age of the fleet. This conclusion is true regardless of what location in the US is observed even though the I/M programs might be quite different. Also missing are distinguishable changes in fleet emissions with the introduction of higher technology emissions control systems.

There were 799 vehicles measured three or more times. These repeat measurements of the same vehicle were placed into four categories: always low emitting (<1 %CO and <0.1 %HC), moderate emitting (<4 %CO or <0.3 %HC), sometimes high emitting (one or more but not all measurements >4 %CO and >0.3 %HC) called "flippers", and always high emitting (>4 %CO and >0.3 %HC). Low emitting vehicles comprising 61% of the 799 vehicles fleet contributed 12% of the total CO emissions. By contrast, 24 vehicles (3% of the 799 vehicle fleet) were responsible for 23% of the total CO emissions. Similar results occurred for the HC data. The 1992 data, when compared to the 1990 and 1989 data sets, show the 1992 set to have more vehicles in the always clean category and fewer flippers. This is thought to arise because the 1992 data was collected in the summer and showed a smaller influence from cold start emissions. The 1990 HC data is also thought to be contaminated by vehicles emitting "steam plumes" of liquid water which the remote sensor incorrectly measured as high HCs.

The data sets for 1989, 1990 and 1992 were examined for vehicles showing up in all three, each with varying number of measurements in a given year, for the purpose of examining the effects of aging on emissions. For HC data, this analysis was restricted to the last two data sets (1992 and 1990) as HC data were not collected in 1989. This subset of the fleet consisted of only 130 vehicles which is too small a group from which to draw any valid conclusions. With a data set this small, individual vehicle variability influences the data more than the small trends expected to be seen. An attempt was also made to see what effect change in ownership might have on emissions by looking for vehicles with the same VINs but with a change in license plate number. This subset of the 130 repeat measurements consisted of only two vehicles both of which were measured with higher emissions after changing owners. Again, this is too small a data set from which to draw any meaningful conclusion beyond speculation.

Analyses of the data based on continent of origin of the vehicle (U.S., Asia, Europe) showed that the European fleet tends to be cleaner than those from the U.S. or Asia, despite starting with similar emissions when new. The difference is thought to be maintenance related since European vehicles tend to be more expensive and a vehicle owner who spends more for a vehicle is likely to take better care of it. From 1992 back to 1987 with one year's exception (1991), vehicles of Asian manufacture are higher emitting than the other two fleets. This is thought to have less to do with the vehicles themselves than with the fact that Asian vehicles tend to have smaller engines and can have higher exhaust concentrations while maintaining equivalent mass emissions in grams per gallon.

The U.S. fleet was divided into four manufacturers, Buick, Oldsmobile, Ford, and Chevrolet. The purpose of this analysis was to look for the influence of light and medium duty trucks on fleet emissions. The fleet consisting of Buicks and Oldsmobiles has slightly lower emissions overall, both for CO and HC, compared to the fleet consisting of Chevrolets and Fords.

Despite the increased percentage of newer technology vehicles (closed loop emissions systems with three-way catalytic converters), the fleet emissions profile has remained virtually unchanged in the Chicago area since 1989. This conclusion suggests that tighter new vehicle emission standards and other emissions limiting programs designed to treat the whole fleet of vehicles (oxygenated fuels, reformulated fuels, transportation control measures) will not accomplish the desired results of better air quality. That the U.S. fleet is one of the lowest emitting in the world is a tribute to their technologically advanced state, however, further air quality improvements must come from reducing the emissions from the 10-20% of the fleet causing most of the mobile source pollution. Remote sensing has shown itself to be a valuable tool in the identification of these vehicles.

Section 1

INTRODUCTION

BACKGROUND

Urban air quality does not meet the federal standards in many states. Violations of the ozone standard are believed to arise from photochemical transformation of oxides of nitrogen (NO_x) and hydrocarbons (HCs). Carbon monoxide (CO) standards are primarily violated as a result of direct emissions of the gas. Mobile sources are a major factor in urban emissions inventories for NO_x, HCs and CO.

Beyond the Federal New Vehicle Emissions standards, additional air pollution control measures taken to mitigate mobile source emissions in non-attainment areas include inspection and maintenance (I/M) programs, oxygenated fuels mandates and transportation control measures. Nonetheless, many areas of non-attainment remained after the 1987 deadline, and some are projected to remain in non-attainment for several more years despite the measures currently undertaken. The remote sensing techniques discussed in this report may have the potential to contribute to further control measures in non-compliance areas. The 1990 US Clean Air Act amendments require non-attainment areas to "include on-road emissions monitoring" in their post-1990 I/M programs. This amendment, the "Barton Clean Air Smog Trap Amendment" was included based on literature and demonstrations of on-road remote sensing presented to the U.S. Congress by the University of Denver.

With initial support from the Colorado Office of Energy Conservation in 1987, the University of Denver (DU) developed an infra-red (IR) remote monitoring system for automobile CO exhaust emissions. Significant improvements in fuel economy result if rich-burning (high CO emissions) or misfiring (high HC emissions) vehicles are tuned to a more stoichiometric and more efficient air/fuel (A/F) ratio. Therefore, the University of Denver CO and HC remote sensor is named Fuel Efficiency Automobile Test (FEAT). Figure 1 shows a schematic diagram of the basic instrument set up along the road.

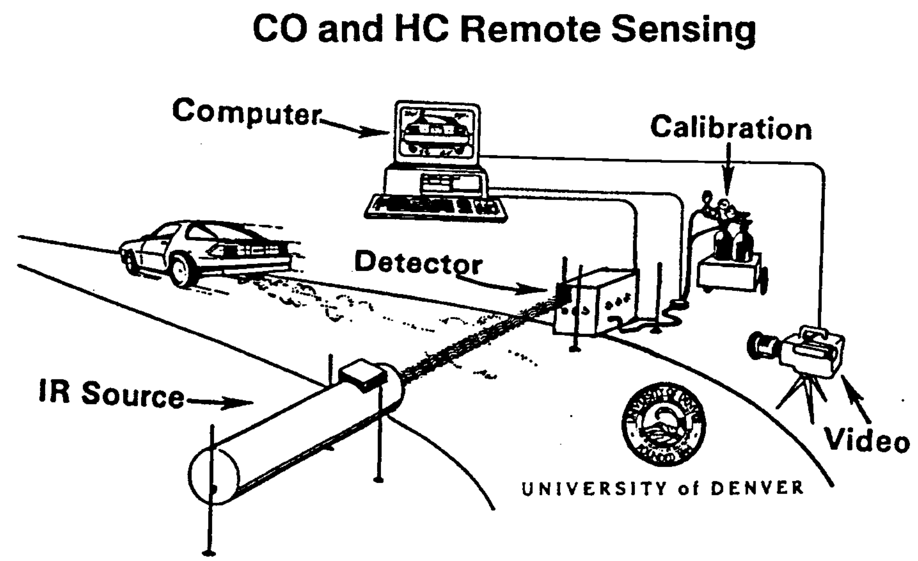


Figure 1 A schematic diagram of the University of Denver on-road emissions monitor. In less than a second, it is capable of measuring emissions from vehicles traveling between 2.5 and 150 mph.

THEORY

The FEAT instrument was designed to emulate the results one would see using a conventional non-dispersive infra-red (NDIR) exhaust gas analyzer. Thus, FEAT is also based on NDIR. An interference filter that transmits infra-red (IR) light of a wavelength known to be uniquely absorbed by the molecule of interest is placed in front of a detector. Reduction in the signal caused by absorption of light by the molecules of interest produces a reduction in the voltage output. One way of conceptualizing the instrument is to imagine a typical bench type NDIR instrument in which the separation of the IR source and detector is increased from 10 cm to 20-40 feet. Instead of pumping exhaust gas through a flow cell, a car now drives between source and detector. Because the effective plume path length and amount of plume seen depends on turbulence and wind, one can only look at ratios of CO or HC to CO_2. These ratios are termed "Q" for CO/CO_2 and "Q'" for HC/CO_2 and are constant for a given exhaust plume. By themselves, Q and Q' are useful parameters with which to describe the combustion system. With the aid of a fundamental knowledge of combustion chemistry, many parameters of the vehicle's operating characteristics can be determined including the instantaneous air/fuel ratio, the %CO or HC which would be read by a tailpipe probe, and the grams CO or HC emitted per gallon of gasoline (g CO/gallon or g HC/gallon) emissions.

gmCO/gal = 14880 * %CO/(42 + (0.79 * %CO) + (8.37 * %HC))

gmHC/gal = 22320 * %HC/(42 + (0.79 * %CO) + (8.37 * %HC))

Most vehicles show a Q and Q' of zero since they emit little to no CO or HC. To observe a Q greater than zero, the engine must have a fuel-rich air/fuel ratio and the emission control system, if present, must not be fully operational. A high Q' can be associated with either fuel-rich or fuel-lean air/fuel ratios coupled with a missing or malfunctioning emission control system. A lean air/fuel ratio while impairing drive ability does not produce CO in the engine. If the air/fuel ratio is lean enough to induce misfire then a large amount of unburned fuel (HC) is present in the exhaust manifold. If the catalyst is absent or non-functional, then high HC will be observed in the exhaust without the presence of high CO. To the extent that the exhaust system of this misfiring vehicle contains some residual catalytic activity, the HC may be partially or totally converted to a CO/CO_2 mixture.

INSTRUMENTAL DETAILS

The present design of FEAT instruments, of which there are now eight, incorporates four channels using interference filters built into Peltier-cooled lead selenide (Pb/Se) detectors. The four channels and their respective filter bandpass centers are: CO (4.6μ), CO_2 (4.3μ), HC (3.4μ) and reference (3.9μ). The instrument uses a mirror to collect the light and focus it onto a spinning 12 faceted polygon mirror which provides a chopping frequency of 2,400 Hz. The reflected light from each facet of the rotating mirror sweeps across a series of four focussing mirrors which in turn direct the light to the four detectors. Each detector thus gets a burst of full signal from the source in a sequential fashion for each measurement mode.

Each detector provides a pulse train at 2,400 Hz equivalent to the intensity of the IR radiation detected at its specific wavelength. Electronic circuitry averages 24 of these pulses, subtracts any background signal, and provides the averaged DC level to four signal ports. These are connected to the computer through an analog to digital converter.

All data from the CO, CO_2, and HC channels are corrected by ratio to the reference channel. This procedure eliminates other sources of opacity such as soot, turbulence, spray, dangling license plates, etc. from providing data that could be incorrectly identified as CO or HC.

Software written for these instruments reports the measurements as %CO, %CO_2, and %HC. The %HC is given as equivalent concentration of propane. This second step is not in accordance with normal I/M procedures. I/M instruments are tested for a single propane/hexane response ratio. Even though all subsequent calibrations are performed with propane, the I/M data are reported as "hexane equivalent" by multiplying the measured percent propane value by the propane/hexane response factor (a value usually close to 0.5). A test of this response factor was performed using our calibration system and yielded a divisor of 0.51. In view of the fact that the instrument is calibrated with propane, we report percent HC as propane.

CALIBRATION

There are two separate calibration procedures performed on every remote sensing unit. The first consists of exposure in the laboratory at a path length of about 22 feet to known absolute concentrations of CO, CO_2, and propane in an 8 cm IR flow cell. The calibration curves generated there are used to establish the fundamental sensitivity of each detector to the gas of interest, and to derive an equation relating the lowered voltages observed to those concentrations. As expected, CO and CO_2 curves are non-linear. Because of the small amount of HC to which the instrument is exposed, the HC curve is closer to linear and is approximated by a linear equation. The equation for the calibration lines become an empirical component of the instrument data analysis algorithm.

Before each day's operation in the field, the instrument undergoes a quality assurance calibration performed with the system set up at the path length to be used at that location. A puff of gas designed to simulate all measured components of the exhaust is released into the instrument's path from a cylinder containing certified amounts of CO, CO_2, and propane. The ratio readings from the instrument are compared to those certified by the cylinder manufacturer. Because of the curvature of the response functions, particularly for CO_2, the field calibrations usually show higher ratios to CO_2 than those derived from the laboratory tests. The data for each day are adjusted by that day's correction factor.

SOFTWARE

The software which runs the system has been written with the concept that it is better to declare that a given vehicle's emission is not correctly measured than to let erroneous data into the database. The copyrighted software contains many checks that are used to detect potential errors. When errors are detected they lead to rejection of the measurement which sets an invalid flag in the database. Two major criteria for rejection are not observing sufficient signal change to measure any exhaust components accurately and observing too much scatter in the HC or CO to CO_2 correlations from which the ratios are derived. The slope of the best fit straight line correlation is used for the ratio determination. The first rejection criterion could occur for passing pedestrians, heavy-duty diesel or gasoline vehicles with an elevated exhaust, or any other instance in which the beam is blocked without the appearance of exhaust. The second criterion is set based on the expected signal/noise of the system. For CO a least square slope error of less than 20% is allowed for all CO readings above 1%. For CO readings below 1%, the rejection threshold is fixed at 0.2 %CO. Rejection criteria for the HC channel are currently set at less than 20% for HC readings of 0.375 %HC and greater and 0.075 %HC for readings less than 0.375 %HC (Bishop *et al.*, 1989; Guenther *et al.*, 1991).

The FEAT remote sensor is accompanied by a video system when license plate information is required. The video camera is coupled directly into the data analysis computer so that the image of each passing vehicle is frozen onto the video screen. The computer writes the date, time, and the CO, HC and CO_2 concentrations at the bottom of the image. These images are then stored on videotape.

FEAT can measure the CO and HC emissions in all vehicles, including gasoline and diesel-powered vehicles, as long as the exhaust plume exits the vehicle within a few feet of the ground. Due to the height of the sensing beam, FEAT will not register emissions from exhausts which exit from the top of vehicles such as heavy duty diesel vehicles in the U.S.. CO and HC emissions from diesel-powered vehicles are, in any case, usually negligible. FEAT is effective across single or multiple traffic lanes of up to 40 feet in width. However, if one wishes to positively identify and video each vehicle with its exhaust, it can only be used across a single lane of traffic. FEAT operates most effectively on dry pavement. Rain, snow, and vehicle spray from very wet pavement cause interferences with the IR beam. These interferences do not cause incorrect readings, rather they cause the frequency of invalid readings to increase, ultimately to the point that all data are rejected as being contaminated by too much "noise". At suitable locations, exhaust can be monitored from over one thousand vehicles per hour.

FEAT has been shown to give accurate readings for CO by means of double-blind studies of vehicles both on the road and on dynamometers (Lawson *et al.*, 1990; Stedman and Bishop, 1990). EPA has shown that the readings are closely comparable to laboratory readings from a vehicle on a dynamometer (Stedman and Bishop, 1990). Lawson and coworkers used a vehicle with variable emissions under passenger control to show the correctness of the on-road readings (Lawson *et al.*, 1990). The most recent data (Ashbaugh *et al.*, 1992) show that the CO readings are correct within ±5% and HC within ±15%.

It is important to point out that on-road emissions (both evaporative and tailpipe) are the parameter which all mobile source control agencies are constituted to control. The fact that a remote sensor can be used to directly measure the tailpipe component is of considerable advantage over other tests, particularly if there are ways that individuals or manufacturers can circumvent other tests, thus rendering the results unrepresentative of the on-road fleet. When an NO channel becomes available, on-road CO, HC and NO emissions will be simultaneously measurable.

The purpose of this report is to present the CO and HC measurements made by means of remote sensing in the Chicago area during the summer of 1992 and compare the results with those from 1989 and 1990. This report compares the data to that from other locations and provides information potentially useful for decision makers charged with the responsibility to both evaluate and reduce on-road motor vehicle emissions. Throughout this report we use the term "on-road emissions" to describe the measurements obtained by the remote sensor, and in the sense of "on-road" intended by the U.S. Congress in the 1990 Clean Air Act Amendments. The term "fleet", unless otherwise stated, is used to mean those vehicles monitored by on-road remote sensing. When fleet data are analyzed as a whole, we find that half the CO is emitted by a small fraction of the vehicles. These vehicles are termed "gross polluters" throughout this report. The cut point for the gross polluter category varies somewhat from fleet to fleet depending mainly on the average age of the vehicles. Also, a "clean car" refers to a vehicle with an on-road CO reading of less than 1 %CO.

Section 2
RESULTS AND DISCUSSION

MEASUREMENT SITE AND DATA COLLECTION

In June, 1992, five days of measurements were carried out at the intersection of I-290 (Eisenhower Expressway) and Central Avenue in Chicago, Illinois. The location was the same as studied in fall of 1989 and 1990 reported in ILENR/RE-AQ-90/05 (Stedman and Bishop, 1990) and ILENR/RE-AQ-91/14 (Stedman *et al.*, 1991a). The average ambient temperatures were 30-40 degrees for 1989 and 1990 studies and 80-90 degrees for this study. The traffic densities were similar between the 1989, 1990 and 1992 studies with an average vehicle speed of 25 mph. In this study, tailpipe HC and CO exhaust concentration ratios of passing vehicles were measured by using the on-road remote sensor.

Each beam block initiates an analysis for vehicle exhaust. Error checking routines in the FEAT computer eliminate invalid data caused by inadequate amount of exhaust, pedestrians, bicyclists, etc. The license plates of passing vehicles were recorded on video tapes which were read for license plate identification. The plates which appeared to be in-state and readable were forwarded to the State to determine make and model year information. In view of the large data set we chose only to analyze data for which both HC and CO parameters were valid. The five days of measurements obtained 11,621 measurements of which 10,990 had valid CO and HC measurements. Video tape transcription was completed with 8,948 vehicles having readable Illinois license plates. Upon return from the Secretary of State's Office, 8,733 complete records with an average vehicle age of 6.71 years were obtained with valid CO and HC data along with make and model year information.

OVERALL RESULTS

Figure 2 compares the distribution of vehicles by percent CO category (black bars) with their contribution to overall CO emissions (clear bars) as indicated by the set of 8,733 records measured in the Chicago area in June, 1992. The mean %CO is 1.04, while the median is only 0.25 %CO. More than 76% of the fleet emits less than 1 %CO. The skewed nature of the distribution is such that more than half the CO emissions come from only 7.5% of the fleet having emissions greater than 4.2 %CO. Vehicles in this segment of the fleet are referred to as

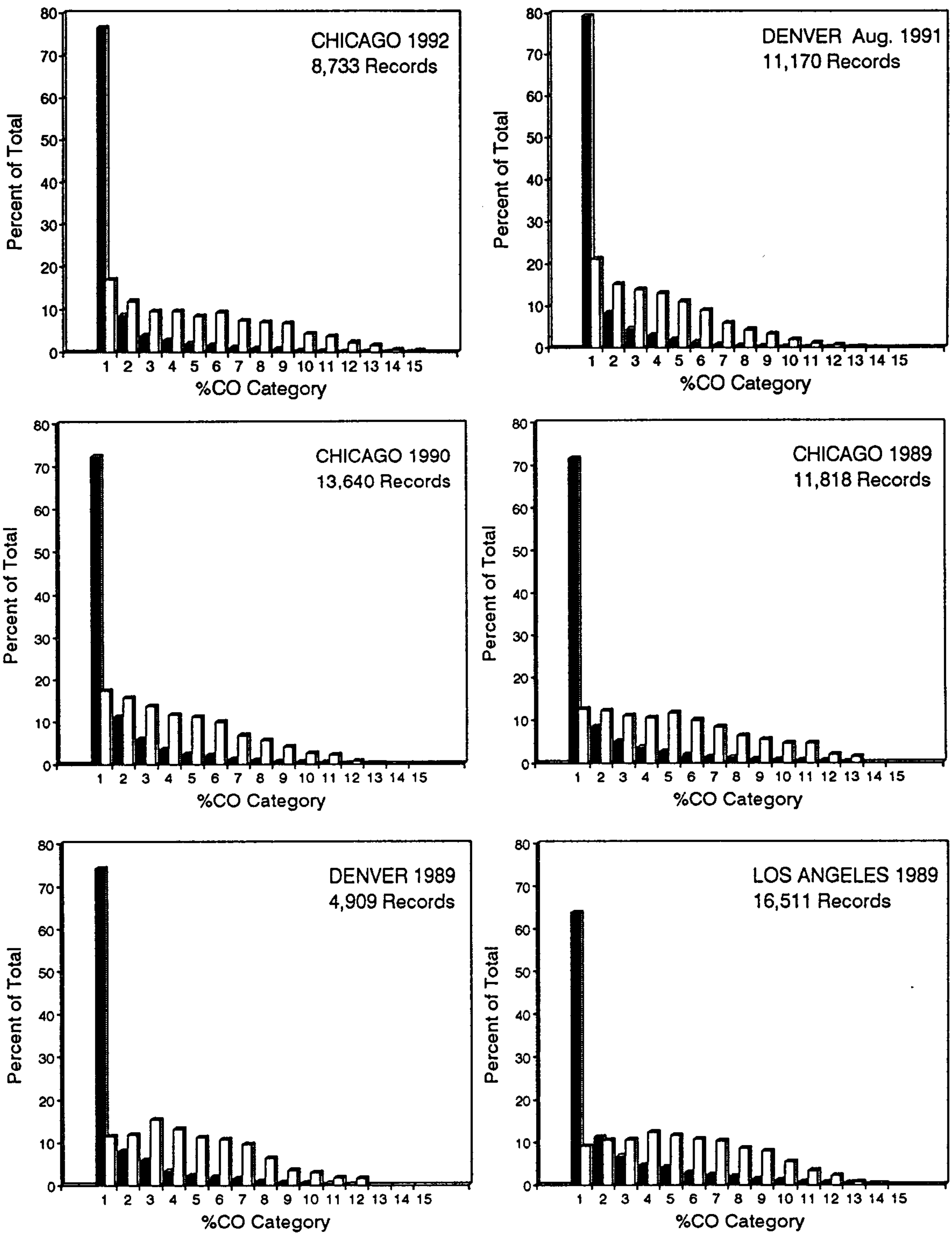


Figure 2 Normalized histogram showing the percentage of the fleet of vehicles with emissions less than the stated %CO category (black bars) and their percentage of total emissions (clear bars).

"CO gross polluters". For comparison, the other graphs in Figure 2 show that the 1992 Chicago CO data are very similar in distribution to that from Chicago in 1989 and 1990, Denver in 1989 and 1991, and Los Angeles in 1989 (Stedman *et al.*, 1991b).

