U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**

NHTSA
www.nhtsa.gov

DOT HS 812 168

June 2015

Measurement of School Bus Pedal Dimensions

DISCLAIMER

This publication is distributed by the U.S. Department of Transportation, National Highway Traffic Safety Administration, in the interest of information exchange. The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the Department of Transportation or the National Highway Traffic Safety Administration. The United States Government assumes no liability for its contents or use thereof. If trade or manufacturers' names or products are mentioned, it is because they are considered essential to the object of the publication and should not be construed as an endorsement. The United States Government does not endorse products or manufacturers.

Suggested APA Format Citation:

Collins, W. D., & Evans, L. (2015, June). *Measurement of school bus pedal dimensions.* (Report No. DOT HS 812 168). Washington, DC: National Highway Traffic Safety Administration.

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
DOT HS 812 168		

4. Title and Subtitle	5. Report Date
Measurement of School Bus Pedal Dimensions	June 2015
	6. Performing Organization Code: NHTSA/NVS-313

7. Author(s)	8. Performing Organization Report No.
William D. Collins, National Highway Traffic Safety Administration Larry Evans, Transportation Research Center Inc.	

9. Performing Organization Name and Address	10. Work Unit No. (TRAIS)
National Highway Traffic Safety Administration Vehicle Research and Test Center P.O. Box 37 East Liberty, OH 43319	11. Contract or Grant No.

12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
National Highway Traffic Safety Administration 1200 New Jersey Avenue SE. Washington, DC 20590	Draft Final Report
	14. Sponsoring Agency Code

15. Supplementary Notes

The authors thank Rory Austin of NHTSA for assistance in vehicle selection; Joshua Orahood, Tim Cleland, and Jim Clevenger of Transportation Research Center Inc. for their testing support.

16. Abstract

The National Transportation Safety Board (NTSB) investigated four crashes of school buses and one of a fire truck, all of which occurred from 2005 to 2009 and concluded that these accidents were consistent with pedal misapplication. Among the NTSB recommendations was that NHTSA analyze pedal configurations in heavy vehicles to determine the effect of pedal design on the driver's task. This research was performed at NHTSA's Vehicle Research and Test Center (VRTC), in East Liberty, Ohio, to provide an overview of the range of typical pedal dimensions in school buses. However, analysis to determine the effect of pedal design on the driver's task was beyond the scope of this study. NHTSA identified 21 dimensions based on the SAE J1100 standard and also developed a procedure capable of determining pedal position. Two additional dimensions were used for the analysis of the transit style buses to account for the steering column position.

The dimensions for 24 Type C (conventional style) buses and 8 Type D (transit style) buses were measured and compared. Only the stepover distance, the seat cushion width, and the steering wheel width and height were not significantly different between the two types. The Type C buses measured were assembled by three different manufacturers, Bluebird Corporation, Fort Valley, GA; IC Corporation, Warrenville, IL (a subsidiary of Navistar); and Thomas Built Corporation, High Point, NC (a subsidiary of Daimler Trucks, N.A.). The Bluebird and Thomas Built buses were the most similar, but they had statistically significant differences in the brake pedal width and the stepover distance from the face planes of the pedals, as well as some differences in seating position. The IC buses were statistically different in 11 and 12 of 21 measurements from the Bluebird and Thomas Built buses, respectively.

The dimensions for six Type D buses manufactured by Bluebird and two by Thomas were measured. The dimensions were statistically different in only 8 of the 23 dimension measured. Most of the differences were smaller distances from the pedals to the "tunnel" on the right side of the pedals for the Bluebird buses.

The measurements for the 32 buses were compared to the dimensions of 101 passenger vehicles. Seventeen of the 21 dimensions were statistically different. Even though the means were different, the distributions of values had considerable overlap. The variables that had little overlap were that the bus accelerator and brake pedals had a shorter overall travel to the floor, and the steering wheel was farther from the floor and pedals for buses than for the passenger vehicles. The dimensions of both the Type C and Type D buses were compared to the average dimensions of the passenger cars. The measurements of Type D buses differed from passenger cars in nearly every dimension. Only the distance from the accelerator to the tunnel and the seat cushion width were not significantly different, and for 14 of the dimensions there was no overlap between the outliers of the 2 distributions. The Type C buses were more similar to passenger car dimensions, differing in 10 of the 21 dimensions measured, with only the height and size of the steering wheel having no overlap between the distributions.

17. Key Words	18. Distribution Statement
Pedal misapplication, unintended acceleration, stepover, school bus	Document is available to the public from the National Technical Information Service www.ntis.gov.