For Figure 3, the measurements from each data set were sorted by CO level from the lowest to the highest and then divided into ten equal sized groups (deciles). Each bar corresponds to the average emissions from each decile of the total fleet. Note that the emissions of the cleanest seven deciles have been averaged together. This has been done because the tiny differences between low emission averages of the cleanest 70% of the fleet are within the error bars of the FEAT measurement capability. These decile plots illustrate that most vehicles are very low emitters. The other graphs in Figure 3 again show that the 1992 Chicago CO data are similar to those from other data sets.

Figure 4 compares the distribution of vehicles by percent HC category (black bars) with their contribution to overall HC emissions (clear bars) for the Chicago 1992 data set. The average %HC in propane equivalents is 0.088 with a median value of 0.058. As with the CO emissions, the distribution shows that more than 74% of the fleet emit less than 0.1 %HC and is skewed such that more than half the HC emissions come from 18% of the fleet with emissions greater than 0.12 %HC. Again, comparison with the other graphs shows the similarity in distribution between the HC data from Chicago in 1990 and 1992 and Denver in 1991.

Figure 5 shows the same analysis as in Figure 3, but for HC emissions. The data for the two Denver dates were collected at different locations with vehicles in different driving modes. The location with the higher HC readings was a site which included a higher proportion of vehicles that were decelerating. The differences between August 1991 and October 1991 HC data collected in Denver are discussed in greater detail elsewhere (Zhang *et al.*, 1993).

As illustrated by Figure 2 to Figure 5, most vehicles are low emitters and the emission distributions in the Chicago, Denver, and Los Angeles area are quite similar, even though the altitude (5,000 ft. in Denver) and the I/M programs are different. The I/M programs in Denver and Los Angeles are decentralized, annual in Denver, biennial in Los Angeles. The I/M program in Illinois was annual and centralized before 1990, and is now biennial for newer vehicles.

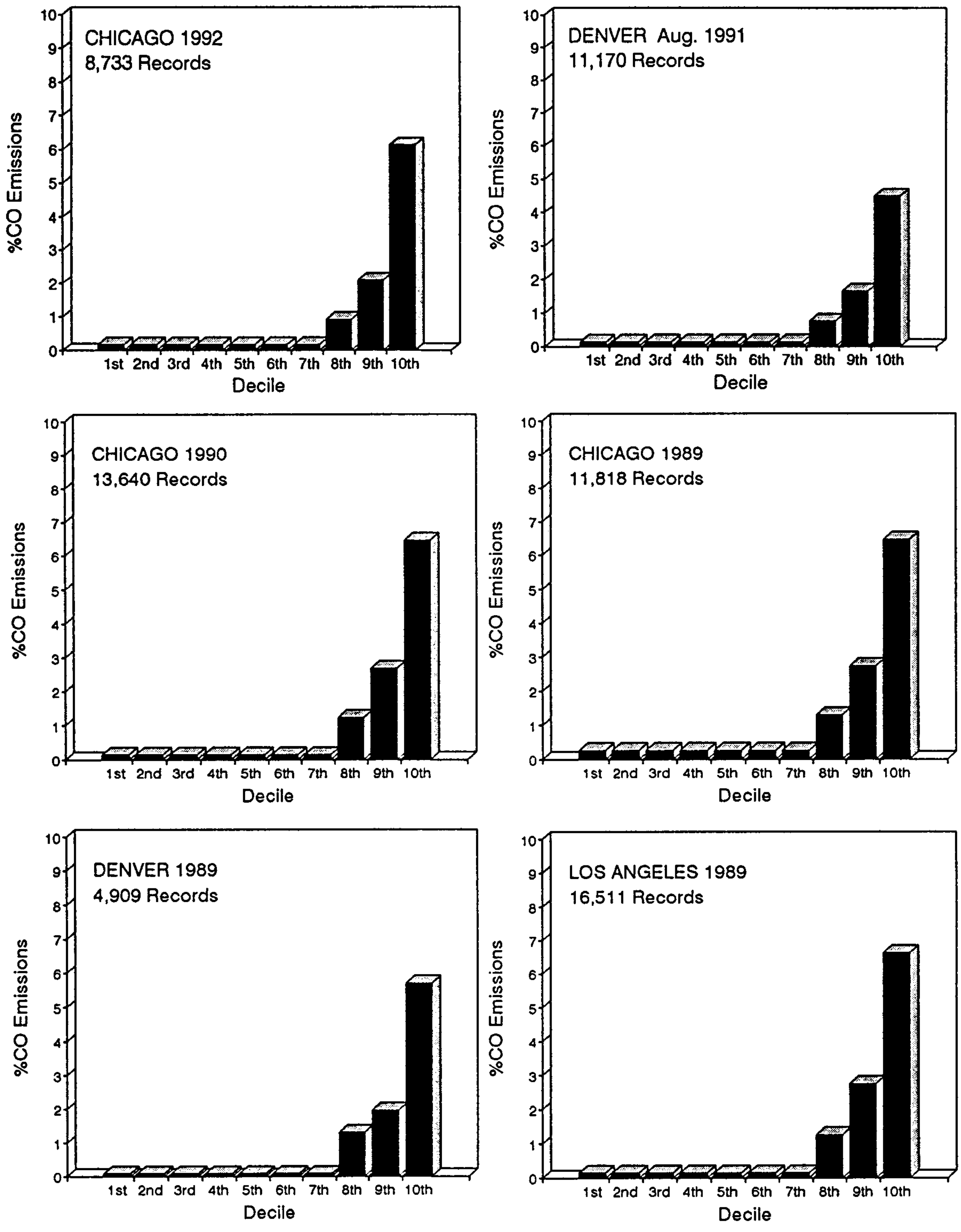


Figure 3 Mean %CO organized into deciles. The seven deciles with the lowest emissions are given the average of all seven since the differences between them are negligible.

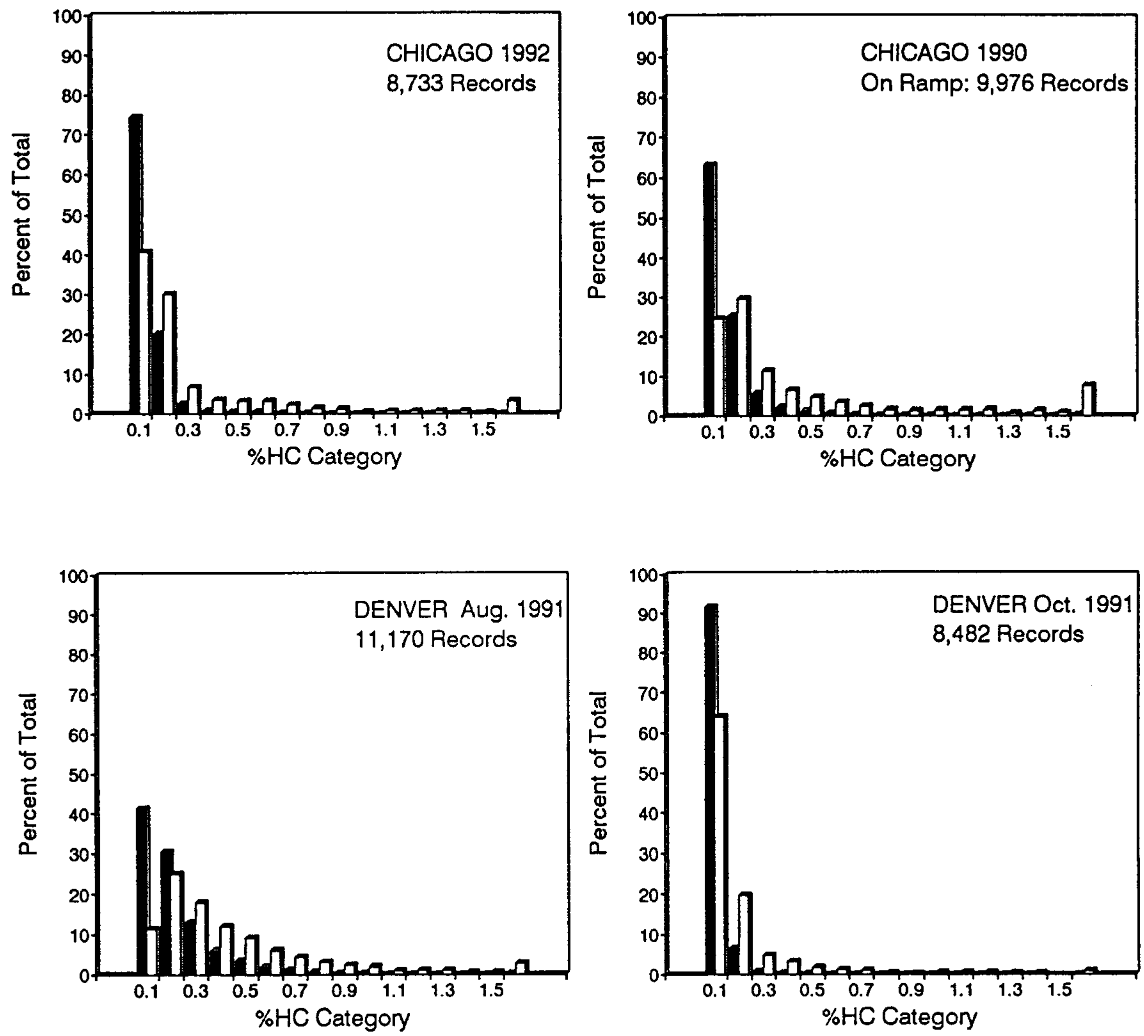


Figure 4 Normalized histogram showing the percentage of the fleet of vehicles with emissions less than the stated %HC category (black bars) and the percentage contribution of those emissions (clear bars). HC emissions are in terms of propane equivalents.

Furthermore, Figures 2 to 5 illustrate that motor vehicle emissions are not normally (Gaussian) distributed with the emissions spread equally about the mean which then equals the median. Motor vehicle emissions turn out empirically to be distributed according to a gamma distribution, which is quite different from the more familiar normal distribution. Two consequences of gamma distributions are: (1) "Outliers" cannot be estimated or eliminated based on normal statistics and (2) Robust analysis of emissions data requires large N (population) values since the emissions picture is dominated by a few high emitters.

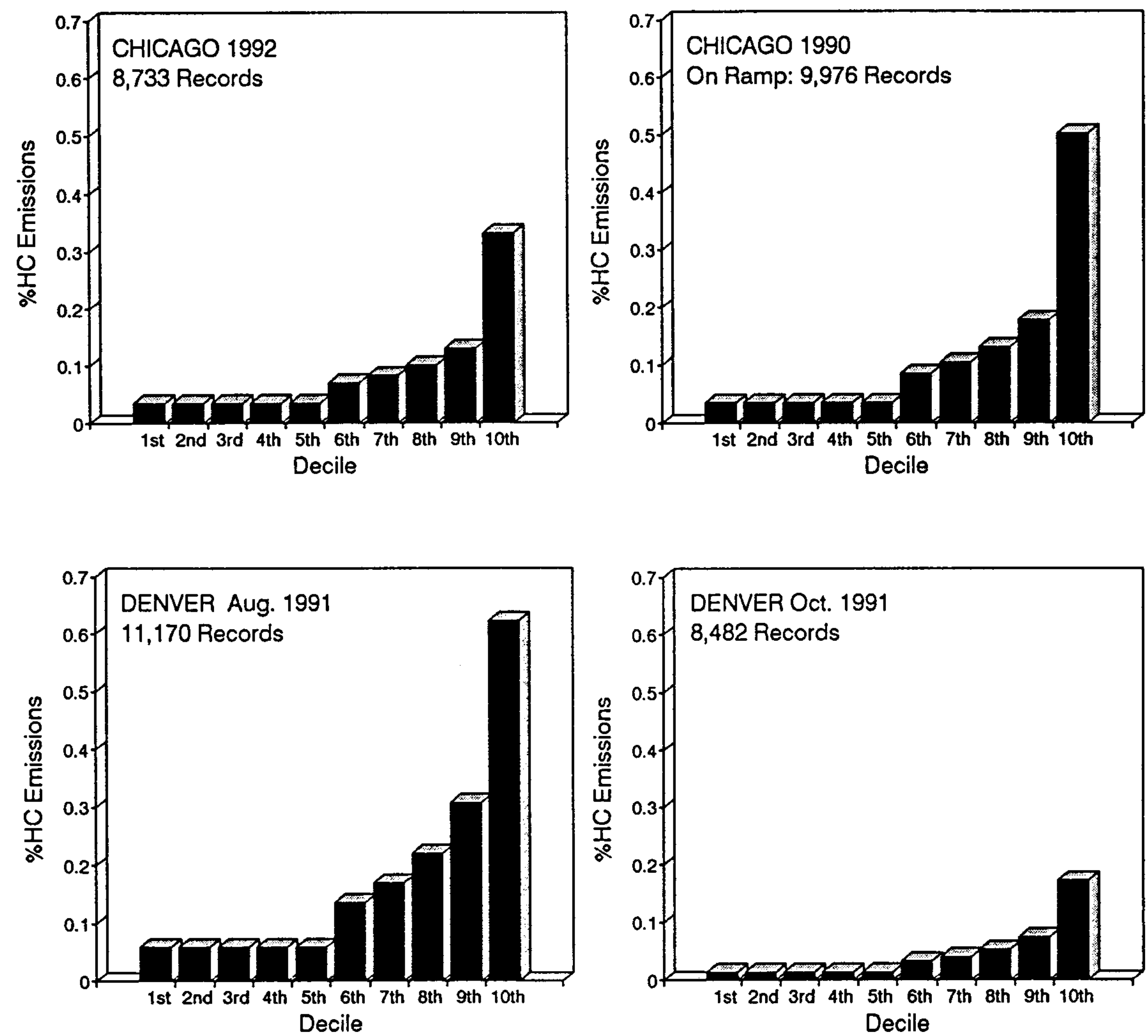


Figure 5 Mean %HC organized into deciles. The five deciles with the lowest emissions are given the average of all five since the differences between them are negligible.

COMPARISON TO PREVIOUS CHICAGO STUDY

The University of Denver's remote sensor for on-road motor vehicle CO and HC emissions has been used in August, 1989, October, 1990, and June, 1992 at same location in the Chicago area. The comparison of mean %CO and mean %HC segregated by vehicle model year for these data sets is presented to investigate emission levels at the same location year after year.

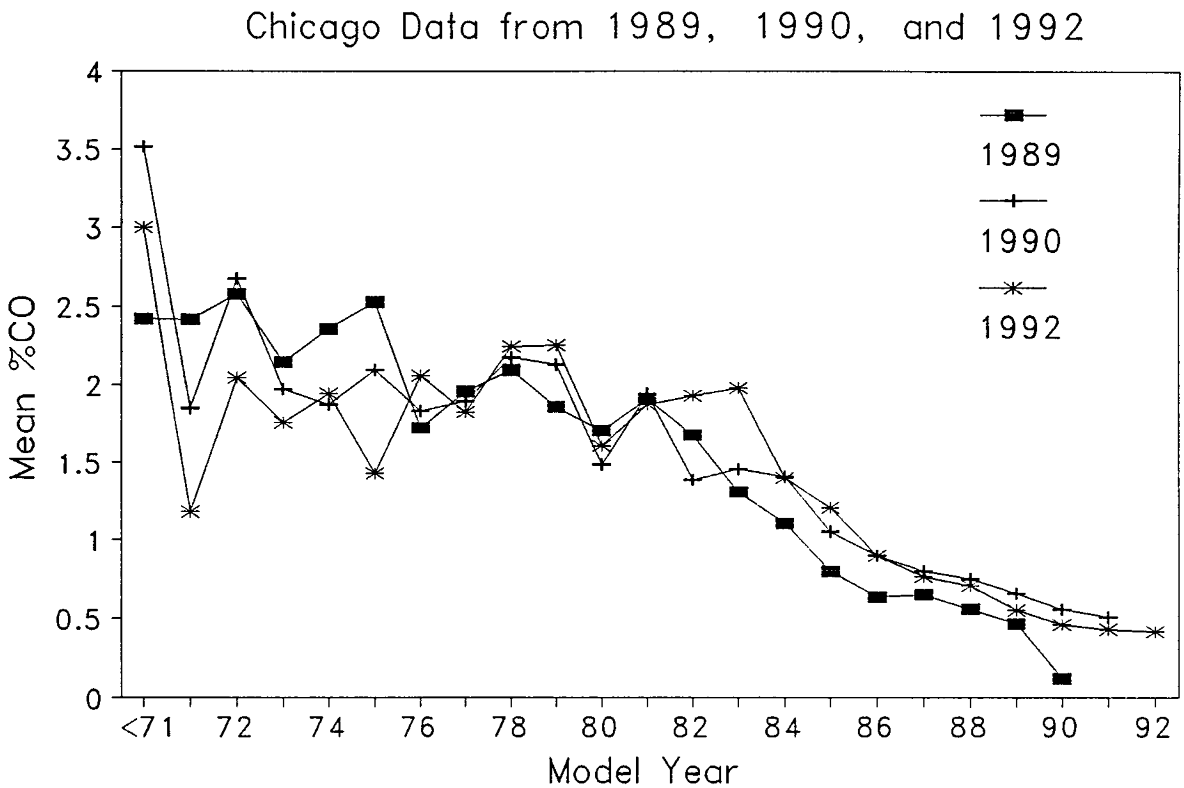


Figure 6 Mean %CO by model year for 1989, 1990, and 1992 from the Chicago data.

Figure 6 shows mean %CO by model year for the 1989, 1990, and 1992 data sets. One can see the same resulting emissions profile at the same location year after year even though two very different instruments are involved (FEAT I was used for 1989 data collection and FEAT III was used for 1990 and 1992 data collection). The overall nature of the three lines are very similar. The lack of apparent "deterioration" from 1981 vehicle model year and older confirms the point, first considered in 1989, that there is no significant emission levels change previous to 1982 model year vehicles. This phenomenon reflects the fact that emissions from the older vehicle fleet cease to deteriorate for CO. The data points before 1972 are rather scattered because there are not enough vehicles in these sample groups. The lack of "deterioration" observed likely arises from the fact that the mean emissions are dominated by the presence of the gross polluters. The gross polluters are mostly badly maintained, and badly maintained vehicles are more prone to high emissions than a well maintained vehicle. The exact number and emissions of the gross polluters can vary slightly from year to year with large effects on the

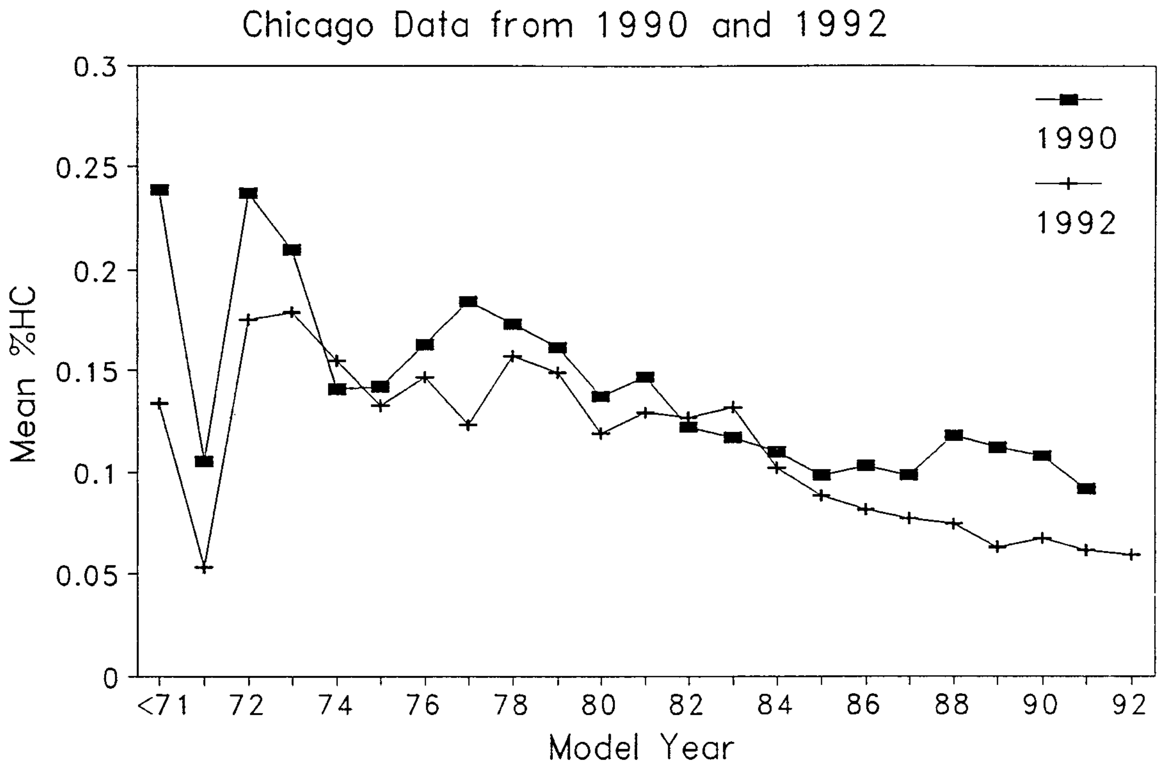


Figure 7 Mean %HC by model year for 1990 and 1992 from the Chicago data.

mean emission levels. On the other hand, the vehicle fleet emissions from 1981 model year and newer decrease smoothly as the age decreases for all three years of data. During the newest eight model years, emissions for a given model year cohort increase between the 1989 and the 1990 data sets, which is to be expected. However, the fact that the new vehicles of the 1992 data set have almost the same emission levels as the 1990 data set is unexpected. We believe this is because the 1992 data were collected during the summer (few cold start vehicles), whereas both 1989 and 1990 data were collected in the fall.

Figure 7 shows a similar analysis for HC emissions. Since the HC channel of the remote sensor was not available in 1989, we only compare the latest two data sets for HC emissions behavior by model year. The emissions pattern is similar to that for CO. The vehicle fleet emissions from 1981 model year and older cease to deteriorate for HCs. The fleet emissions starting in the 1982 model year decrease slowly as the age decreases. In the 1991 report, it was observed that 1988 and newer 1500cc Hondas along with several other cars with small engines appeared to be very high HC emitters. These measurements, which caused the high points in the 1990 fleet, were found to be caused by an interference in the HC channel arising from a small "steam" plume behind these cars on cold days. The 1992 data were obtained during much warmer weather conditions where the interference did not occur.

QUINTILE INVESTIGATION

For each model year the on-road CO and HC emissions were rank ordered in ascending order of emissions and divided into five groups (quintiles). Examination of the means of the various %CO quintiles (Figure 8A) shows that the mean %CO of the highest emitting quintile rises smoothly back to 1983 when that quintile's mean reaches about 7 %CO. At this point the highest emitting quintile stops rising and becomes more variable because the sample sizes in older model years are small.

The quintile plot shows no obvious sign of any sharp breaks in emissions levels to coincide with those model years when emissions control technologies were changed. There are four basic divisions in emissions control technology. Starting in 1983, most vehicles are equipped with closed-loop systems with oxygen sensors and three-way catalysts. The 1981 and 1982 model years represent transition years between the new and old technologies (1975 to 1980). Starting around 1975 and continuing to 1980 vehicles were equipped with oxidation catalysts and before 1975 vehicles had no catalysts.

The second graph, Figure 8B, shows the observed age distribution of the measured fleet. The observed age distribution depends on the combined effects of recessions and the socioeconomic status of the location chosen. In this study, most vehicles are from the 1985 to 1991 model years. Multiplying the mean %CO of each quintile by the fleet age distribution results in a graph, Figure 8C, showing the percentage of the total CO emitted by each quintile of each model year. The lowest emitting 40% of the vehicles, regardless of the model year, make an essentially negligible contribution to the total CO emissions. The greatest contribution is from the dirtiest 20% of the vehicles between the 1982 and 1989 model years. This is due to the large number of vehicles dating from this period, combined with the relatively high emissions from the dirtiest 20% of these vehicles. The highest emitting 20% of the new

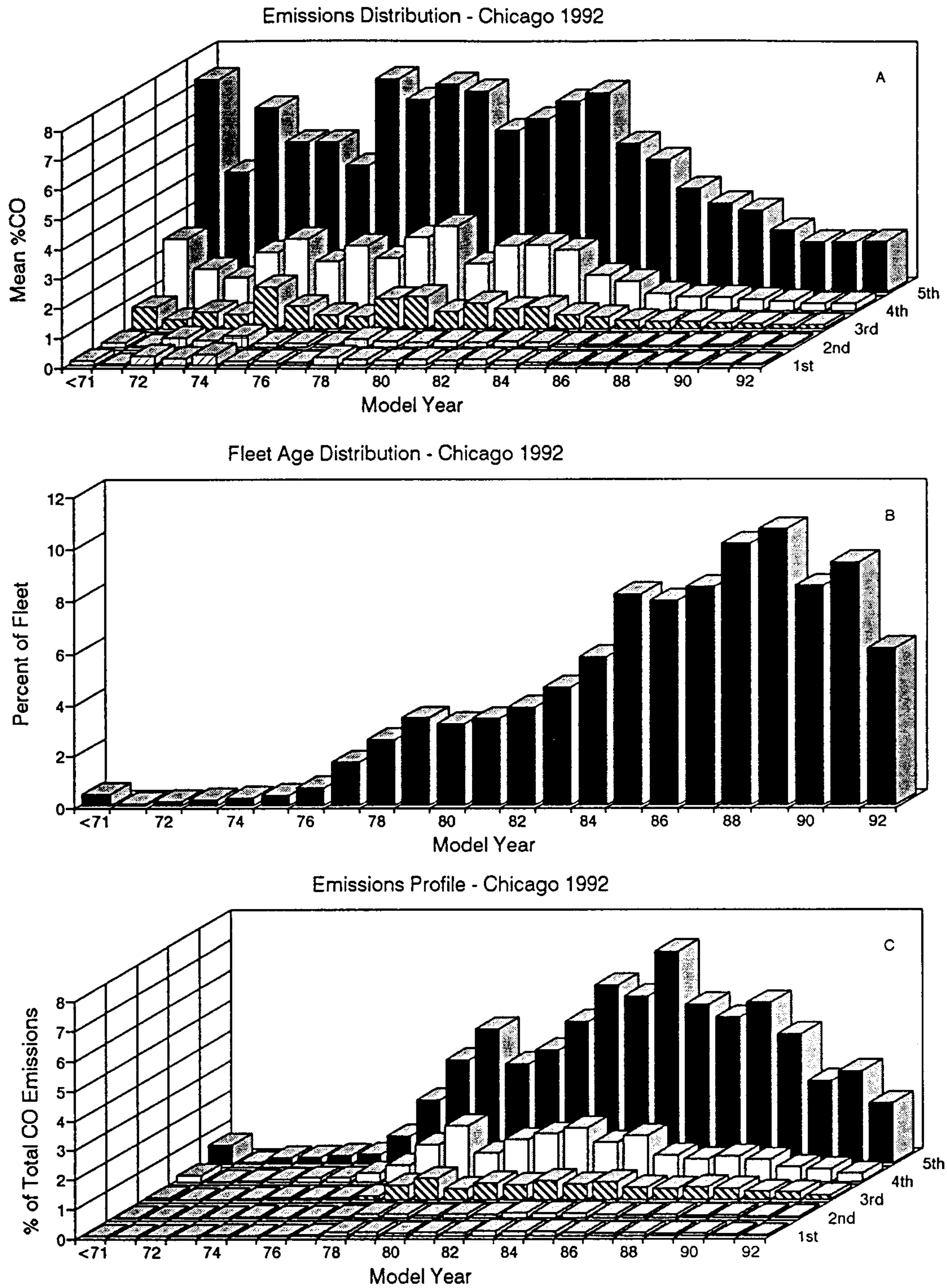


Figure 8 The 1992 Chicago %CO data presented as: A) emissions of each model year divided into quintiles, B) fleet model year distribution, and C) contribution of each quintile to the total emissions (product of graphs A and B).

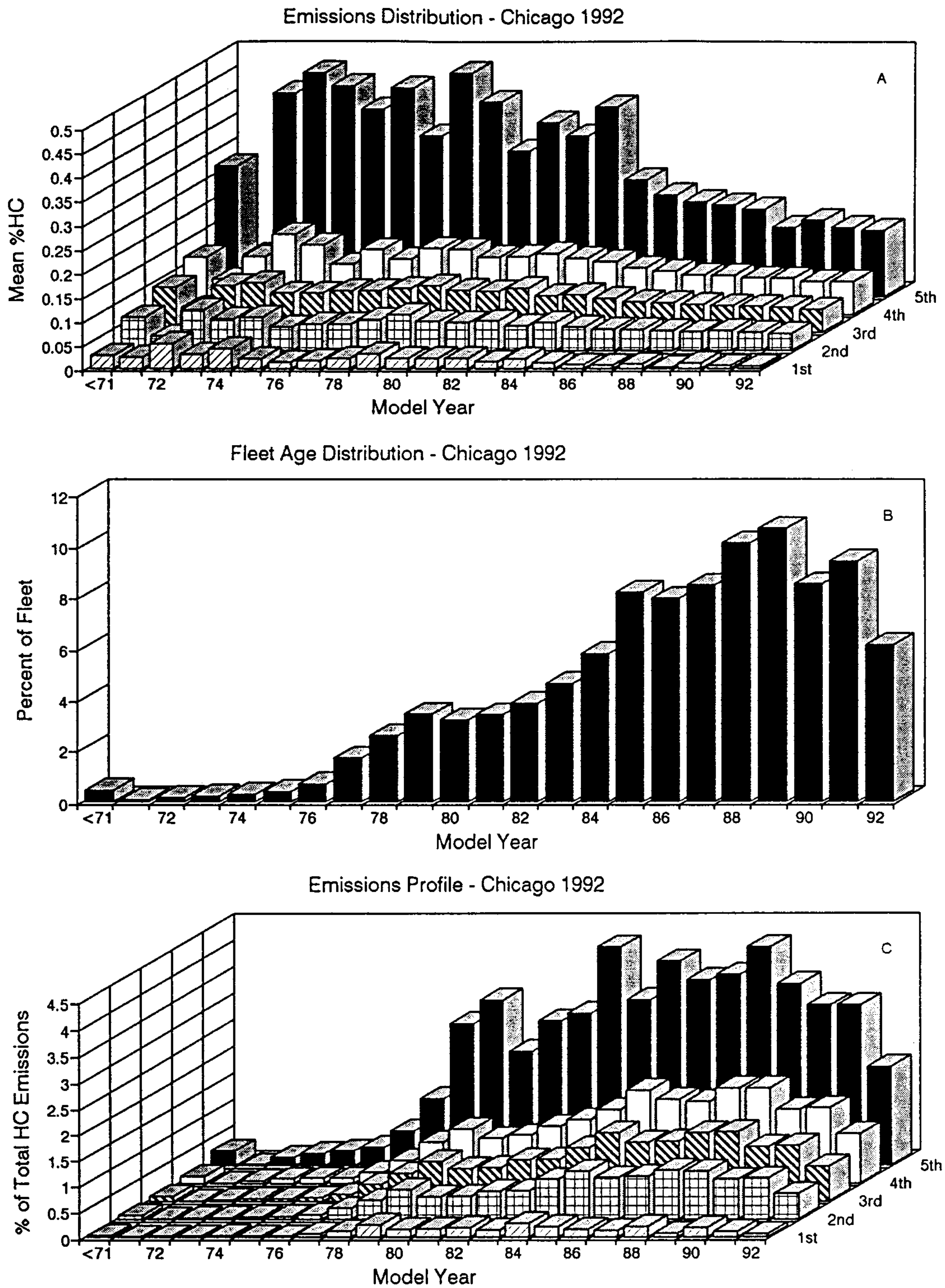


Figure 9 The 1992 Chicago %HC data presented as: A) emissions of each model year divided into quintiles, B) fleet model year distribution, and C) contribution of each quintile to the total emissions (product of graphs A and B).

vehicles is dirtier than the cleanest 40% of any model year. The older vehicles from 1975 and before are almost irrelevant to total fleet emissions because there are so few of them being driven on a regular basis.

Figure 9 shows the same investigation for hydrocarbon emissions. It shows a similar picture as CO emissions, but with different vertical scaling.

As we have shown in previous studies, these quintile graphs show that any program which treats all vehicles in a given model year as equally polluting can not be cost effective. Such programs include fuel reformulation, transportation control measures and mandatory I/M testing. One can also show that tighter newer car standards are unlikely to be at all effective, and scrappage programs based on age alone can be improved by considering repair over scrappage and polluter category as more important than age (Stedman *et al.*, 1994).

REPEAT MEASUREMENTS OF THE SAME VEHICLE

During the 1992 study, 799 vehicles were detected three or more times with valid CO and HC measurements. The mean of this sub-fleet is 0.98 %CO and 0.079 %HC, with an average age of 6.52 years. This sub-fleet is slightly younger than the 6.71 average age of the entire fleet and consequently slightly lower in emissions.

The CO and HC emissions of this sub-fleet are summarized in Table I and Table II, respectively. The vehicles are grouped in order from the lowest emissions level to the highest emissions level. The groups are defined as: clean vehicles for CO and HC (Allex) with all repeat measurements less than 1 %CO or 0.1 %HC, respectively; reasonably clean vehicles for CO or HC (Allok) with all repeat measurements less than 4 %CO or 0.3 %HC, respectively; "flippers" for those vehicles which exceeded 4 %CO or 0.3 %HC one or more times (Onebad and Two+bad) but not with every measurement; and "gross polluters" for those vehicles whose emissions exceeded 4 %CO or 0.3 %HC with every measurement (Allbad).

Of these 799 vehicles, 491 (61% of the sub-fleet) never emitted more than 1 %CO. This 61% of the sub-fleet emitted only 12% of the total CO emissions from the 799 vehicles. At the other extreme are 24 vehicles, comprising 3% of the sub-fleet, which were always in the gross polluting category (greater than 4 %CO). These 24 vehicles emitted more CO than the 491 cleanest vehicles put together and were responsible for 23% of the total CO emissions. Two hundred vehicles were occasionally over 1 %CO but always less than 4 %CO. They constituted 25% of the sub-fleet and emitted 27% of the total CO emissions. There were 84 flippers which showed variable emissions, meaning that some readings were over the cut point and some readings were below the cut point. Of these flippers, 38 were over the gross polluter cut point at least twice. This 4.8 percent of the sub-fleet are responsible for 24 percent of the total CO emissions. It has been shown (Stedman *et al.*, 1994) that emissions variability of high emitting vehicles is a phenomenon which occurs irrespective of the emission test procedure used, including I/M 240 and FTP, with FTP results sometimes differing by as much as a order of the magnitude for the same broken vehicle using the same fuel. It has also been (Stedman *et al.*, 1991a) shown that only a small fraction of the flippers can be ascribed to cold start or to off-cycle hard accelerations.

Table I Summary of %CO statistics for vehicles measured three or more times in Chicago 1992.

Set	No>3	# Vehicles	% Vehicles	Total %CO	% Total CO
All		799	100.00	2862.91	100.00
Allex	All<1%	491	61.45	344.32	12.03
Allok	All<4%	200	25.03	776.04	27.10
Onebad	One>4%	46	5.76	389.44	13.60
Twobad	Two>4%	25	3.13	370.51	12.94
3+bad	3+>4%	13	1.63	327.90	11.45
Allbad	All>4%	24	3.00	654.70	22.87

Notes:

Allex - Vehicles with all readings less than 1 %CO
Allok - Vehicles with some readings greater than 1 %CO but all readings less than 4 %CO
Onebad - Variable vehicles with only one reading greater than 4 %CO
Twobad - Variable vehicles with exactly two readings greater than 4 %CO
3+bad - Variable vehicles with three or more but not all readings greater than 4 %CO
Allbad - Vehicles with all readings greater than 4 %CO

Table II Summary of %HC statistics for vehicles measured three or more times in Chicago 1992.

Set	No>3	# Vehicles	% Vehicles	Total %HC	% Total HC
All		799	100.00	231.545	100.00
Allex	All<0.1%	451	56.45	74.636	32.23
Allok	All<0.3%	304	38.04	106.463	45.98
Onebad	One>0.3%	32	4.01	25.800	11.14
Two+bad	Two+>0.3%	5	0.63	7.232	3.12
Allbad	All>0.3%	7	0.88	17.414	7.52

Notes:

Allex - Vehicles with all readings less than 0.1%HC
Allok - Vehicles with some readings greater than 0.1% but all readings less than 0.3 %HC
Onebad - Variable vehicles with only one reading greater than 0.3 %HC
Two+bad - Variable vehicles with two or more readings greater than 0.3 %HC
Allbad - Vehicles with all readings greater than 0.3 %HC

The analysis of the multiply measured vehicles for hydrocarbon emissions showed that more than 94 percent of the sub-fleet never exceeded the HC gross polluter cut point established at that location. Only 44 vehicles (5.5% of the sub-fleet) exceeded the cut point one or more times and emitted 22% of the total HC emissions.

For comparison, the results of the same analysis for the 1990 Chicago on-ramp data set and the 1989 Chicago data set are presented. Figure 10 shows the distributions of CO emissions for the multiply measured vehicles in the three data sets. Among these three data sets, the 1992 data set has the highest percentage of low emitting vehicles as well as gross polluters along with the lowest percentage of "flippers". This is thought to arise because the summer monitoring in 1992 eliminated most cold start vehicles, hence lessening the number of "flippers". Similar to the 1992 data set, the 1989 and 1990 data sets had a large contribution to the total CO emissions from the few vehicles which were always gross polluters. In the 1989 data set, 31 vehicles (2.6% of the sub-fleet) were always in the gross polluting category (greater than 4 %CO) and were responsible for 19% of the total CO emissions. In the 1990 data set, 10 vehicles (2.3% of the sub-fleet) always emitted over 4 %CO and were responsible for 16% of

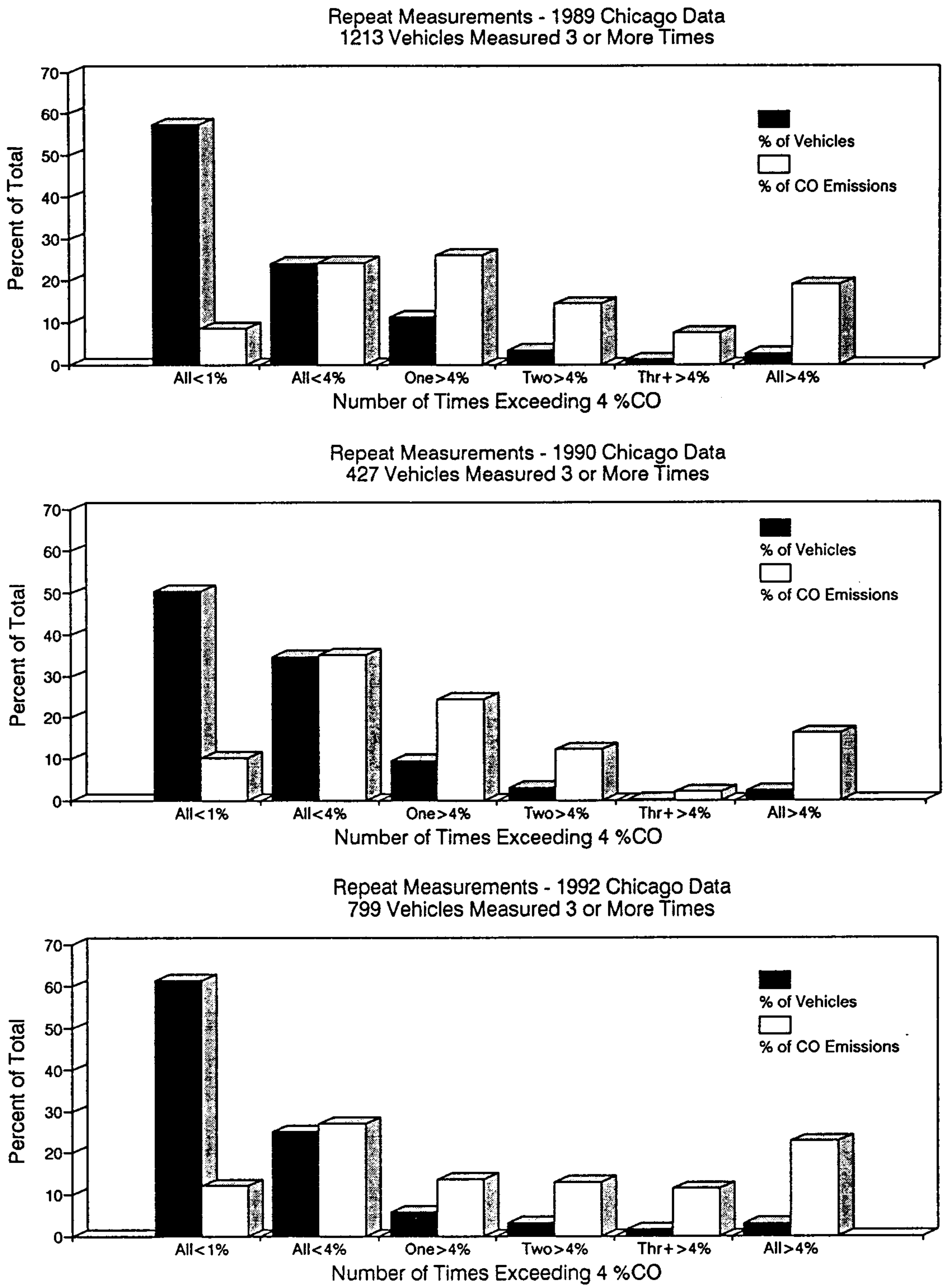
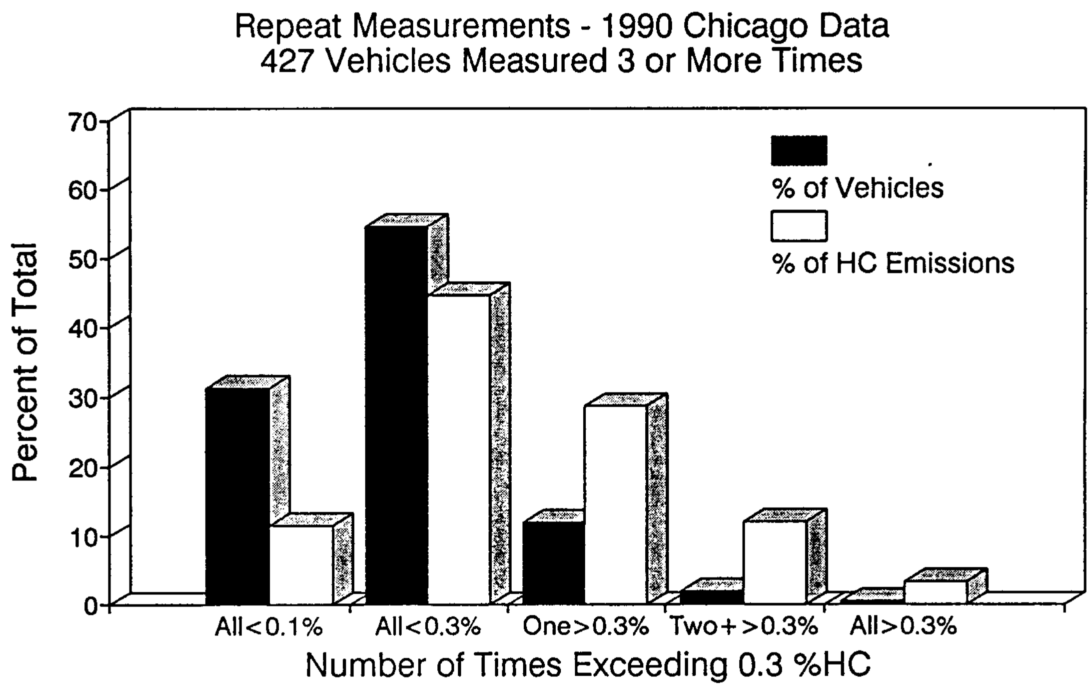


Figure 10 Repeat %CO measurements in the Chicago database for 1989, 1990, and 1992.