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	181	

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1. Executive Summary

The National Transportation Safety Board (NTSB) investigated four crashes of school buses and one of a fire truck, all of which occurred from 2005 to 2009 and concluded that these accidents were consistent with pedal misapplication.[1] One NTSB recommendation was that NHTSA analyze pedal configurations in heavy vehicles to determine the effect of pedal design on the driver's task. This research was performed at NHTSA's Vehicle Research and Test Center (VRTC), in East Liberty, Ohio, to provide an overview of the range of typical pedal dimensions in school buses. However, analysis to determine the effect of pedal design on the driver's task was beyond the scope of this study.

Recently, NHTSA completed a study to analyze possible relationships in a limited number of cases between pedal design factors and the rate of pedal misapplication in passenger vehicles, specifically occurring when drivers intend to apply the brake but instead apply the accelerator.[2] In that study, NHTSA identified 21 dimensions based on the SAE J1100 standard and also developed a procedure capable of determining precise pedal positions. Two additional dimensions were added to the current study to accommodate the Type D buses for a total of 23 different dimensions. These dimensions include pedal placement dimensions as well as dimensions such as the distance from the steering wheel to the floor plane that help define the driver's orientation to the pedals.

The dimensions for 24 Type C (conventional style) buses and 8 Type D (transit style) buses were measured. All the horizontal pedal dimensions were significantly different between the two types of buses. For the other pedal dimensions, only the perpendicular stepover distance was not significantly different. The driver position dimensions of seat cushion width and steering wheel width and height were not different.

---

[1] National Transportation Safety Board. (2009, September 1). *Pedal misapplcations in heavy vehicles.* (Special Investigation Report. Report No. NTSB/ST-0902 PB2009-917003, Notation 1841A). Washington, DC: Author. Available at www.ntsb.gov/doclib/safetystudies/SIR0902.pdf

[2] Collins, W., Evans, L., & Hughes, R.. (n.a.) An analysis of the relationship between driver brake and accelerator controls and reported pedal misapplication rates in North Carolina. (Unpublished NHTSA report). Washington, DC: National Highway Traffic Safety Administration.

The Type C buses measured were assembled by three different manufacturers, Bluebird Corporation, Fort Valley, GA; IC Corporation, Warrenville, IL (a subsidiary of Navistar); and Thomas Built Corporation, High Point, NC (a subsidiary of Daimler Trucks, N.A.). The Bluebird and Thomas Built buses were the most similar, but they had statistically significant differences in the brake pedal width and stepover in plane, (that is the perpendicular distance between the planes of the brake and accelerator pedal faces) as well as some differences in seating position. The IC buses were statistically different in 11 and 12 of 21 measurements from the Bluebird and Thomas Built buses, respectively.

The dimensions for six Type D buses manufactured by Bluebird and two by Thomas were measured. The dimensions were statistically different in only 8 of the 23 dimensions measured. Most of the differences were smaller distances from the pedals to the "tunnel" on the right side of the pedals for the Bluebird buses.

The measurements for the 32 buses were compared to the dimensions of 101 passenger vehicles previously reported by NHTSA. Seventeen of the 21 dimensions were statistically different on average. From inspection of the distributions, even though the means were different, the distributions of values had considerable overlap for most values. The variables that had little overlap were that the bus accelerator and brake pedals had a shorter overall travel to the floor and the steering wheel was farther from the floor and pedals for buses than for the passenger vehicles.

The dimensions of both the Type C and Type D buses were compared to the average dimensions of the passenger cars. The measurements of Type D buses differed from passenger cars in nearly every dimension. Only the distance from the accelerator to the tunnel (A) and seat cushion width (L) were not significantly different, and for 14 of the dimensions there was no overlap between the outliers of the 2 distributions. The Type C buses were more similar to passenger car dimensions, differing in 10 of the 21 dimensions measured, with only the height and size of the steering wheel having no overlap between the distributions.

2. Background

After the initial investigation of a school bus crash in May 2005 suggested that the cause may have been pedal misapplication, the National Transportation Safety Board carried out a special investigation into pedal misapplication in heavy vehicles. The NTSB investigated four crashes of school buses and one of a fire truck, all of which occurred from 2005 to 2009. The NTSB also reviewed work done by NHTSA in the 1980s after receiving claims of sudden unintended acceleration for certain passenger vehicles.[3] The NTSB investigators found no mechanical failures of the braking system in the vehicles, no contributing medical conditions of the drivers, and no outside interference with the driver. The absence of these factors, along with other evidence, led the NTSB to conclude that these accidents were consistent with pedal misapplication. The NTSB recommended that national and State associations of pupil transportation include the risk of pedal misapplication in literature and training sessions.