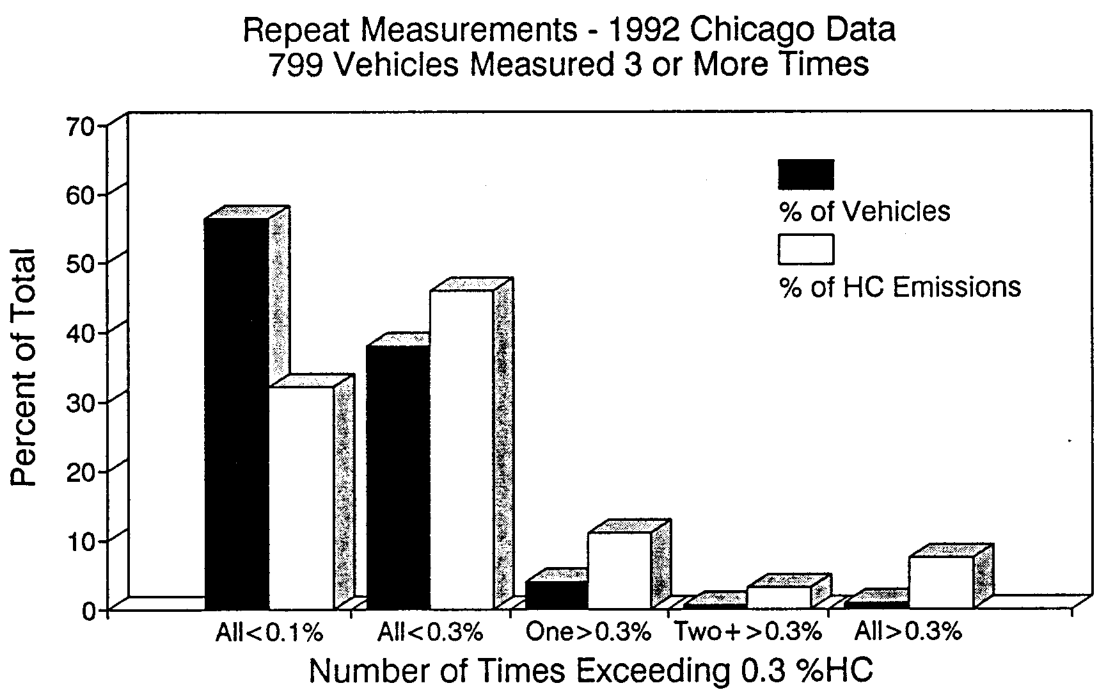


Figure 11 Repeat %HC measurements in the Chicago database for 1990 and 1992.

total CO emissions. In all data sets, these consistent gross polluters emitted more CO than all the low emitting vehicles put together.

Figure 11 shows the comparison for repeat HC measurements in 1990 and 1992. As discussed earlier, the 1990 HC data from Chicago was contaminated by interference "steam".

EMISSIONS CHARACTERISTICS OF THE SAME VEHICLE OVER FOUR YEARS

In order to further evaluate the effect of aging on vehicle emissions, a subset of 130 vehicles, which were measured in 1989, 1990 and 1992, was identified by license plate and VIN. This fleet was not necessarily measured the same number of times in each of the three years. Also HC data were not obtained during 1989 and thus the only comparison possible is between the 1990 and 1992 data sets. A comparison of the differences in mean emissions of this sub-fleet as a function of model year, shown in Figures 12 and 13, illustrates that the effect of aging on a

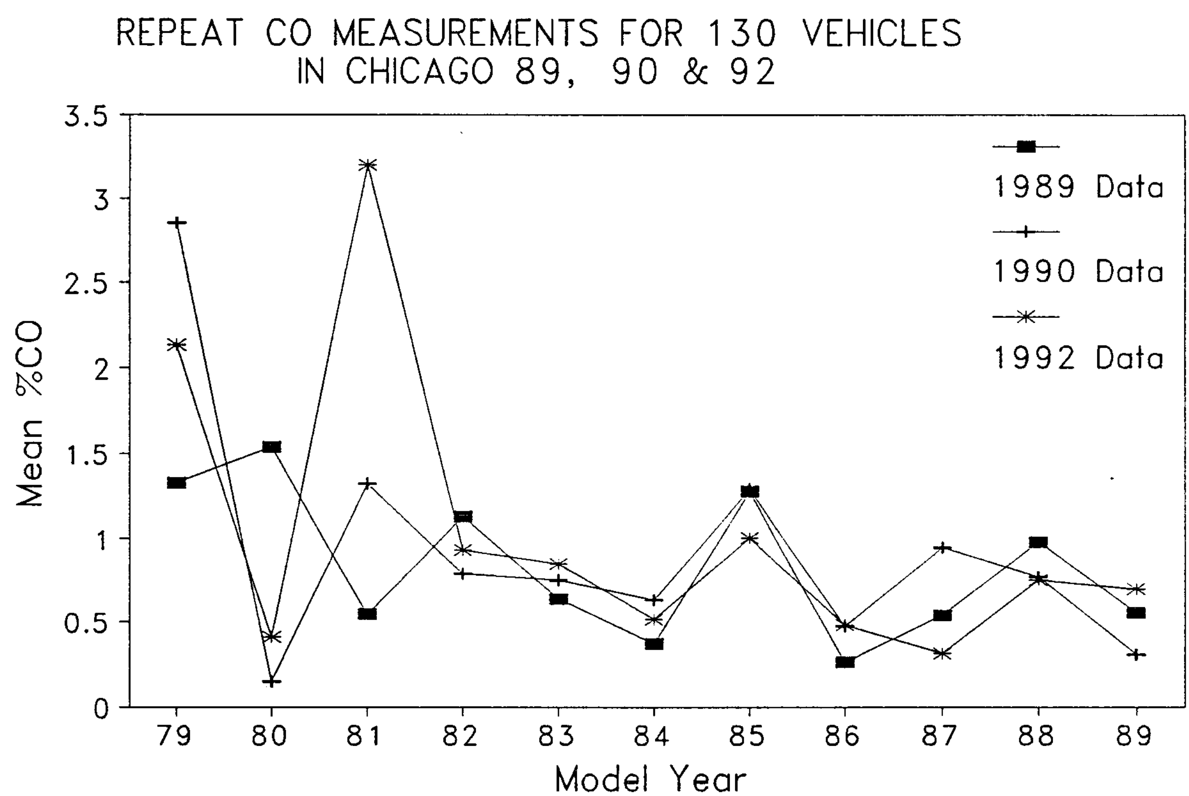


Figure 12 Mean %CO by model year for the same 130 vehicles measured in 1989, 1990, and 1992.

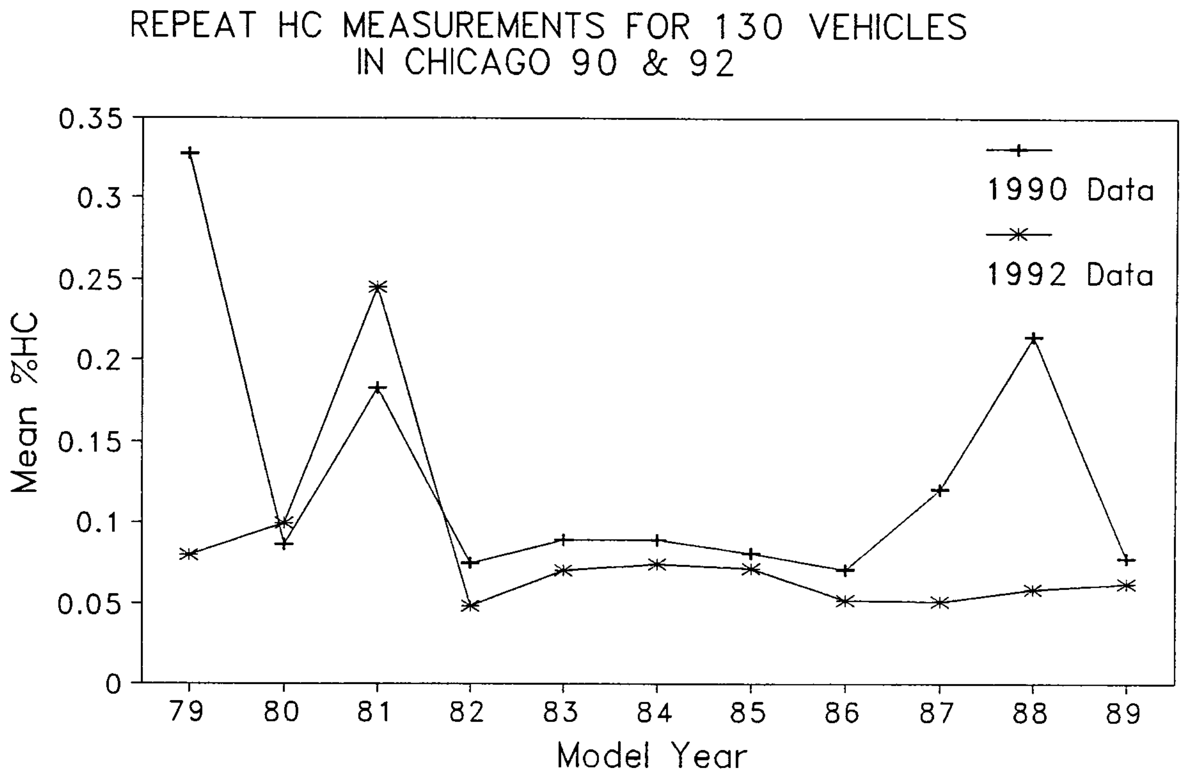


Figure 13 Mean %HC by model year for the same 130 vehicles measured in 1990 and 1992.

small fleet of vehicles is not significant compared to the natural variability of the means of any randomly chosen small fleet. This has to do with the gamma distribution of the emissions and the domination of fleet emissions by a few high emitters. In other words, it can be assumed that the rate of emissions of a fleet of vehicles will increase detectably as the fleet ages only when the fleet contains a large enough number of vehicles.

Since these are the same vehicles measured each year, MOBILE models would predict uniform year to year deterioration. However, a closer look at Figures 12 and 13 shows that the differences of the mean %CO for each model year in all the three years fluctuate little from the 1982 to 1989 model years, while the data for the vehicles from the 1979 to 1981 model years are rather scattered. It is apparent that the year to year differences in maintenance status of the gross polluters is a much larger effect than the year to year deterioration for this small set of vehicles. For the HC data, the picture is quite similar to the CO data. The differences between the mean %HC measurements in the 1990 and 1992 data sets are insignificant from the 1980 to

1989 model years, except in 1987 and 1988. The effect seen in the 1987 and 1988 model years is almost certainly caused by a small "steam" plume present behind some smaller vehicles in the cool fall days of 1990, which were not present in the summer of 1992.

Another analytical effort was performed by looking at the vehicles with the same vehicle identification number (VIN) but different license plates, as these vehicles potentially changed ownership. Seven of the 130 vehicles had changed license plates, however, a further examination of the names of the owners showed only two of the seven actually changed ownership. A 1985 Ford vehicle, which changed ownership between 1989 and 1990, had average %CO values of 1.69, 4.51, and 5.55 in 1989, 1990, and 1992, respectively. Another vehicle which changed ownership between 1990 and 1992 was a 1982 Pontiac. The observed mean %CO values were 3.50, and 6.39 in 1990 and 1992, respectively. Both vehicles increased emissions dramatically after their change in ownership. This result is the same as shown in a preliminary analysis of the 1989 and 1990 data. It can be speculated that a vehicle which is up for sale has lost its value to its owner who, therefore, does not pay proper attention to its maintenance. However, such speculation needs more vehicles found in that category for confirmation.

EMISSIONS CHARACTERISTICS SEGREGATED BY VEHICLE MAKE

The 1992 remote sensing data for on-road CO and HC emissions of the Chicago fleet has been segregated by vehicle maker in order to investigate the correlation between CO and HC emissions and the continent of origin of the vehicles in the fleet. In this analysis the continent of origin is derived strictly from the maker's name. No attempt has been made to separate vehicles made in the USA by manufacturers outside the USA, thus all Renault and Volkswagen are classified as European, all Honda, Toyota and Subaru as Asian, all Ford, GM or Chrysler are treated as USA, wherever manufactured.

Figure 14 shows the mean %CO data as a function of model year of registration for USA, European and Asian sub-fleets. For vehicles registered as 1979 and older, the total numbers of vehicles in each model year are too small to make meaningful distinctions, so these data are combined into one group consisting of vehicles older than 1980. For vehicles registered as

1993, the number of vehicles is also too small to be statistically meaningful. As one can see, the new vehicles from 1988 and newer are on average quite clean. Furthermore, there is no obvious evidence of significant differences in the emissions of the new fleet based upon their continent of origin. In almost all model years, the European manufactured sub-fleet stands out as the cleanest among the three sub-fleets. For vehicles from model year 1987 to 1992 (except 1991), the Asian manufactured fleet appears systematically as the highest emitting in this analysis. It is important to note that the gas mileage of the Asian sub-fleet is higher on average than the USA sub-fleet, thus higher emissions in %CO or in the equivalent gm/gallon units may not in every case correspond to a higher fleet average in gm/mile units (Stephens and Cadle, 1991). For the fleet manufactured before 1987 (except 1980) the USA manufactured vehicles stand out as having the highest emissions in %CO or gm/gallon units. In per-mile units they would stand out even further, particularly in the 1981 to 1983 model years. The data are very similar to the same analysis performed on vehicles measured in California (Stedman *et al.*, 1991b). Further analysis of the California data implied that the differences between

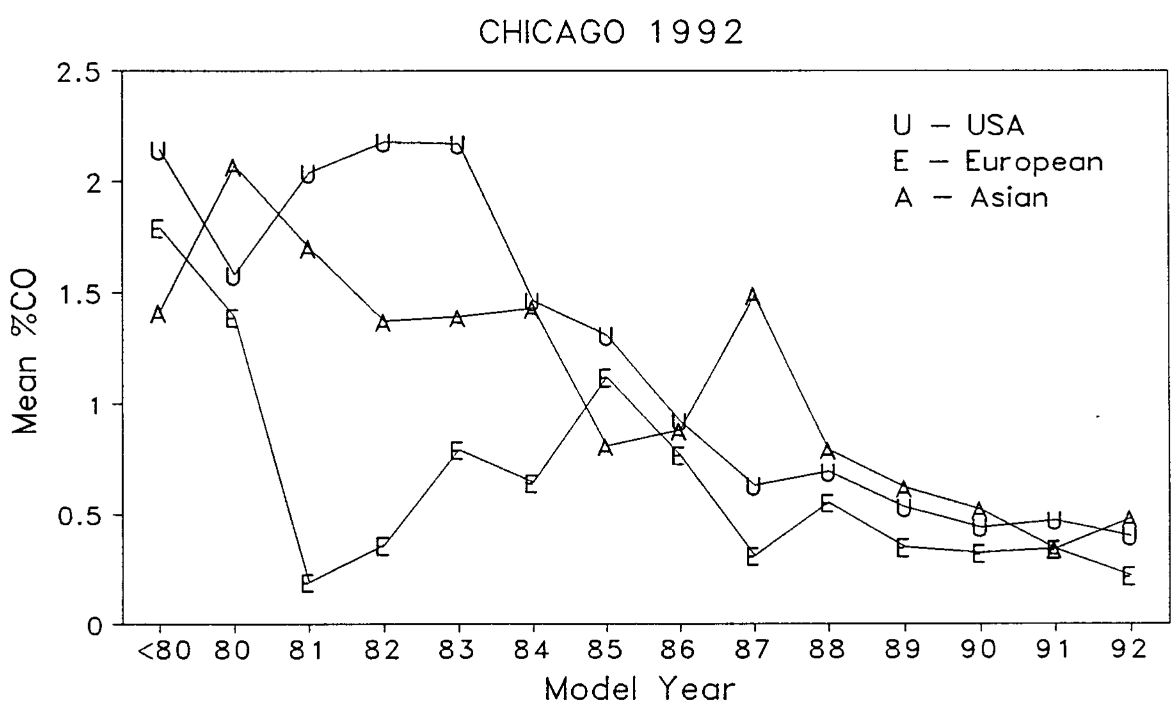


Figure 14 A plot of mean %CO by model year based on the continent of origin of the manufacturer, European, USA, or Asian.

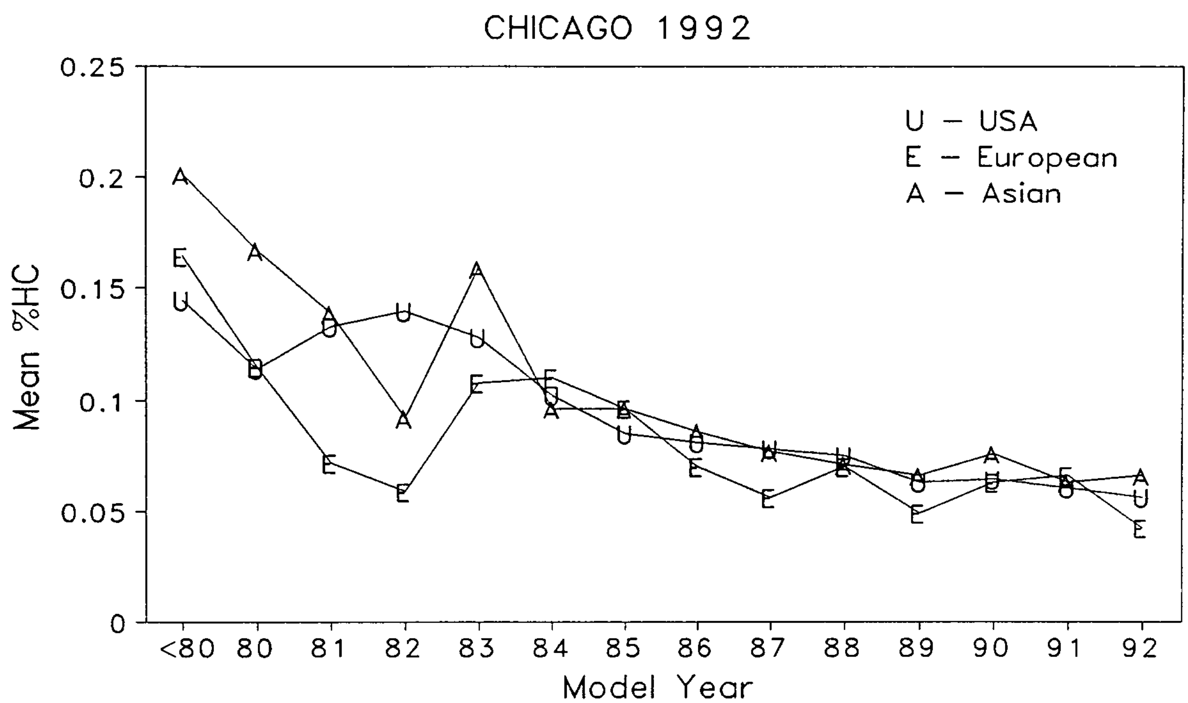


Figure 15 A plot of mean %HC by model year based on the continent of origin of the manufacturer, European, USA, or Asian.

manufacturers were not caused by the manufacturers themselves but rather by the extent to which vehicles from the different continents were being maintained by their owners.

The comparable analysis for HC emissions is shown on Figure 15. Like the CO graph, the European manufactured fleet is the lowest emitting for HC emissions in most model years. For vehicles back to 1984 the HC emission levels of the USA and Asian sub-fleets are on average quite close.

The entire USA database has been further searched for vehicles with the maker's names Ford (1268 vehicles), Chevrolet (1732 vehicles), Buick (756 vehicles) and Oldsmobile (708 vehicles). All vehicles with names Ford and Chevrolet are included regardless of whether the vehicles are listed as pickups or as passenger vehicles. However, vehicles with names Buick and Oldsmobile are almost all passenger vehicles. Figures 16 and 17 show vehicle make analyses again as a function of model year. For model years 1986 to 1990, Buick or Oldsmobile are

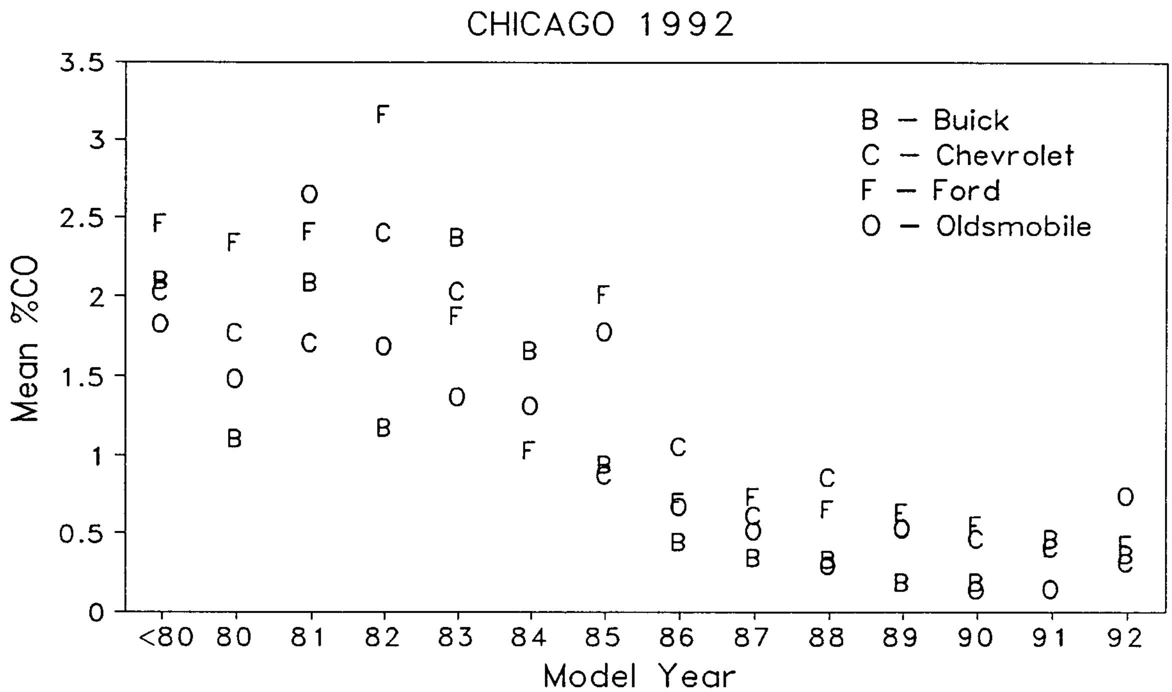


Figure 16 A plot of mean %CO by model year for Fords, Chevrolets, Buicks, and Oldsmobiles.

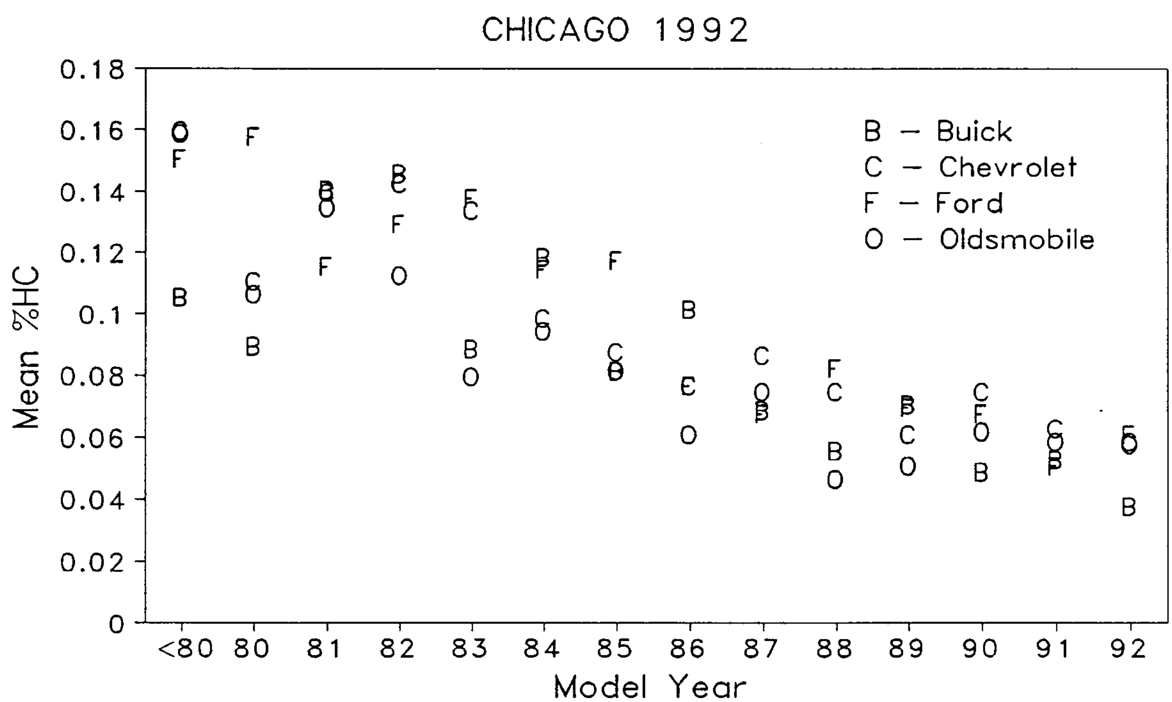


Figure 17 A plot of the mean %HC by model years for Fords, Chevrolets, Buicks, and Oldsmobiles.

lowest on both graphs which suggests that the presence of pickups in the Ford and Chevrolet sub-fleet has a small but detectable effect of increased on-road emissions.

COMPARISON OF DATA TO OTHER LOCATIONS AROUND THE WORLD

The University of Denver's remote sensor for on-road CO and HC emissions (FEAT) has been used to measure the emissions of more than 600,000 vehicles in Denver, Chicago, the Los Angeles Basin, Toronto (Canada), London and Leicester (the United Kingdom), Mexico City (Mexico), Copenhagen (Denmark), Thessaloniki (Greece), Melbourne (Australia) and Gothenburg (Sweden). Some of the available on-road remote sensing data of CO and HC emissions in various locations are summarized in Table III. From this table one can see that the U.S. fleets are among the low emitting in the world due to their technologically advanced state. Mexico City and Kathmandu have the highest mean and median %CO compared to the other cities in Table III. The observation that the median of each fleet is lower than the mean indicates that the average emission of a fleet is dominated by the high emitters. Furthermore, the difference between mean and median for each fleet implies the skewed nature of the distribution. The larger difference of the mean from the median, the further away from the normal distribution. Two cities in Asia, Bangkok and Kathmandu, stand out for HC emissions due to the high percentage of two cycle engines and three or four-wheeled tuk-tuks, many of which were also badly tuned and apparently poorly maintained.

Table III On-road remote sensing data summaries of CO and HC emissions in various locations around the world.

ON-ROAD REMOTE SENSING DATA SUMMARY

Location	Date	#Records	Mean %CO	Median %CO	Mean %HC	Median %HC
Denver	91-92	35,945	0.74	0.11	0.057	0.033
Denver	Nov.93	58,894	0.58	0.13	0.022	0.013
Chicago	Oct.90	13,640	1.10	0.37	0.139	0.087
Chicago	Jun.92	8,733	1.04	0.25	0.088	0.064
Los Angeles	Jun.91	47,708	0.79	0.15	0.076	0.042
Provo	91-92	12,066	1.17	0.45	0.220	0.127
El Paso	Mar.93	15,986	1.22	0.37	0.073	0.044
Juarez	Mar.93	7,640	2.96	2.18	0.170	0.091
Mexico City	Feb.91	31,838	4.30	3.81	0.214	0.113
Gothenburg	Sep.91	10,285	0.71	0.14	0.058	0.046
Denmark	Oct.92	9,038	1.71	0.67	0.177	0.058
Melbourne	May 92	15,908	1.42	0.57	0.107	0.058
Thessaloniki	Sep.92	10,536	1.40	0.55	0.155	0.082
London	Nov.92	11,666	0.96	0.17	0.136	0.071
London	Nov.93	9,669	1.00	0.20	0.053	0.020
Leicester	Nov.92	4,992	2.32	1.61	0.212	0.131
Leicester	Nov.93	4,744	2.15	1.29	0.067	0.019
Edinburgh	Nov.92	4,524	1.48	0.69	0.129	0.084
Edinburgh	Nov.93	3,546	1.50	0.59	0.061	0.033
Bangkok	Aug.93	5,260	3.04	2.54	0.948	0.567
Hong Kong	Aug.93	5,891	0.96	0.18	0.054	0.037
Kathmandu	Aug.93	11,227	3.85	3.69	0.757	0.363
Seoul	Aug.93	3,104	0.82	0.26	0.044	0.019
Taipei	Aug.93	12,062	1.49	0.88	0.062	0.050

Section 3
CONCLUSIONS

The University of Denver's remote sensor (FEAT system) for on-road CO and HC exhaust emissions was used in the Chicago area in 1989, 1990 and 1992. The analyses of the 1992 data set and the comparison of the results with those from 1989 and 1990 lead to several conclusions.

All the data sets show that on-road CO and HC emissions are never normal distributed. In contrast, they are well represented by a gamma distribution, thus classical statistical procedures can not be applied. The overall averages of the emission distributions are controlled by the distribution tails which contain the vehicles of all ages having extremely high emission rates. Robust sampling statistics of emission data require large population N values to properly characterize the high-emitting vehicle contribution because the automobile emissions picture is dominated by only a small number of high emitters.

Comparison of the mean %CO and %HC data by model year from the 1989, 1990 and 1992 data sets reveals very similar emissions profiles at the same location year after year. With respect to the instrument performance, this result suggests that the FEAT system has good repeatability and reproducibility. With respect to the effectiveness of emissions control programs, however, the similarity between fleet emission profiles indicates that there has been no sign of significant reduction in mobile source emissions in the area even though the I/M program in Illinois has been changed and the percentage of newer technology vehicles (closed loop emissions systems with three-way catalytic converters) has increased since 1989. This conclusion suggests that tighter new vehicle emission standards and other emissions limiting programs designed to treat the whole fleet of vehicles (oxygenated fuels, reformulated fuels, transportation control measures) will not accomplish the desired results of better air quality.

The analysis of data from the repeat measurements of the same vehicle reveals several interesting results. A significant finding is that high-emitting vehicles exhibit greater variability in their emissions than clean vehicles. The variable emitting vehicles ("flippers") have been noted since early in the history of remote sensing measurements. Further analysis shows that they appear in all data sets that include high-emitting vehicles. This finding has important implications for the design of vehicle testing programs.

By the continent of origin, the emissions of European nameplate vehicles are lower than American or Asian nameplates vehicles. However, the new vehicles from 1988 and newer are on average very low emitting, regardless their continent of origin.

Overall, the U.S. fleet is one of the lowest emitting in the world because of their technologically advanced state and low age. A majority of the vehicles of all ages are not gross polluters. The majority of the emissions are from the highest emitting 10% of the vehicles for CO and 20% of the vehicles for HC. Therefore, further air quality improvements must come from reducing the emission from the 10-20% of the fleet causing most of the mobile source pollution. Remote sensing has shown itself to be a valuable tool in the identification of these vehicles.

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Appendix

REPEAT VEHICLES MEASURED IN 1989, 1990, AND 1992

DATE	VEHICLE	LICENSE	VIN	%CO	%HC
06/05/92	80 VOLKSWAGEN	OL3582	17A0829493	0.44	0.318
10/24/90	80 VOLKSWAGEN	OL3582	17A0829493	0.51	0.093
08/11/89	80 VOLKSWAGEN	OL3582	17A0829493	3.65	
08/10/89	80 VOLKSWAGEN	OL3582	17A0829493	6.07	
06/05/92	86 DODGE	ALV579	1B3BA44K4GG194981	0.49	0.011
06/04/92	86 DODGE	ALV579	1B3BA44K4GG194981	0.28	0.083
06/02/92	86 DODGE	ALV579	1B3BA44K4GG194981	0.58	0.110
06/01/92	86 DODGE	ALV579	1B3BA44K4GG194981	1.49	0.093
10/24/90	86 DODGE	ALV579	1B3BA44K4GG194981	1.00	0.172
08/11/89	86 DODGE	ALV579	1B3BA44K4GG194981	0.19	
08/10/89	86 DODGE	ALV579	1B3BA44K4GG194981	0.22	
08/09/89	86 DODGE	ALV579	1B3BA44K4GG194981	0.14	
08/07/89	86 DODGE	ALV579	1B3BA44K4GG194981	0.09	
06/05/92	88 DODGE	MB1668	1B3BD46D7JC209896	0.22	0.027
06/04/92	88 DODGE	MB1668	1B3BD46D7JC209896	0.35	0.001
06/03/92	88 DODGE	MB1668	1B3BD46D7JC209896	0.07	0.016
06/02/92	88 DODGE	MB1668	1B3BD46D7JC209896	2.35	0.189
10/26/90	88 DODGE	MB1668	1B3BD46D7JC209896	0.25	0.021
10/25/90	88 DODGE	MB1668	1B3BD46D7JC209896	0.16	0.057
08/10/89	88 DODGE	MB1668	1B3BD46D7JC209896	0.22	
08/09/89	88 DODGE	MB1668	1B3BD46D7JC209896	0.12	
08/08/89	88 DODGE	MB1668	1B3BD46D7JC209896	0.49	
08/07/89	88 DODGE	MB1668	1B3BD46D7JC209896	4.92	
06/05/92	87 DODGE	CW3758	1B3BZ44C5HD380999	0.11	0.061
06/04/92	87 DODGE	CW3758	1B3BZ44C5HD380999	0.18	0.102
06/03/92	87 DODGE	CW3758	1B3BZ44C5HD380999	0.08	0.047
06/02/92	87 DODGE	CW3758	1B3BZ44C5HD380999	0.04	0.018
06/01/92	87 DODGE	CW3758	1B3BZ44C5HD380999	0.85	0.161
10/26/90	87 DODGE	CW3758	1B3BZ44C5HD380999	0.10	0.032
10/25/90	87 DODGE	CW3758	1B3BZ44C5HD380999	0.48	0.122
10/24/90	87 DODGE	CW3758	1B3BZ44C5HD380999	0.21	0.034
08/11/89	87 DODGE	CW3758	1B3BZ44C5HD380999	0.00	
08/10/89	87 DODGE	CW3758	1B3BZ44C5HD380999	0.20	
08/09/89	87 DODGE	CW3758	1B3BZ44C5HD380999	0.05	
08/08/89	87 DODGE	CW3758	1B3BZ44C5HD380999	0.03	
08/07/89	87 DODGE	CW3758	1B3BZ44C5HD380999	-0.01	
06/01/92	88 DODGE	GAFFNEY	1B3CS48D5JN317672	0.04	0.157
10/25/90	88 DODGE	GAFFNEY	1B3CS48D5JN317672	0.10	0.040
08/10/89	88 DODGE	GAFFNEY	1B3CS48D5JN317672	0.28	
08/07/89	88 DODGE	GAFFNEY	1B3CS48D5JN317672	-0.05	
06/05/92	83 CHRYSLER	PN147	1C3BC59G9DF231984	1.25	0.054
06/04/92	83 CHRYSLER	PN147	1C3BC59G9DF231984	2.89	0.093
06/02/92	83 CHRYSLER	PN147	1C3BC59G9DF231984	0.24	-0.024
06/01/92	83 CHRYSLER	PN147	1C3BC59G9DF231984	0.36	0.008
10/26/90	83 CHRYSLER	PN147	1C3BC59G9DF231984	0.93	-0.042

10/25/90	83 CHRYSLER	PN147	1C3BC59G9DF231984	0.12	0.088
10/24/90	83 CHRYSLER	PN147	1C3BC59G9DF231984	1.02	0.431
08/11/89	83 CHRYSLER	PN147	1C3BC59G9DF231984	-0.07	
06/02/92	88 CHRYSLER	PD6608	1C3BU6635JD210125	0.00	0.001
10/25/90	88 CHRYSLER	PD6608	1C3BU6635JD210125	2.64	0.079
08/10/89	88 CHRYSLER	PD6608	1C3BU6635JD210125	0.03	
08/09/89	88 CHRYSLER	PD6608	1C3BU6635JD210125	0.05	
08/07/89	88 CHRYSLER	PD6608	1C3BU6635JD210125	0.02	
06/05/92	85 FORD	ST4461	1FABP19X8FK102384	2.53	0.110
06/04/92	85 FORD	ST4461	1FABP19X8FK102384	1.16	0.098
06/03/92	85 FORD	ST4461	1FABP19X8FK102384	0.25	0.053
06/02/92	85 FORD	ST4461	1FABP19X8FK102384	1.41	0.129
06/01/92	85 FORD	ST4461	1FABP19X8FK102384	0.10	0.069
10/26/90	85 FORD	ST4461	1FABP19X8FK102384	0.56	0.063
10/25/90	85 FORD	ST4461	1FABP19X8FK102384	0.32	0.095
10/24/90	85 FORD	ST4461	1FABP19X8FK102384	0.11	0.054
08/11/89	85 FORD	ST4461	1FABP19X8FK102384	1.84	
08/09/89	85 FORD	ST4461	1FABP19X8FK102384	7.30	
08/08/89	85 FORD	ST4461	1FABP19X8FK102384	4.40	
08/07/89	85 FORD	ST4461	1FABP19X8FK102384	4.28	
06/05/92	87 FORD	KVV216	1FABP37X3HK202586	0.03	0.005
06/04/92	87 FORD	KVV216	1FABP37X3HK202586	0.15	-0.004
06/03/92	87 FORD	KVV216	1FABP37X3HK202586	1.84	0.061
06/02/92	87 FORD	KVV216	1FABP37X3HK202586	0.45	0.061
10/26/90	87 FORD	KVV216	1FABP37X3HK202586	0.32	0.191
10/25/90	87 FORD	KVV216	1FABP37X3HK202586	6.42	1.126
10/24/90	87 FORD	KVV216	1FABP37X3HK202586	0.14	-0.013
08/11/89	87 FORD	KVV216	1FABP37X3HK202586	0.15	
08/10/89	87 FORD	KVV216	1FABP37X3HK202586	1.82	
08/09/89	87 FORD	KVV216	1FABP37X3HK202586	2.15	
08/08/89	87 FORD	KVV216	1FABP37X3HK202586	0.90	
08/07/89	87 FORD	KVV216	1FABP37X3HK202586	0.10	
06/05/92	83 FORD	QA7015	1FABP43F4DZ116417	0.00	0.010
10/25/90	83 FORD	QA7015	1FABP43F4DZ116417	0.24	0.129
08/11/89	83 FORD	QA7015	1FABP43F4DZ116417	0.07	
08/10/89	83 FORD	QA7015	1FABP43F4DZ116417	0.08	
08/09/89	83 FORD	QA7015	1FABP43F4DZ116417	0.49	
08/08/89	83 FORD	QA7015	1FABP43F4DZ116417	0.17	
06/05/92	85 FORD	TZ3516	1FABP43F7FZ120402	5.55	0.081
10/26/90	85 FORD	TZ3516	1FABP43F7FZ120402	1.05	0.078
10/25/90	85 FORD	TZ3516	1FABP43F7FZ120402	5.72	0.138
10/24/90	85 FORD	TZ3516	1FABP43F7FZ120402	6.77	0.111
08/11/89	85 FORD	617894	1FABP43F7FZ120402	0.39	
08/10/89	85 FORD	617894	1FABP43F7FZ120402	-0.01	
08/09/89	85 FORD	617894	1FABP43F7FZ120402	-0.01	
08/08/89	85 FORD	617894	1FABP43F7FZ120402	5.64	
08/07/89	85 FORD	617894	1FABP43F7FZ120402	2.44	

06/05/92	87 FORD	PZAZZ1	1FABP52D9HG173655	0.08	-0.003
06/04/92	87 FORD	PZAZZ1	1FABP52D9HG173655	-0.04	0.006
06/03/92	87 FORD	PZAZZ1	1FABP52D9HG173655	0.14	0.012
06/02/92	87 FORD	PZAZZ1	1FABP52D9HG173655	-0.10	-0.033
06/01/92	87 FORD	PZAZZ1	1FABP52D9HG173655	-0.13	-0.009
10/24/90	87 FORD	PZAZZ1	1FABP52D9HG173655	0.06	0.044
08/10/89	87 FORD	PZAZZ1	1FABP52D9HG173655	0.07	
06/05/92	89 FORD	EB2361	1FABP52U1KG140687	0.63	0.079
06/04/92	89 FORD	EB2361	1FABP52U1KG140687	0.08	0.018
06/02/92	89 FORD	EB2361	1FABP52U1KG140687	0.49	0.076
06/01/92	89 FORD	EB2361	1FABP52U1KG140687	3.49	0.098
10/25/90	89 FORD	EB2361	1FABP52U1KG140687	0.40	0.232
08/11/89	89 FORD	EB2361	1FABP52U1KG140687	0.05	
08/10/89	89 FORD	EB2361	1FABP52U1KG140687	0.05	
08/08/89	89 FORD	EB2361	1FABP52U1KG140687	0.02	
08/07/89	89 FORD	EB2361	1FABP52U1KG140687	0.46	
06/02/92	88 FORD	GS6276	1FABP6245JH112213	0.12	0.057
10/24/90	88 FORD	GS6276	1FABP6245JH112213	0.18	0.072
08/08/89	88 FORD	GS6276	1FABP6245JH112213	1.23	
06/05/92	87 FORD	BF1993	1FAPP2192HW329252	2.20	0.115
06/04/92	87 FORD	BF1993	1FAPP2192HW329252	1.83	0.081
06/03/92	87 FORD	BF1993	1FAPP2192HW329252	1.09	0.201
06/01/92	87 FORD	BF1993	1FAPP2192HW329252	0.34	0.084
10/26/90	87 FORD	BF1993	1FAPP2192HW329252	0.86	0.058
10/25/90	87 FORD	BF1993	1FAPP2192HW329252	1.85	0.128
10/24/90	87 FORD	BF1993	1FAPP2192HW329252	0.48	0.019
08/11/89	87 FORD	BF1993	1FAPP2192HW329252	-0.03	
08/10/89	87 FORD	BF1993	1FAPP2192HW329252	0.82	
08/09/89	87 FORD	BF1993	1FAPP2192HW329252	-0.07	
08/07/89	87 FORD	BF1993	1FAPP2192HW329252	-0.04	
06/05/92	88 FORD	NV3346	1FAPP9199JW373246	0.13	0.038
06/04/92	88 FORD	NV3346	1FAPP9199JW373246	0.72	-0.016
06/03/92	88 FORD	NV3346	1FAPP9199JW373246	0.64	0.025
06/02/92	88 FORD	NV3346	1FAPP9199JW373246	0.03	0.028
10/26/90	88 FORD	NV3346	1FAPP9199JW373246	0.32	0.040
08/11/89	88 FORD	NV3346	1FAPP9199JW373246	4.22	
08/08/89	88 FORD	NV3346	1FAPP9199JW373246	2.33	
08/07/89	88 FORD	NV3346	1FAPP9199JW373246	0.04	
06/05/92	89 FORD	RF9785	1FTEE14N9KHC06523	0.23	0.055
06/04/92	89 FORD	RF9785	1FTEE14N9KHC06523	0.06	0.054
06/03/92	89 FORD	RF9785	1FTEE14N9KHC06523	-0.15	-0.009
06/02/92	89 FORD	RF9785	1FTEE14N9KHC06523	0.10	0.072
06/01/92	89 FORD	RF9785	1FTEE14N9KHC06523	0.02	0.028
10/26/90	89 FORD	RF9785	1FTEE14N9KHC06523	0.13	0.073
08/11/89	89 FORD	RF9785	1FTEE14N9KHC06523	0.07	
08/09/89	89 FORD	RF9785	1FTEE14N9KHC06523	-0.02	
08/08/89	89 FORD	RF9785	1FTEE14N9KHC06523	-0.08	

08/07/89	89 FORD	RF9785	1FTEE14N9KHC06523	-0.01	
06/04/92	89 FORD	8290DV-B	1FTFE24H9KHB39569	-0.05	0.013
06/02/92	89 FORD	8290DV-B	1FTFE24H9KHB39569	0.11	0.056
10/24/90	89 FORD	8290DV-B	1FTFE24H9KHB39569	0.04	0.020
08/09/89	89 FORD	8290DV-B	1FTFE24H9KHB39569	0.23	
08/08/89	89 FORD	8290DV-B	1FTFE24H9KHB39569	0.02	
06/04/92	88 FORD	128199RV	1FTFE24N6JHB95179	0.62	0.053
06/03/92	88 FORD	128199RV	1FTFE24N6JHB95179	0.56	0.057
10/26/90	88 FORD	128199RV	1FTFE24N6JHB95179	0.21	0.070
10/25/90	88 FORD	128199RV	1FTFE24N6JHB95179	0.11	0.085
08/11/89	88 FORD	128199RV	1FTFE24N6JHB95179	0.05	
08/10/89	88 FORD	128199RV	1FTFE24N6JHB95179	0.30	
06/03/92	84 CHEVROLET	XE4607	1G1AN35H5EX105212	0.02	0.041
06/01/92	84 CHEVROLET	XE4607	1G1AN35H5EX105212	1.07	0.082
10/26/90	84 CHEVROLET	XE4607	1G1AN35H5EX105212	-0.26	0.036
10/24/90	84 CHEVROLET	XE4607	1G1AN35H5EX105212	0.09	0.026
10/24/90	84 CHEVROLET	XE4607	1G1AN35H5EX105212	-0.01	0.035
08/11/89	84 CHEVROLET	XE4607	1G1AN35H5EX105212	0.00	
08/09/89	84 CHEVROLET	XE4607	1G1AN35H5EX105212	0.17	
08/08/89	84 CHEVROLET	XE4607	1G1AN35H5EX105212	0.94	
08/07/89	84 CHEVROLET	XE4607	1G1AN35H5EX105212	0.10	
06/01/92	84 CHEVROLET	GWA256	1G1AN47HXEH155634	0.76	0.028
10/26/90	84 CHEVROLET	GWA256	1G1AN47HXEH155634	0.35	0.044
10/24/90	84 CHEVROLET	GWA256	1G1AN47HXEH155634	0.51	0.076
08/11/89	84 CHEVROLET	GWA256	1G1AN47HXEH155634	0.02	
08/10/89	84 CHEVROLET	GWA256	1G1AN47HXEH155634	0.17	
08/08/89	84 CHEVROLET	GWA256	1G1AN47HXEH155634	0.07	
08/07/89	84 CHEVROLET	GWA256	1G1AN47HXEH155634	0.07	
06/04/92	83 CHEVROLET	LV7944	1G1AW27R1D6810526	0.41	0.112
06/02/92	83 CHEVROLET	LV7944	1G1AW27R1D6810526	0.17	0.120
10/25/90	83 CHEVROLET	LV7944	1G1AW27R1D6810526	0.98	0.110
08/10/89	83 CHEVROLET	LV7944	1G1AW27R1D6810526	0.28	
08/09/89	83 CHEVROLET	LV7944	1G1AW27R1D6810526	0.37	
08/08/89	83 CHEVROLET	LV7944	1G1AW27R1D6810526	0.71	
06/04/92	85 CHEVROLET	LZC714	1G1AW27R7F6244827	1.27	0.086
06/01/92	85 CHEVROLET	LZC714	1G1AW27R7F6244827	1.25	0.070
10/24/90	85 CHEVROLET	LZC714	1G1AW27R7F6244827	1.13	0.085
08/10/89	85 CHEVROLET	LZC714	1G1AW27R7F6244827	0.06	
08/09/89	85 CHEVROLET	LZC714	1G1AW27R7F6244827	0.03	
08/07/89	85 CHEVROLET	LZC714	1G1AW27R7F6244827	0.38	
08/07/89	85 CHEVROLET	LZC714	1G1AW27R7F6244827	0.24	
06/05/92	87 CHEVROLET	MRCOZZI	1G1BU51H5H9126773	0.01	-0.034
06/04/92	87 CHEVROLET	MRCOZZI	1G1BU51H5H9126773	0.28	0.017
06/03/92	87 CHEVROLET	MRCOZZI	1G1BU51H5H9126773	0.09	0.037
10/26/90	87 CHEVROLET	MRCOZZI	1G1BU51H5H9126773	-0.14	0.122

10/25/90	87	CHEVROLET	MRCOZZI	1G1BU51H5H9126773	-0.31	0.019
10/24/90	87	CHEVROLET	MRCOZZI	1G1BU51H5H9126773	0.10	-0.026
08/10/89	87	CHEVROLET	MRCOZZI	1G1BU51H5H9126773	-0.12	
08/08/89	87	CHEVROLET	MRCOZZI	1G1BU51H5H9126773	0.39	
06/01/92	86	CHEVROLET	KF8267	1G1GZ37Z3GR205417	0.05	0.042
10/26/90	86	CHEVROLET	KF8267	1G1GZ37Z3GR205417	0.04	0.113
10/24/90	86	CHEVROLET	KF8267	1G1GZ37Z3GR205417	-0.04	-0.004
08/11/89	86	CHEVROLET	KF8267	1G1GZ37Z3GR205417	0.14	
08/09/89	86	CHEVROLET	KF8267	1G1GZ37Z3GR205417	0.21	
06/05/92	87	CHEVROLET	DOC249	1G1JC1110HJ150925	0.20	0.067
06/04/92	87	CHEVROLET	DOC249	1G1JC1110HJ150925	0.20	0.054
06/03/92	87	CHEVROLET	DOC249	1G1JC1110HJ150925	0.23	0.071
06/02/92	87	CHEVROLET	DOC249	1G1JC1110HJ150925	0.11	0.068
10/26/90	87	CHEVROLET	DOC249	1G1JC1110HJ150925	1.70	0.363
10/24/90	87	CHEVROLET	DOC249	1G1JC1110HJ150925	0.46	0.075
08/11/89	87	CHEVROLET	DOC249	1G1JC1110HJ150925	0.02	
08/10/89	87	CHEVROLET	DOC249	1G1JC1110HJ150925	0.19	
08/08/89	87	CHEVROLET	DOC249	1G1JC1110HJ150925	0.03	
06/05/92	89	CHEVROLET	NPJ546	1G1JC1115KJ130287	0.99	0.095
10/26/90	89	CHEVROLET	NPJ546	1G1JC1115KJ130287	0.84	-0.012
08/08/89	89	CHEVROLET	NPJ546	1G1JC1115KJ130287	0.40	
06/04/92	89	CHEVROLET	NKS771	1G1JC1119KJ188712	0.43	0.098
10/26/90	89	CHEVROLET	NKS771	1G1JC1119KJ188712	0.48	0.255
10/25/90	89	CHEVROLET	NKS771	1G1JC1119KJ188712	0.18	-0.005
10/24/90	89	CHEVROLET	NKS771	1G1JC1119KJ188712	0.17	0.056
08/11/89	89	CHEVROLET	NKS771	1G1JC1119KJ188712	0.03	
08/10/89	89	CHEVROLET	NKS771	1G1JC1119KJ188712	-0.13	
08/09/89	89	CHEVROLET	NKS771	1G1JC1119KJ188712	0.00	
08/08/89	89	CHEVROLET	NKS771	1G1JC1119KJ188712	0.10	
06/02/92	87	CHEVROLET	DER127	1G1JC8115HJ133725	0.10	0.014
06/01/92	87	CHEVROLET	DER127	1G1JC8115HJ133725	0.19	0.083
10/26/90	87	CHEVROLET	DER127	1G1JC8115HJ133725	0.72	0.040
10/24/90	87	CHEVROLET	DER127	1G1JC8115HJ133725	0.45	0.091
08/11/89	87	CHEVROLET	DER127	1G1JC8115HJ133725	-0.15	
08/10/89	87	CHEVROLET	DER127	1G1JC8115HJ133725	1.07	
08/09/89	87	CHEVROLET	DER127	1G1JC8115HJ133725	0.40	
08/08/89	87	CHEVROLET	DER127	1G1JC8115HJ133725	0.06	
06/02/92	87	CHEVROLET	PAT1976	1G1JC811XHJ245128	0.33	0.106
10/26/90	87	CHEVROLET	PAT1976	1G1JC811XHJ245128	0.27	-0.002
08/09/89	87	CHEVROLET	PAT1976	1G1JC811XHJ245128	0.00	
06/04/92	88	CHEVROLET	BJS96	1G1LT5111JE205719	0.14	0.057
06/01/92	88	CHEVROLET	BJS96	1G1LT5111JE205719	0.16	0.070
10/26/90	88	CHEVROLET	ED2132	1G1LT5111JE205719	0.77	0.089
08/11/89	88	CHEVROLET	ED2132	1G1LT5111JE205719	0.07	
08/10/89	88	CHEVROLET	ED2132	1G1LT5111JE205719	0.08	

08/08/89	88	CHEVROLET	ED2132	1G1LT5111JE205719	0.07	
08/07/89	88	CHEVROLET	ED2132	1G1LT5111JE205719	0.07	
06/03/92	88	CHEVROLET	CV6366	1G1LT5115JY664248	0.30	0.095
10/26/90	88	CHEVROLET	CV6366	1G1LT5115JY664248	0.67	0.085
10/25/90	88	CHEVROLET	CV6366	1G1LT5115JY664248	0.32	0.038
08/10/89	88	CHEVROLET	CV6366	1G1LT5115JY664248	0.14	
08/09/89	88	CHEVROLET	CV6366	1G1LT5115JY664248	-0.03	
06/02/92	88	CHEVROLET	BT2667	1G1LT51W7JE504997	0.07	0.052
10/26/90	88	CHEVROLET	BT2667	1G1LT51W7JE504997	1.82	0.123
10/24/90	88	CHEVROLET	BT2667	1G1LT51W7JE504997	5.05	0.274
08/11/89	88	CHEVROLET	BT2667	1G1LT51W7JE504997	0.07	
08/10/89	88	CHEVROLET	BT2667	1G1LT51W7JE504997	0.05	
08/09/89	88	CHEVROLET	BT2667	1G1LT51W7JE504997	0.07	
08/08/89	88	CHEVROLET	BT2667	1G1LT51W7JE504997	0.07	
06/02/92	89	CHEVROLET	BARBS85	1G1LV14W7KE288066	0.53	0.061
10/26/90	89	CHEVROLET	BARBS85	1G1LV14W7KE288066	0.62	0.087
08/09/89	89	CHEVROLET	BARBS85	1G1LV14W7KE288066	0.00	
06/03/92	86	PONTIAC	ORACHEL	1G28L69HXGX211031	-0.03	-0.015
10/25/90	86	PONTIAC	ORACHEL	1G28L69HXGX211031	0.17	0.015
08/11/89	86	PONTIAC	ORACHEL	1G28L69HXGX211031	-0.03	
08/10/89	86	PONTIAC	ORACHEL	1G28L69HXGX211031	0.00	
06/01/92	82	PONTIAC	YY3734	1G2AC27GXC7525254	6.39	0.157
10/25/90	82	PONTIAC	QC3709	1G2AC27GXC7525254	3.50	0.121
08/10/89	82	PONTIAC	QC3709	1G2AC27GXC7525254	5.00	
06/05/92	86	PONTIAC	MJR75	1G2BL69Y9GX264741	0.03	0.020
06/03/92	86	PONTIAC	MJR75	1G2BL69Y9GX264741	0.08	0.054
06/02/92	86	PONTIAC	MJR75	1G2BL69Y9GX264741	1.16	0.112
06/01/92	86	PONTIAC	MJR75	1G2BL69Y9GX264741	0.90	0.076
10/26/90	86	PONTIAC	MJR75	1G2BL69Y9GX264741	0.29	0.078
10/25/90	86	PONTIAC	MJR75	1G2BL69Y9GX264741	-0.09	0.031
10/24/90	86	PONTIAC	MJR75	1G2BL69Y9GX264741	1.81	0.123
08/10/89	86	PONTIAC	MJR75	1G2BL69Y9GX264741	1.75	
08/09/89	86	PONTIAC	MJR75	1G2BL69Y9GX264741	0.10	
08/08/89	86	PONTIAC	MJR75	1G2BL69Y9GX264741	0.00	
08/07/89	86	PONTIAC	MJR75	1G2BL69Y9GX264741	1.53	
06/03/92	88	PONTIAC	GB8709	1G2HY54C7JW242736	0.00	0.046
10/24/90	88	PONTIAC	GB8709	1G2HY54C7JW242736	0.17	0.091
08/07/89	88	PONTIAC	GB8709	1G2HY54C7JW242736	0.00	
06/05/92	87	PONTIAC	SYG125	1G2HZ5431HW294841	0.09	0.039
06/04/92	87	PONTIAC	SYG125	1G2HZ5431HW294841	0.06	0.051
06/03/92	87	PONTIAC	SYG125	1G2HZ5431HW294841	0.28	0.091
10/26/90	87	PONTIAC	SYG125	1G2HZ5431HW294841	3.50	0.271
08/10/89	87	PONTIAC	SYG125	1G2HZ5431HW294841	3.31	
08/09/89	87	PONTIAC	SYG125	1G2HZ5431HW294841	0.02	

06/04/92	88 PONTIAC	GHZ487	1G2HZ54C8JW242029	0.19	0.097
06/02/92	88 PONTIAC	GHZ487	1G2HZ54C8JW242029	0.14	0.061
10/25/90	88 PONTIAC	GHZ487	1G2HZ54C8JW242029	0.11	0.071
08/11/89	88 PONTIAC	GHZ487	1G2HZ54C8JW242029	-0.02	
08/10/89	88 PONTIAC	GHZ487	1G2HZ54C8JW242029	0.06	
06/05/92	89 PONTIAC	EH5421	1G2NE14U2KC620476	0.15	0.018
06/04/92	89 PONTIAC	EH5421	1G2NE14U2KC620476	0.15	0.017
06/03/92	89 PONTIAC	EH5421	1G2NE14U2KC620476	0.18	0.016
06/02/92	89 PONTIAC	EH5421	1G2NE14U2KC620476	0.39	0.107
06/01/92	89 PONTIAC	EH5421	1G2NE14U2KC620476	0.42	0.208
06/01/92	89 PONTIAC	EH5421	1G2NE14U2KC620476	0.19	0.052
10/26/90	89 PONTIAC	EH5421	1G2NE14U2KC620476	0.19	0.065
08/11/89	89 PONTIAC	EH5421	1G2NE14U2KC620476	-0.03	
08/07/89	89 PONTIAC	EH5421	1G2NE14U2KC620476	0.29	
06/01/92	89 PONTIAC	PK1504	1G2NE54U4KC764330	0.39	0.052
10/24/90	89 PONTIAC	PK1504	1G2NE54U4KC764330	0.96	0.209
08/10/89	89 PONTIAC	PK1504	1G2NE54U4KC764330	0.03	
08/09/89	89 PONTIAC	PK1504	1G2NE54U4KC764330	-0.06	
08/07/89	89 PONTIAC	PK1504	1G2NE54U4KC764330	0.02	
06/05/92	87 PONTIAC	ZWM464	1G2NV11L6HC781949	0.12	0.028
06/04/92	87 PONTIAC	ZWM464	1G2NV11L6HC781949	0.33	0.037
06/03/92	87 PONTIAC	ZWM464	1G2NV11L6HC781949	-0.03	0.025
06/02/92	87 PONTIAC	ZWM464	1G2NV11L6HC781949	-0.30	0.055
10/26/90	87 PONTIAC	ZWM464	1G2NV11L6HC781949	0.23	0.073
10/24/90	87 PONTIAC	ZWM464	1G2NV11L6HC781949	0.09	0.040
08/08/89	87 PONTIAC	ZWM464	1G2NV11L6HC781949	0.01	
08/07/89	87 PONTIAC	ZWM464	1G2NV11L6HC781949	-0.04	
06/04/92	84 OLDSMOBILE	FPZ677	1G3AM19E7ED464061	0.24	0.003
06/03/92	84 OLDSMOBILE	FPZ677	1G3AM19E7ED464061	0.11	0.008
06/02/92	84 OLDSMOBILE	FPZ677	1G3AM19E7ED464061	0.98	0.037
10/24/90	84 OLDSMOBILE	FPZ677	1G3AM19E7ED464061	0.97	0.078
08/10/89	84 OLDSMOBILE	FPZ677	1G3AM19E7ED464061	0.05	
06/05/92	83 OLDSMOBILE	CAX564	1G3AM47A8DM569420	0.06	0.054
06/03/92	83 OLDSMOBILE	CAX564	1G3AM47A8DM569420	0.11	0.057
06/02/92	83 OLDSMOBILE	CAX564	1G3AM47A8DM569420	0.06	0.047
10/25/90	83 OLDSMOBILE	CAX564	1G3AM47A8DM569420	-0.31	-0.034
10/24/90	83 OLDSMOBILE	CAX564	1G3AM47A8DM569420	-0.08	0.007
08/11/89	83 OLDSMOBILE	CAX564	1G3AM47A8DM569420	-0.06	
08/10/89	83 OLDSMOBILE	CAX564	1G3AM47A8DM569420	0.03	
08/09/89	83 OLDSMOBILE	CAX564	1G3AM47A8DM569420	-0.07	
08/08/89	83 OLDSMOBILE	CAX564	1G3AM47A8DM569420	0.01	
06/04/92	81 OLDSMOBILE	ML6455	1G3AR47AXBM539088	2.46	0.179
06/02/92	81 OLDSMOBILE	ML6455	1G3AR47AXBM539088	9.78	0.585
06/01/92	81 OLDSMOBILE	ML6455	1G3AR47AXBM539088	7.83	0.185
10/26/90	81 OLDSMOBILE	ML6455	1G3AR47AXBM539088	2.30	0.185
10/24/90	81 OLDSMOBILE	ML6455	1G3AR47AXBM539088	0.88	0.171

08/10/89	81	OLDSMOBILE	ML6455	1G3AR47AXBM539088	0.16	
06/03/92	83	OLDSMOBILE	KAX276	1G3AY37YXDM954697	1.80	0.078
06/01/92	83	OLDSMOBILE	KAX276	1G3AY37YXDM954697	2.02	0.031
10/26/90	83	OLDSMOBILE	KAX276	1G3AY37YXDM954697	1.92	0.030
08/09/89	83	OLDSMOBILE	KAX276	1G3AY37YXDM954697	0.62	
08/08/89	83	OLDSMOBILE	KAX276	1G3AY37YXDM954697	0.69	
06/04/92	82	OLDSMOBILE	OP1691	1G3AY69Y1CM291453	0.05	0.012
06/01/92	82	OLDSMOBILE	OP1691	1G3AY69Y1CM291453	0.13	0.029
10/24/90	82	OLDSMOBILE	OP1691	1G3AY69Y1CM291453	0.04	0.081
08/07/89	82	OLDSMOBILE	OP1691	1G3AY69Y1CM291453	0.00	
06/04/92	86	OLDSMOBILE	EH9826	1G3GM47Y5GP306747	0.07	0.042
10/26/90	86	OLDSMOBILE	EH9826	1G3GM47Y5GP306747	-0.09	-0.031
10/24/90	86	OLDSMOBILE	EH9826	1G3GM47Y5GP306747	0.32	0.053
08/11/89	86	OLDSMOBILE	EH9826	1G3GM47Y5GP306747	-0.01	
08/10/89	86	OLDSMOBILE	EH9826	1G3GM47Y5GP306747	0.12	
08/09/89	86	OLDSMOBILE	EH9826	1G3GM47Y5GP306747	-0.21	
08/08/89	86	OLDSMOBILE	EH9826	1G3GM47Y5GP306747	-0.19	
08/07/89	86	OLDSMOBILE	EH9826	1G3GM47Y5GP306747	0.00	
06/03/92	85	OLDSMOBILE	VW1739	1G3GR69Y0FR376427	0.03	0.037
10/26/90	85	OLDSMOBILE	VW1739	1G3GR69Y0FR376427	0.49	0.029
10/24/90	85	OLDSMOBILE	VW1739	1G3GR69Y0FR376427	1.09	0.091
08/09/89	85	OLDSMOBILE	LYR899	1G3GR69Y0FR376427	0.05	
06/04/92	86	OLDSMOBILE	MX8793	1G3HY6936G1843961	0.00	0.010
06/03/92	86	OLDSMOBILE	MX8793	1G3HY6936G1843961	0.01	0.029
06/02/92	86	OLDSMOBILE	MX8793	1G3HY6936G1843961	0.13	0.042
06/01/92	86	OLDSMOBILE	MX8793	1G3HY6936G1843961	0.31	-0.009
10/26/90	86	OLDSMOBILE	MX8793	1G3HY6936G1843961	1.84	0.154
10/24/90	86	OLDSMOBILE	MX8793	1G3HY6936G1843961	0.10	0.037
08/09/89	86	OLDSMOBILE	MX8793	1G3HY6936G1843961	0.60	
06/02/92	86	OLDSMOBILE	GEM366	1G3NF69U1GM361690	2.66	0.135
10/26/90	86	OLDSMOBILE	GEM366	1G3NF69U1GM361690	0.73	0.108
10/24/90	86	OLDSMOBILE	GEM366	1G3NF69U1GM361690	0.86	0.184
08/11/89	86	OLDSMOBILE	GEM366	1G3NF69U1GM361690	0.30	
06/02/92	83	BUICK	NU5930	1G4AH19R6D6434099	0.34	0.077
06/01/92	83	BUICK	NU5930	1G4AH19R6D6434099	0.52	0.080
10/26/90	83	BUICK	NU5930	1G4AH19R6D6434099	0.67	0.158
10/25/90	83	BUICK	NU5930	1G4AH19R6D6434099	1.04	-0.005
10/24/90	83	BUICK	NU5930	1G4AH19R6D6434099	0.51	0.059
08/11/89	83	BUICK	NU5930	1G4AH19R6D6434099	0.77	
08/09/89	83	BUICK	NU5930	1G4AH19R6D6434099	0.23	
08/08/89	83	BUICK	NU5930	1G4AH19R6D6434099	0.14	
06/05/92	89	BUICK	LFH257	1G4AH51R0KT442796	0.14	0.044
06/03/92	89	BUICK	LFH257	1G4AH51R0KT442796	0.20	0.053
06/02/92	89	BUICK	LFH257	1G4AH51R0KT442796	0.31	0.098

10/24/90	89	BUICK	LFH257	1G4AH51R0KT442796	0.16	0.076
08/11/89	89	BUICK	LFH257	1G4AH51R0KT442796	0.06	
08/10/89	89	BUICK	LFH257	1G4AH51R0KT442796	0.01	
08/09/89	89	BUICK	LFH257	1G4AH51R0KT442796	0.04	
08/08/89	89	BUICK	LFH257	1G4AH51R0KT442796	0.02	
08/07/89	89	BUICK	LFH257	1G4AH51R0KT442796	0.01	
06/05/92	87	BUICK	UAZ414	1G4AL51W6HT470504	0.02	-0.008
06/04/92	87	BUICK	UAZ414	1G4AL51W6HT470504	0.11	0.066
06/03/92	87	BUICK	UAZ414	1G4AL51W6HT470504	0.08	-0.014
06/02/92	87	BUICK	UAZ414	1G4AL51W6HT470504	0.17	0.014
06/01/92	87	BUICK	UAZ414	1G4AL51W6HT470504	0.16	0.034
10/25/90	87	BUICK	UAZ414	1G4AL51W6HT470504	2.33	0.103
10/24/90	87	BUICK	UAZ414	1G4AL51W6HT470504	0.71	0.114
08/10/89	87	BUICK	UAZ414	1G4AL51W6HT470504	0.05	
08/09/89	87	BUICK	UAZ414	1G4AL51W6HT470504	0.08	
08/08/89	87	BUICK	UAZ414	1G4AL51W6HT470504	-0.01	
08/07/89	87	BUICK	UAZ414	1G4AL51W6HT470504	-0.04	
06/05/92	81	BUICK	UBV784	1G4AM47A9BH216346	1.15	0.261
06/04/92	81	BUICK	UBV784	1G4AM47A9BH216346	0.13	0.134
06/02/92	81	BUICK	UBV784	1G4AM47A9BH216346	0.27	0.179
06/01/92	81	BUICK	UBV784	1G4AM47A9BH216346	0.77	0.192
10/26/90	81	BUICK	UBV784	1G4AM47A9BH216346	0.78	0.191
08/08/89	81	BUICK	UBV784	1G4AM47A9BH216346	0.94	
06/01/92	84	BUICK	QB7250	1G4AN69A1EH865293	0.10	0.058
10/26/90	84	BUICK	QB7250	1G4AN69A1EH865293	0.22	0.077
08/07/89	84	BUICK	QB7250	1G4AN69A1EH865293	0.18	
06/05/92	84	BUICK	GS2773	1G4AN69Y3EH928195	0.44	0.076
06/04/92	84	BUICK	GS2773	1G4AN69Y3EH928195	0.42	0.063
06/03/92	84	BUICK	GS2773	1G4AN69Y3EH928195	0.77	0.049
06/02/92	84	BUICK	GS2773	1G4AN69Y3EH928195	1.05	0.105
06/01/92	84	BUICK	GS2773	1G4AN69Y3EH928195	0.79	0.095
10/24/90	84	BUICK	GS2773	1G4AN69Y3EH928195	3.90	0.190
08/11/89	84	BUICK	GS2773	1G4AN69Y3EH928195	0.07	
08/10/89	84	BUICK	GS2773	1G4AN69Y3EH928195	0.85	
08/09/89	84	BUICK	GS2773	1G4AN69Y3EH928195	0.03	
08/08/89	84	BUICK	GS2773	1G4AN69Y3EH928195	0.90	
08/07/89	84	BUICK	GS2773	1G4AN69Y3EH928195	0.26	
06/01/92	84	BUICK	UB7948	1G4AP37Y8EH848421	0.01	0.034
10/25/90	84	BUICK	UB7948	1G4AP37Y8EH848421	0.67	0.080
10/24/90	84	BUICK	UB7948	1G4AP37Y8EH848421	0.28	0.079
08/07/89	84	BUICK	CGH317	1G4AP37Y8EH848421	1.82	
06/05/92	85	BUICK	SZB582	1G4EZ57Y9FE459944	2.03	0.043
06/03/92	85	BUICK	SZB582	1G4EZ57Y9FE459944	1.06	0.090
06/02/92	85	BUICK	SZB582	1G4EZ57Y9FE459944	1.05	0.060
10/26/90	85	BUICK	SZB582	1G4EZ57Y9FE459944	0.10	0.017
10/24/90	85	BUICK	SZB582	1G4EZ57Y9FE459944	0.42	0.063

08/08/89	85	BUICK	SZB582	1G4EZ57Y9FE459944	0.58	
06/04/92	85	BUICK	NTINOS1	1G4JS27P2FK428870	0.33	0.065
06/02/92	85	BUICK	NTINOS1	1G4JS27P2FK428870	0.34	0.106
10/25/90	85	BUICK	NTINOS1	1G4JS27P2FK428870	0.79	0.192
08/11/89	85	BUICK	NTINOS1	1G4JS27P2FK428870	0.21	
06/05/92	84	CADILLAC	SZT651	1G6AM4780E9146366	0.43	0.063
06/04/92	84	CADILLAC	SZT651	1G6AM4780E9146366	0.58	0.108
06/02/92	84	CADILLAC	SZT651	1G6AM4780E9146366	0.59	0.153
06/01/92	84	CADILLAC	SZT651	1G6AM4780E9146366	0.42	0.134
10/26/90	84	CADILLAC	SZT651	1G6AM4780E9146366	0.62	0.136
10/25/90	84	CADILLAC	SZT651	1G6AM4780E9146366	0.51	0.168
10/24/90	84	CADILLAC	SZT651	1G6AM4780E9146366	0.82	0.129
08/10/89	84	CADILLAC	SZT651	1G6AM4780E9146366	0.55	
08/09/89	84	CADILLAC	SZT651	1G6AM4780E9146366	1.08	
06/03/92	87	CADILLAC	DNS215	1G6CD5184H4273680	0.02	0.054
06/02/92	87	CADILLAC	DNS215	1G6CD5184H4273680	0.01	0.028
10/26/90	87	CADILLAC	DNS215	1G6CD5184H4273680	0.37	0.071
08/10/89	87	CADILLAC	DNS215	1G6CD5184H4273680	0.50	
08/09/89	87	CADILLAC	DNS215	1G6CD5184H4273680	-0.18	
08/08/89	87	CADILLAC	DNS215	1G6CD5184H4273680	0.03	
06/02/92	88	CHEVROLET	NV3235	1GCEG25H8J7186097	0.39	0.135
10/24/90	88	CHEVROLET	NV3235	1GCEG25H8J7186097	0.12	0.054
08/11/89	88	CHEVROLET	NV3235	1GCEG25H8J7186097	0.58	
08/10/89	88	CHEVROLET	NV3235	1GCEG25H8J7186097	0.47	
08/09/89	88	CHEVROLET	NV3235	1GCEG25H8J7186097	0.00	
08/08/89	88	CHEVROLET	NV3235	1GCEG25H8J7186097	0.24	
06/02/92	76	CHEVROLET	QE1061	1H57Q6K455670	0.16	0.032
10/25/90	76	CHEVROLET	QE1061	1H57Q6K455670	11.59	1.707
10/24/90	76	CHEVROLET	QE1061	1H57Q6K455670	0.33	0.081
08/08/89	76	CHEVROLET	QE1061	1H57Q6K455670	0.87	
08/07/89	76	CHEVROLET	QE1061	1H57Q6K455670	2.36	
06/03/92	88	HONDA	NT4517	1HGCA5647JA185226	0.11	0.049
06/02/92	88	HONDA	NT4517	1HGCA5647JA185226	0.10	0.045
10/24/90	88	HONDA	NT4517	1HGCA5647JA185226	0.00	0.015
08/09/89	88	HONDA	NT4517	1HGCA5647JA185226	-0.01	
06/05/92	88	HONDA	826741	1HGCA564XJA146761	0.08	0.027
06/04/92	88	HONDA	826741	1HGCA564XJA146761	0.17	0.069
06/02/92	88	HONDA	826741	1HGCA564XJA146761	1.36	0.060
06/01/92	88	HONDA	826741	1HGCA564XJA146761	0.08	0.051
10/26/90	88	HONDA	826741	1HGCA564XJA146761	1.00	0.029
10/25/90	88	HONDA	826741	1HGCA564XJA146761	0.09	0.048
10/24/90	88	HONDA	826741	1HGCA564XJA146761	1.12	0.040
08/11/89	88	HONDA	826741	1HGCA564XJA146761	0.25	
08/10/89	88	HONDA	826741	1HGCA564XJA146761	0.24	
08/08/89	88	HONDA	826741	1HGCA564XJA146761	0.10	

08/07/89	88 HONDA	826741	1HGCA564XJA146761	0.10	
06/05/92	88 HONDA	HZ8091	1HGED3655JA038206	0.12	0.037
10/26/90	88 HONDA	HZ8091	1HGED3655JA038206	3.06	0.300
10/24/90	88 HONDA	HZ8091	1HGED3655JA038206	2.99	0.079
08/11/89	88 HONDA	HZ8091	1HGED3655JA038206	0.91	
08/09/89	88 HONDA	HZ8091	1HGED3655JA038206	0.03	
08/08/89	88 HONDA	HZ8091	1HGED3655JA038206	0.67	
08/07/89	88 HONDA	HZ8091	1HGED3655JA038206	3.24	
06/04/92	88 LINCOLN	AFORD2	1LNBM81F5JY673489	5.28	0.078
06/03/92	88 LINCOLN	AFORD2	1LNBM81F5JY673489	3.57	0.037
06/02/92	88 LINCOLN	AFORD2	1LNBM81F5JY673489	5.10	0.074
10/24/90	88 LINCOLN	AFORD2	1LNBM81F5JY673489	0.08	0.027
08/11/89	88 LINCOLN	AFORD2	1LNBM81F5JY673489	0.03	
08/10/89	88 LINCOLN	AFORD2	1LNBM81F5JY673489	0.10	
08/08/89	88 LINCOLN	AFORD2	1LNBM81F5JY673489	0.06	
08/07/89	88 LINCOLN	AFORD2	1LNBM81F5JY673489	-0.04	
06/01/92	89 LINCOLN	EUW649	1LNBM93E9KY620340	1.72	0.293
10/26/90	89 LINCOLN	EUW649	1LNBM93E9KY620340	0.53	0.054
08/11/89	89 LINCOLN	EUW649	1LNBM93E9KY620340	-0.24	
08/10/89	89 LINCOLN	EUW649	1LNBM93E9KY620340	0.12	
06/05/92	89 MERCURY	KPZ935	1MEBM50U9KG610937	0.11	0.020
06/04/92	89 MERCURY	KPZ935	1MEBM50U9KG610937	0.20	0.041
06/03/92	89 MERCURY	KPZ935	1MEBM50U9KG610937	0.14	0.061
06/02/92	89 MERCURY	KPZ935	1MEBM50U9KG610937	0.10	0.068
10/26/90	89 MERCURY	KPZ935	1MEBM50U9KG610937	0.17	0.044
10/25/90	89 MERCURY	KPZ935	1MEBM50U9KG610937	0.17	0.090
08/11/89	89 MERCURY	KPZ935	1MEBM50U9KG610937	0.41	
08/10/89	89 MERCURY	KPZ935	1MEBM50U9KG610937	0.22	
08/09/89	89 MERCURY	KPZ935	1MEBM50U9KG610937	0.09	
08/08/89	89 MERCURY	KPZ935	1MEBM50U9KG610937	0.12	
06/03/92	85 MERCURY	FYR388	1MEBP7930FF601830	-0.05	0.017
10/24/90	85 MERCURY	FYR388	1MEBP7930FF601830	1.52	0.079
08/09/89	85 MERCURY	FYR388	1MEBP7930FF601830	0.35	
08/08/89	85 MERCURY	FYR388	1MEBP7930FF601830	8.64	
06/05/92	88 NISSAN	MY2834	1N4PB22S8JC764767	1.01	0.029
06/04/92	88 NISSAN	MY2834	1N4PB22S8JC764767	2.94	0.045
06/03/92	88 NISSAN	MY2834	1N4PB22S8JC764767	3.97	0.084
06/02/92	88 NISSAN	MY2834	1N4PB22S8JC764767	3.14	0.059
10/26/90	88 NISSAN	MY2834	1N4PB22S8JC764767	0.32	0.039
10/24/90	88 NISSAN	MY2834	1N4PB22S8JC764767	5.04	0.101
08/11/89	88 NISSAN	MY2834	1N4PB22S8JC764767	11.62	
08/10/89	88 NISSAN	MY2834	1N4PB22S8JC764767	10.84	
08/08/89	88 NISSAN	MY2834	1N4PB22S8JC764767	12.47	
08/07/89	88 NISSAN	MY2834	1N4PB22S8JC764767	9.24	
06/05/92	89 NISSAN	8191EC-B	1N6ND11S4KC375159	0.13	0.059

06/04/92	89	NISSAN	8191EC-B	1N6ND11S4KC375159	0.12	0.074
06/03/92	89	NISSAN	8191EC-B	1N6ND11S4KC375159	0.18	0.065
10/26/90	89	NISSAN	8191EC-B	1N6ND11S4KC375159	0.64	0.035
10/25/90	89	NISSAN	8191EC-B	1N6ND11S4KC375159	0.24	0.125
10/24/90	89	NISSAN	8191EC-B	1N6ND11S4KC375159	-0.36	0.029
08/11/89	89	NISSAN	8191EC-B	1N6ND11S4KC375159	0.11	
08/08/89	89	NISSAN	8191EC-B	1N6ND11S4KC375159	-0.06	
08/07/89	89	NISSAN	8191EC-B	1N6ND11S4KC375159	0.01	
06/05/92	87	PLYMOUTH	ER5887	1P3BS48D1HN318967	0.27	0.022
06/04/92	87	PLYMOUTH	ER5887	1P3BS48D1HN318967	2.06	0.021
06/01/92	87	PLYMOUTH	ER5887	1P3BS48D1HN318967	-0.05	-0.021
10/25/90	87	PLYMOUTH	ER5887	1P3BS48D1HN318967	2.65	0.121
10/24/90	87	PLYMOUTH	ER5887	1P3BS48D1HN318967	1.48	0.101
08/11/89	87	PLYMOUTH	ER5887	1P3BS48D1HN318967	0.07	
06/05/92	85	VOLKSWAGEN	621311	1VWBA0173FV016221	0.13	0.027
06/04/92	85	VOLKSWAGEN	621311	1VWBA0173FV016221	0.09	0.033
06/02/92	85	VOLKSWAGEN	621311	1VWBA0173FV016221	0.29	0.085
10/24/90	85	VOLKSWAGEN	621311	1VWBA0173FV016221	0.12	0.105
08/11/89	85	VOLKSWAGEN	621311	1VWBA0173FV016221	0.04	
08/10/89	85	VOLKSWAGEN	621311	1VWBA0173FV016221	0.08	
08/09/89	85	VOLKSWAGEN	621311	1VWBA0173FV016221	0.05	
08/08/89	85	VOLKSWAGEN	621311	1VWBA0173FV016221	0.06	
08/07/89	85	VOLKSWAGEN	621311	1VWBA0173FV016221	0.07	
06/03/92	87	CHEVROLET	JRP257	1Y1SK5148HZ094178	0.18	0.148
06/02/92	87	CHEVROLET	JRP257	1Y1SK5148HZ094178	0.28	0.054
06/01/92	87	CHEVROLET	JRP257	1Y1SK5148HZ094178	0.18	0.122
10/24/90	87	CHEVROLET	JRP257	1Y1SK5148HZ094178	0.04	0.047
08/08/89	87	CHEVROLET	JRP257	1Y1SK5148HZ094178	-0.22	
06/03/92	88	CHEVROLET	NX5742	1Y1SK6140JZ099872	0.15	0.037
10/25/90	88	CHEVROLET	NX5742	1Y1SK6140JZ099872	0.27	0.094
08/11/89	88	CHEVROLET	NX5742	1Y1SK6140JZ099872	-0.02	
08/10/89	88	CHEVROLET	NX5742	1Y1SK6140JZ099872	-0.02	
08/09/89	88	CHEVROLET	NX5742	1Y1SK6140JZ099872	-0.07	
06/05/92	89	FORD	OP9319	1ZVBT22L8K5171603	-0.69	0.034
06/02/92	89	FORD	OP9319	1ZVBT22L8K5171603	3.91	0.073
10/26/90	89	FORD	OP9319	1ZVBT22L8K5171603	0.73	0.059
08/09/89	89	FORD	OP9319	1ZVBT22L8K5171603	0.02	
06/05/92	87	DODGE	KF4780	2B4HB11T4HK240221	0.19	0.039
06/02/92	87	DODGE	KF4780	2B4HB11T4HK240221	0.55	0.094
06/01/92	87	DODGE	KF4780	2B4HB11T4HK240221	0.44	0.060
06/01/92	87	DODGE	KF4780	2B4HB11T4HK240221	0.76	0.124
10/26/90	87	DODGE	KF4780	2B4HB11T4HK240221	1.70	0.174
08/11/89	87	DODGE	KF4780	2B4HB11T4HK240221	0.44	
08/11/89	87	DODGE	KF4780	2B4HB11T4HK240221	1.99	
08/11/89	87	DODGE	KF4780	2B4HB11T4HK240221	0.17	
08/11/89	87	DODGE	KF4780	2B4HB11T4HK240221	3.75	

08/09/89	87 DODGE	KF4780	2B4HB11T4HK240221	2.44	
08/09/89	87 DODGE	KF4780	2B4HB11T4HK240221	1.63	
08/09/89	87 DODGE	KF4780	2B4HB11T4HK240221	1.26	
08/07/89	87 DODGE	KF4780	2B4HB11T4HK240221	-0.02	
06/01/92	87 DODGE	202373B	2B7HB23H8HK249912	0.12	0.062
10/26/90	87 DODGE	202373B	2B7HB23H8HK249912	0.10	0.040
10/26/90	87 DODGE	202373B	2B7HB23H8HK249912	0.11	0.068
10/25/90	87 DODGE	202373B	2B7HB23H8HK249912	-0.22	0.048
08/08/89	87 DODGE	202373B	2B7HB23H8HK249912	0.00	
06/05/92	87 FORD	RZN229	2FABP73F4HX133571	0.02	-0.023
06/04/92	87 FORD	RZN229	2FABP73F4HX133571	0.07	0.044
06/03/92	87 FORD	RZN229	2FABP73F4HX133571	0.03	0.028
06/01/92	87 FORD	RZN229	2FABP73F4HX133571	-0.04	0.051
10/24/90	87 FORD	RZN229	2FABP73F4HX133571	0.40	0.030
08/11/89	87 FORD	RZN229	2FABP73F4HX133571	0.08	
06/05/92	88 FORD	MX2400	2FAPP36X7JB123123	-0.09	0.025
06/03/92	88 FORD	MX2400	2FAPP36X7JB123123	0.32	0.125
06/02/92	88 FORD	MX2400	2FAPP36X7JB123123	-0.22	-0.058
10/25/90	88 FORD	MX2400	2FAPP36X7JB123123	0.17	0.143
10/24/90	88 FORD	MX2400	2FAPP36X7JB123123	0.62	0.139
08/10/89	88 FORD	MX2400	2FAPP36X7JB123123	0.01	
06/02/92	83 CHEVROLET	GE6395	2G1AL69HXD1179996	0.25	0.029
10/26/90	83 CHEVROLET	GE6395	2G1AL69HXD1179996	0.42	0.112
10/24/90	83 CHEVROLET	GE6395	2G1AL69HXD1179996	0.66	0.089
08/08/89	83 CHEVROLET	GE6395	2G1AL69HXD1179996	5.11	
06/04/92	88 BUICK	ME2577	2G4WB14W5J1423764	0.46	0.074
10/24/90	88 BUICK	ME2577	2G4WB14W5J1423764	0.33	0.078
08/11/89	88 BUICK	ME2577	2G4WB14W5J1423764	0.07	
08/10/89	88 BUICK	ME2577	2G4WB14W5J1423764	0.00	
08/09/89	88 BUICK	ME2577	2G4WB14W5J1423764	0.07	
06/02/92	89 CHEVROLET	CNL847	2GBEG25K5K4130633	0.55	0.084
10/24/90	89 CHEVROLET	CNL847	2GBEG25K5K4130633	0.52	0.128
08/11/89	89 CHEVROLET	CNL847	2GBEG25K5K4130633	0.39	
08/10/89	89 CHEVROLET	CNL847	2GBEG25K5K4130633	0.09	
08/09/89	89 CHEVROLET	CNL847	2GBEG25K5K4130633	0.13	
08/08/89	89 CHEVROLET	CNL847	2GBEG25K5K4130633	0.39	
06/02/92	86 CHEVROLET	5930BD-B	2GCEG25H1G4136906	0.06	0.038
10/24/90	86 CHEVROLET	5930BD-B	2GCEG25H1G4136906	-0.04	-0.016
08/10/89	86 CHEVROLET	5930BD-B	2GCEG25H1G4136906	0.24	
08/09/89	86 CHEVROLET	5930BD-B	2GCEG25H1G4136906	0.23	
08/08/89	86 CHEVROLET	5930BD-B	2GCEG25H1G4136906	0.02	
08/07/89	86 CHEVROLET	5930BD-B	2GCEG25H1G4136906	0.02	
06/04/92	87 CHEVROLET	3900AP-B	2GCEG25K5H4103243	1.45	0.085
06/02/92	87 CHEVROLET	3900AP-B	2GCEG25K5H4103243	0.24	0.103

06/01/92	87 CHEVROLET	3900AP-B	2GCEG25K5H4103243	0.84	0.111
10/25/90	87 CHEVROLET	3900AP-B	2GCEG25K5H4103243	0.61	0.037
10/25/90	87 CHEVROLET	3900AP-B	2GCEG25K5H4103243	0.60	0.061
08/11/89	87 CHEVROLET	3900AP-B	2GCEG25K5H4103243	1.03	
08/10/89	87 CHEVROLET	3900AP-B	2GCEG25K5H4103243	0.02	
08/07/89	87 CHEVROLET	3900AP-B	2GCEG25K5H4103243	0.04	
06/03/92	79 OLDSMOBILE	LL4591	3N37R9X236241	7.52	0.152
10/24/90	79 OLDSMOBILE	LL4591	3N37R9X236241	2.84	0.138
08/09/89	79 OLDSMOBILE	LL4591	3N37R9X236241	1.90	
06/02/92	88 PLYMOUTH	PP3293	3P3CS44D8JT868120	0.58	0.087
10/26/90	88 PLYMOUTH	PP3293	3P3CS44D8JT868120	0.22	0.020
08/10/89	88 PLYMOUTH	PP3293	3P3CS44D8JT868120	0.18	
08/09/89	88 PLYMOUTH	PP3293	3P3CS44D8JT868120	0.12	
08/08/89	88 PLYMOUTH	PP3293	3P3CS44D8JT868120	0.01	
08/07/89	88 PLYMOUTH	PP3293	3P3CS44D8JT868120	0.00	
06/05/92	89 TOYOTA	PL7994	4T1SV21E7KU029440	0.11	0.036
06/02/92	89 TOYOTA	PL7994	4T1SV21E7KU029440	0.05	0.043
10/26/90	89 TOYOTA	PL7994	4T1SV21E7KU029440	0.00	0.035
08/11/89	89 TOYOTA	PL7994	4T1SV21E7KU029440	6.35	
08/10/89	89 TOYOTA	PL7994	4T1SV21E7KU029440	6.66	
08/07/89	89 TOYOTA	PL7994	4T1SV21E7KU029440	0.19	
06/01/92	80 BUICK	UP9619	4X69XAH510822	0.11	0.032
10/24/90	80 BUICK	UP9619	4X69XAH510822	0.07	0.022
08/07/89	80 BUICK	UP9619	4X69XAH510822	0.05	
06/05/92	76 CADILLAC	W-55405	6D47S6Q242995	0.14	0.046
06/04/92	76 CADILLAC	W-55405	6D47S6Q242995	0.06	0.025
06/02/92	76 CADILLAC	W-55405	6D47S6Q242995	0.25	0.063
10/26/90	76 CADILLAC	GWY238	6D47S6Q242995	0.86	0.101
10/24/90	76 CADILLAC	GWY238	6D47S6Q242995	-0.13	0.001
08/11/89	76 CADILLAC	GWY238	6D47S6Q242995	0.81	
08/11/89	76 CADILLAC	GWY238	6D47S6Q242995	0.30	
08/10/89	76 CADILLAC	GWY238	6D47S6Q242995	0.47	
08/09/89	76 CADILLAC	GWY238	6D47S6Q242995	3.15	
08/08/89	76 CADILLAC	GWY238	6D47S6Q242995	0.07	
08/07/89	76 CADILLAC	GWY238	6D47S6Q242995	0.00	
06/05/92	79 MERCURY	JT1519	9F14Y622333	0.31	0.081
06/04/92	79 MERCURY	JT1519	9F14Y622333	0.21	0.081
06/01/92	79 MERCURY	JT1519	9F14Y622333	0.49	0.131
10/26/90	79 MERCURY	JT1519	9F14Y622333	3.14	0.250
10/25/90	79 MERCURY	JT1519	9F14Y622333	7.78	1.437
08/11/89	79 MERCURY	JT1519	9F14Y622333	2.65	
08/09/89	79 MERCURY	JT1519	9F14Y622333	3.00	
08/08/89	79 MERCURY	JT1519	9F14Y622333	2.29	
08/07/89	79 MERCURY	JT1519	9F14Y622333	3.19	
06/04/92	79 FORD	IP6286	9X92T126735	8.13	0.132

06/02/92	79	FORD	IP6286	9X92T126735	7.92	0.126
10/26/90	79	FORD	IP6286	9X92T126735	4.69	0.154
10/24/90	79	FORD	IP6286	9X92T126735	2.08	0.067
08/10/89	79	FORD	IP6286	9X92T126735	1.26	
08/09/89	79	FORD	IP6286	9X92T126735	0.21	
06/04/92	79	CHEVROLET	YE8231	CKL189Z133915	0.07	0.029
10/26/90	79	CHEVROLET	KG5829	CKL189Z133915	0.33	0.008
10/25/90	79	CHEVROLET	KG5829	CKL189Z133915	1.59	0.107
10/24/90	79	CHEVROLET	KG5829	CKL189Z133915	0.33	0.116
08/11/89	79	CHEVROLET	KG5829	CKL189Z133915	0.24	
06/02/92	88	MITSUBISHI	AML386	JA3BB47S6JY005416	0.10	0.039
10/26/90	88	MITSUBISHI	AML386	JA3BB47S6JY005416	0.33	0.090
10/24/90	88	MITSUBISHI	AML386	JA3BB47S6JY005416	0.10	0.018
08/11/89	88	MITSUBISHI	AML386	JA3BB47S6JY005416	0.04	
08/09/89	88	MITSUBISHI	AML386	JA3BB47S6JY005416	0.00	
06/05/92	88	ACURA	EVL204	JH4DA3449JS011757	0.48	0.099
06/03/92	88	ACURA	EVL204	JH4DA3449JS011757	0.61	0.134
06/02/92	88	ACURA	EVL204	JH4DA3449JS011757	0.71	0.146
06/01/92	88	ACURA	EVL204	JH4DA3449JS011757	0.63	0.120
10/25/90	88	ACURA	EVL204	JH4DA3449JS011757	-0.04	2.289
10/24/90	88	ACURA	EVL204	JH4DA3449JS011757	0.77	1.000
08/11/89	88	ACURA	EVL204	JH4DA3449JS011757	-0.11	
06/05/92	88	HONDA	FY7238	JHMBA4231JC063322	0.10	0.031
10/24/90	88	HONDA	FY7238	JHMBA4231JC063322	0.66	0.070
08/10/89	88	HONDA	FY7238	JHMBA4231JC063322	0.17	
06/05/92	88	HONDA	NW4944	JHMED6350JS036134	0.25	0.064
10/26/90	88	HONDA	NW4944	JHMED6350JS036134	0.47	0.988
10/25/90	88	HONDA	NW4944	JHMED6350JS036134	0.35	1.779
10/24/90	88	HONDA	NW4944	JHMED6350JS036134	0.22	0.157
08/09/89	88	HONDA	NW4944	JHMED6350JS036134	0.01	
08/07/89	88	HONDA	NW4944	JHMED6350JS036134	0.33	
06/02/92	83	HONDA	ZFN635	JHMWD5524DS005961	4.28	0.183
10/26/90	83	HONDA	ED3733	JHMWD5524DS005961	2.08	0.245
10/24/90	83	HONDA	ED3733	JHMWD5524DS005961	2.33	0.132
08/09/89	83	HONDA	ED3733	JHMWD5524DS005961	0.36	
08/08/89	83	HONDA	ED3733	JHMWD5524DS005961	4.29	
06/04/92	88	MAZDA	XGREGX	JM1FC3317J0624502	0.20	0.044
10/26/90	88	MAZDA	XGREGX	JM1FC3317J0624502	1.15	0.395
10/25/90	88	MAZDA	XGREGX	JM1FC3317J0624502	0.25	0.039
10/24/90	88	MAZDA	XGREGX	JM1FC3317J0624502	0.77	0.043
08/10/89	88	MAZDA	XGREGX	JM1FC3317J0624502	0.15	
08/09/89	88	MAZDA	XGREGX	JM1FC3317J0624502	1.00	
08/07/89	88	MAZDA	XGREGX	JM1FC3317J0624502	2.47	

06/04/92	87	MAZDA	599987	JM1GC22A5H1103153	0.05	0.049
10/26/90	87	MAZDA	599987	JM1GC22A5H1103153	0.16	0.035
10/25/90	87	MAZDA	599987	JM1GC22A5H1103153	0.24	0.028
10/24/90	87	MAZDA	599987	JM1GC22A5H1103153	-0.10	0.013
08/11/89	87	MAZDA	599987	JM1GC22A5H1103153	0.03	
06/01/92	89	NISSAN	PN9004	JN1HS36PXKW016311	0.07	0.044
10/26/90	89	NISSAN	PN9004	JN1HS36PXKW016311	0.17	0.064
08/11/89	89	NISSAN	PN9004	JN1HS36PXKW016311	0.32	
08/07/89	89	NISSAN	PN9004	JN1HS36PXKW016311	0.20	
06/04/92	89	NISSAN	364589	JN1HT21S4KT201796	0.13	0.062
06/01/92	89	NISSAN	364589	JN1HT21S4KT201796	0.27	0.084
10/25/90	89	NISSAN	364589	JN1HT21S4KT201796	0.20	0.030
08/11/89	89	NISSAN	364589	JN1HT21S4KT201796	-0.06	
06/05/92	82	DATSUN	836629	JN1HU01SXCT033973	-0.70	0.004
06/04/92	82	DATSUN	836629	JN1HU01SXCT033973	0.13	0.041
06/03/92	82	DATSUN	836629	JN1HU01SXCT033973	0.18	0.035
06/02/92	82	DATSUN	836629	JN1HU01SXCT033973	0.39	0.061
10/26/90	82	DATSUN	836629	JN1HU01SXCT033973	0.06	0.017
10/25/90	82	DATSUN	836629	JN1HU01SXCT033973	0.19	0.089
10/24/90	82	DATSUN	836629	JN1HU01SXCT033973	0.15	0.068
08/11/89	82	DATSUN	836629	JN1HU01SXCT033973	0.06	
08/10/89	82	DATSUN	836629	JN1HU01SXCT033973	-0.01	
08/09/89	82	DATSUN	836629	JN1HU01SXCT033973	0.61	
06/03/92	87	NISSAN	JZ6808	JN1HU1115HT256118	0.98	0.047
06/02/92	87	NISSAN	JZ6808	JN1HU1115HT256118	0.17	0.032
10/24/90	87	NISSAN	JZ6808	JN1HU1115HT256118	0.07	0.015
08/09/89	87	NISSAN	JZ6808	JN1HU1115HT256118	0.06	
06/01/92	88	NISSAN	SZY437	JN1HU11PXJT638204	0.09	0.030
10/25/90	88	NISSAN	SZY437	JN1HU11PXJT638204	-0.02	0.031
08/10/89	88	NISSAN	SZY437	JN1HU11PXJT638204	0.00	
06/01/92	87	NISSAN	DEN972	JN1HU11S1HT242869	0.02	0.028
10/26/90	87	NISSAN	DEN972	JN1HU11S1HT242869	0.07	0.052
08/11/89	87	NISSAN	DEN972	JN1HU11S1HT242869	0.16	
08/07/89	87	NISSAN	DEN972	JN1HU11S1HT242869	0.03	
06/03/92	86	NISSAN	SBJ335	JN1HU11S6GT150171	1.23	0.041
10/25/90	86	NISSAN	SBJ335	JN1HU11S6GT150171	0.71	0.069
08/09/89	86	NISSAN	SBJ335	JN1HU11S6GT150171	1.19	
08/07/89	86	NISSAN	SBJ335	JN1HU11S6GT150171	0.06	
06/05/92	83	DATSUN	QA2960	JN1HZ06S0DX509006	1.00	0.108
06/03/92	83	DATSUN	QA2960	JN1HZ06S0DX509006	1.73	0.137
06/02/92	83	DATSUN	QA2960	JN1HZ06S0DX509006	0.74	0.131
10/25/90	83	DATSUN	QA2960	JN1HZ06S0DX509006	0.45	0.164
10/24/90	83	DATSUN	QA2960	JN1HZ06S0DX509006	1.64	0.071
08/09/89	83	DATSUN	QA2960	JN1HZ06S0DX509006	0.68	

08/07/89	83	DATSUN	QA2960	JN1HZ06S0DX509006	0.11	
06/05/92	86	NISSAN	LYH397	JN1HZ14S7GX137421	0.69	0.044
06/04/92	86	NISSAN	LYH397	JN1HZ14S7GX137421	0.15	0.038
06/03/92	86	NISSAN	LYH397	JN1HZ14S7GX137421	2.34	0.087
06/02/92	86	NISSAN	LYH397	JN1HZ14S7GX137421	-0.04	0.053
06/01/92	86	NISSAN	LYH397	JN1HZ14S7GX137421	0.48	0.050
10/26/90	86	NISSAN	LYH397	JN1HZ14S7GX137421	0.35	0.065
10/25/90	86	NISSAN	LYH397	JN1HZ14S7GX137421	0.33	0.074
10/24/90	86	NISSAN	LYH397	JN1HZ14S7GX137421	0.00	0.053
08/11/89	86	NISSAN	LYH397	JN1HZ14S7GX137421	0.59	
08/10/89	86	NISSAN	LYH397	JN1HZ14S7GX137421	0.35	
08/09/89	86	NISSAN	LYH397	JN1HZ14S7GX137421	0.52	
08/08/89	86	NISSAN	LYH397	JN1HZ14S7GX137421	0.62	
06/04/92	83	NISSAN	JZL708	JN1MN24SXDM103826	0.47	0.069
06/03/92	83	NISSAN	JZL708	JN1MN24SXDM103826	0.89	0.114
10/24/90	83	NISSAN	JZL708	JN1MN24SXDM103826	0.33	-0.055
08/11/89	83	NISSAN	JZL708	JN1MN24SXDM103826	0.13	
08/10/89	83	NISSAN	JZL708	JN1MN24SXDM103826	0.17	
08/08/89	83	NISSAN	JZL708	JN1MN24SXDM103826	2.28	
08/07/89	83	NISSAN	JZL708	JN1MN24SXDM103826	0.25	
06/03/92	87	NISSAN	GODIS11	JN1PB2411HU035581	0.25	0.137
10/26/90	87	NISSAN	GODIS11	JN1PB2411HU035581	11.23	1.093
08/11/89	87	NISSAN	GODIS11	JN1PB2411HU035581	6.32	
08/10/89	87	NISSAN	GODIS11	JN1PB2411HU035581	1.54	
06/04/92	86	TOYOTA	STS333	JT2AE86S5G0192015	0.09	0.056
10/26/90	86	TOYOTA	STS333	JT2AE86S5G0192015	0.46	0.217
10/25/90	86	TOYOTA	STS333	JT2AE86S5G0192015	0.17	0.051
10/24/90	86	TOYOTA	STS333	JT2AE86S5G0192015	0.19	0.041
08/10/89	86	TOYOTA	STS333	JT2AE86S5G0192015	0.11	
08/09/89	86	TOYOTA	STS333	JT2AE86S5G0192015	0.07	
08/08/89	86	TOYOTA	STS333	JT2AE86S5G0192015	0.02	
08/07/89	86	TOYOTA	STS333	JT2AE86S5G0192015	0.09	
06/04/92	88	TOYOTA	XIV184	JT2MX73E8J0155953	0.53	0.056
10/24/90	88	TOYOTA	XIV184	JT2MX73E8J0155953	0.55	0.044
08/10/89	88	TOYOTA	XIV184	JT2MX73E8J0155953	-0.02	
08/09/89	88	TOYOTA	XIV184	JT2MX73E8J0155953	-0.02	
08/08/89	88	TOYOTA	XIV184	JT2MX73E8J0155953	2.76	
08/07/89	88	TOYOTA	XIV184	JT2MX73E8J0155953	0.08	
06/05/92	87	TOYOTA	CF7140	JT2SV21E5H3129435	0.16	0.031
06/04/92	87	TOYOTA	CF7140	JT2SV21E5H3129435	0.09	0.052
10/25/90	87	TOYOTA	CF7140	JT2SV21E5H3129435	-0.06	0.065
08/11/89	87	TOYOTA	CF7140	JT2SV21E5H3129435	-0.02	
06/02/92	85	TOYOTA	93725RV	JT4YR27V2F0033886	0.82	0.106
06/01/92	85	TOYOTA	93725RV	JT4YR27V2F0033886	0.49	0.063
10/26/90	85	TOYOTA	93725RV	JT4YR27V2F0033886	0.41	0.094

10/25/90	85	TOYOTA	93725RV	JT4YR27V2F0033886	0.09	0.009
08/11/89	85	TOYOTA	93725RV	JT4YR27V2F0033886	0.07	
08/10/89	85	TOYOTA	93725RV	JT4YR27V2F0033886	0.43	
08/09/89	85	TOYOTA	93725RV	JT4YR27V2F0033886	0.16	
08/09/89	85	TOYOTA	93725RV	JT4YR27V2F0033886	0.03	
08/08/89	85	TOYOTA	93725RV	JT4YR27V2F0033886	0.22	
08/08/89	85	TOYOTA	93725RV	JT4YR27V2F0033886	0.12	
08/07/89	85	TOYOTA	93725RV	JT4YR27V2F0033886	0.22	
06/02/92	89	HYUNDAI	EDC105	KMHBF22S7KU050564	-0.14	0.015
10/24/90	89	HYUNDAI	EDC105	KMHBF22S7KU050564	0.26	0.052
08/11/89	89	HYUNDAI	EDC105	KMHBF22S7KU050564	0.08	
08/09/89	89	HYUNDAI	EDC105	KMHBF22S7KU050564	-0.01	
08/08/89	89	HYUNDAI	EDC105	KMHBF22S7KU050564	0.02	
06/05/92	89	HYUNDAI	PX8791	KMHLF21J7KU639689	0.22	0.044
06/03/92	89	HYUNDAI	PX8791	KMHLF21J7KU639689	6.55	0.093
06/02/92	89	HYUNDAI	PX8791	KMHLF21J7KU639689	8.61	0.070
10/24/90	89	HYUNDAI	PX8791	KMHLF21J7KU639689	0.16	0.046
08/10/89	89	HYUNDAI	PX8791	KMHLF21J7KU639689	1.42	
08/09/89	89	HYUNDAI	PX8791	KMHLF21J7KU639689	2.03	
08/08/89	89	HYUNDAI	PX8791	KMHLF21J7KU639689	9.43	
06/05/92	80	PLYMOUTH	DF6119	ML44AAD371025	0.23	0.130
06/04/92	80	PLYMOUTH	DF6119	ML44AAD371025	0.32	0.107
06/03/92	80	PLYMOUTH	DF6119	ML44AAD371025	0.30	0.039
06/02/92	80	PLYMOUTH	DF6119	ML44AAD371025	0.90	0.046
06/01/92	80	PLYMOUTH	DF6119	ML44AAD371025	0.48	0.032
10/25/90	80	PLYMOUTH	DF6119	ML44AAD371025	0.25	0.035
10/24/90	80	PLYMOUTH	DF6119	ML44AAD371025	0.25	0.221
08/11/89	80	PLYMOUTH	DF6119	ML44AAD371025	0.51	
08/09/89	80	PLYMOUTH	DF6119	ML44AAD371025	0.06	
08/08/89	80	PLYMOUTH	DF6119	ML44AAD371025	0.31	
08/07/89	80	PLYMOUTH	DF6119	ML44AAD371025	0.11	
06/02/92	79	CHRYSLER	LZP138	SS22G9R164848	0.31	0.061
10/25/90	79	CHRYSLER	LZP138	SS22G9R164848	1.58	0.080
08/10/89	79	CHRYSLER	LZP138	SS22G9R164848	0.86	
06/05/92	86	BMW	406615	WBAAB6406G1214536	0.34	0.091
06/04/92	86	BMW	406615	WBAAB6406G1214536	0.22	0.049
06/03/92	86	BMW	406615	WBAAB6406G1214536	0.41	0.030
06/02/92	86	BMW	406615	WBAAB6406G1214536	0.83	0.049
10/26/90	86	BMW	406615	WBAAB6406G1214536	0.12	-0.013
10/25/90	86	BMW	406615	WBAAB6406G1214536	0.26	0.084
08/11/89	86	BMW	406615	WBAAB6406G1214536	0.06	
08/10/89	86	BMW	406615	WBAAB6406G1214536	0.13	
06/05/92	84	BMW	FXL372	WBAAK7405E8763641	0.53	0.132
06/04/92	84	BMW	FXL372	WBAAK7405E8763641	0.85	0.098
06/03/92	84	BMW	FXL372	WBAAK7405E8763641	0.33	0.111
06/01/92	84	BMW	FXL372	WBAAK7405E8763641	0.29	0.086

10/26/90	84 BMW	FXL372	WBAAK7405E8763641	0.19	0.094
08/11/89	84 BMW	FXL372	WBAAK7405E8763641	0.13	
08/10/89	84 BMW	FXL372	WBAAK7405E8763641	0.16	
08/07/89	84 BMW	FXL372	WBAAK7405E8763641	0.18	
06/05/92	87 BMW	XT9062	WBADK8309H9707639	0.09	0.038
06/01/92	87 BMW	XT9062	WBADK8309H9707639	0.12	0.055
10/26/90	87 BMW	XT9062	WBADK8309H9707639	0.41	0.062
10/25/90	87 BMW	XT9062	WBADK8309H9707639	0.19	0.061
10/24/90	87 BMW	XT9062	WBADK8309H9707639	0.70	0.069
08/11/89	87 BMW	XT9062	WBADK8309H9707639	0.05	
08/07/89	87 BMW	XT9062	WBADK8309H9707639	0.08	
06/04/92	88 BMW	RAYDOH	WBSAK0304J2197523	0.04	0.023
10/26/90	88 BMW	RAYDOH	WBSAK0304J2197523	0.17	0.052
08/10/89	88 BMW	RAYDOH	WBSAK0304J2197523	0.15	
06/04/92	83 MERCEDES	BOUTIQE	WDBAB93A1DN017646	0.05	0.047
06/02/92	83 MERCEDES	BOUTIQE	WDBAB93A1DN017646	-0.03	-0.001
10/25/90	83 MERCEDES	BOUTIQE	WDBAB93A1DN017646	0.10	0.079
10/24/90	83 MERCEDES	BOUTIQE	WDBAB93A1DN017646	-0.03	0.018
08/11/89	83 MERCEDES	BOUTIQE	WDBAB93A1DN017646	0.06	
08/09/89	83 MERCEDES	BOUTIQE	WDBAB93A1DN017646	0.11	
06/05/92	86 VOLKSWAGEN	JN6997	WVWFB0321GE200951	-0.27	0.042
06/03/92	86 VOLKSWAGEN	JN6997	WVWFB0321GE200951	0.14	0.054
06/02/92	86 VOLKSWAGEN	JN6997	WVWFB0321GE200951	0.11	0.046
10/26/90	86 VOLKSWAGEN	JN6997	WVWFB0321GE200951	0.33	0.027
10/24/90	86 VOLKSWAGEN	JN6997	WVWFB0321GE200951	2.12	0.087
08/11/89	86 VOLKSWAGEN	JN6997	WVWFB0321GE200951	0.01	
06/05/92	89 VOLKSWAGEN	FW9785	WVWRB11G8KW247432	0.11	0.028
10/24/90	89 VOLKSWAGEN	FW9785	WVWRB11G8KW247432	0.34	0.123
08/11/89	89 VOLKSWAGEN	FW9785	WVWRB11G8KW247432	0.07	
06/05/92	89 VOLVO	PL3064	YV1FA8746K2317023	0.75	0.026
06/01/92	89 VOLVO	PL3064	YV1FA8746K2317023	0.12	0.049
10/26/90	89 VOLVO	PL3064	YV1FA8746K2317023	0.02	0.062
08/11/89	89 VOLVO	PL3064	YV1FA8746K2317023	0.56	
08/07/89	89 VOLVO	PL3064	YV1FA8746K2317023	0.02	