The NTSB also made several specific recommendations to NHTSA:

- NHTSA should require the installation of brake transmission shift interlocks (BTSI) in heavy vehicles.[4] Based on the documented success of brake transmission shift interlocks in preventing sudden unintended acceleration of light passenger vehicles during initial movement, (3) the NTSB concluded that the installation of BTSI on heavy vehicles would have prevented three of the five incidents they investigated.
- NHTSA should develop and implement industrial standards for onboard recording of bus crash data.[5]
- NHTSA should analze pedal configurations in heavy vehicles, including innovative designs, to determine the effect of pedal design on the driver's task.[6]
- Ultimately, NHTSA should publish pedal design guidelines for designers and manufacturers.[7]

---

[3] Pollard, J., & Sussman, E. D. (1989, January). *An examination of sudden acceleration.* (Report No. DOT HS 807 367). Washington, DC: National Highway Traffic Safety Administration. Available at www.autosafety.org/sites/default/files/1989%20NHTSA%20SA%20Study%20Report%20&%20Appendices%20A-D(1).pdf

[4] Recommendation H-09-01, page 37and H-99-53, page 38

[5] Recommendation H-99-54, page 38

[6] Recommendation H-09-12, page 37

[7] Recommendation H=09-13, page 37

This report is not intended to fully respond to the NTSB recommendation that NHTSA analyze pedal configurations in heavy vehicles, including innovative designs, to determine the effect of pedal design on the driver's task. Rather, the data compiled in this report analyzes pedal configurations in certain heavy vehicles.

Recently, NHTSA completed a study to analyze possible relationships between pedal design factors and the rate of pedal misapplication in passenger vehicles, specifically occurring when drivers intend to apply the brake but instead apply the accelerator, which can result in unintended acceleration (UA) of a vehicle.[2, 8] An example of a design factor is "lateral separation," the horizontal gap between the brake and accelerator pedals. Another example is "stepover," the distance between the surface plane of the brake pedal and the surface plane of the accelerator pedal. Previous research efforts into UA events hypothesized that pedal design factors may contribute to driver pedal error. The previous study used data from a North Carolina State Crash Database,[9] selected because it offered detailed police accident report records with sufficiently specific vehicle make and model information for 2,411 UA events. This database was also recently used to study demographic information.[10] The records covered a 5-year period from 2004 to 2008.

A UA event is defined as any unintended powered acceleration of a motor vehicle. That is, acceleration powered by the engine and not intentionally commanded by the operator via the vehicle's controls. UA events included, but were not limited to, stuck throttle, engine surging, high idle speed, and sudden acceleration incidents (SAI).

An SAI is defined in the report "An Examination of Sudden Acceleration"[11] as any "unintended, unexpected, high-power accelerations from a stationary position or very low initial speed accompanied by an apparent loss of braking effectiveness." The report was the result of a study conducted in the late 1980's to identify and evaluate factors that contribute to the occurrence of SAI. It also identified vehicle design factors such as pedal placement and pedal feedback as important variables in events that involve the unintentional misapplication of vehicle control pedals.

---

[8] Collins, Evans, & Hughes (n.a.)

[9] Lococo, K. H., Staplin, L., Martell, C. A., & Sifrit, K. J. (March 2012). Pedal Application Errors. (Report No. DOT HS 811 597). Washington, DC: National Highway Traffic Safety Administration.

[10] Ibid.

[11] Pollard, & Sussman (1989.

Currently, there is no globally accepted standard to regulate pedal placement. The human factors science needed to better determine optimal locations of pedals has historically been limited and difficult to obtain. As a result, significant variation can be found in the locations of pedal controls among vehicle manufacturers. Overall variability has been asserted to be a contributing design factor in cases of UA events. In a memorandum report for NHTSA's Office of Defects Investigation (ODI) of activities in response to a request from the Minnesota State Patrol, the vehicle defects investigator noted that a "lack of consistency between the pedal cluster positions in the vehicle primarily operated by the driver and the subject vehicle may have contributed to the subject crash."[12] It has been theorized that the variation in pedal placement may be a factor in the higher observed rate of pedal misapplication by drivers who were unfamiliar with the vehicle.

Another relevant design factor is stepover height, defined as the difference in height between the plane of the brake pedal face and the plane of the accelerator pedal face. Vehicles with little stepover height may cause the driver to inadvertently depress both pedals at the same time or to more likely confuse the pedal location. In 1983, Audi recalled 117,000 Model 5000 passenger cars (Recall 83V-095[13]) due to insufficient stepover height and installed a brake pedal plate to increase the height of the pedal face.

There are two main types of pedal designs among the measured school buses: one is pedals that are mounted to the vertical firewall under the instrument panel, and the other is pedals that are mounted to and hinged at the floor.

The research program described in this report was performed at NHTSA's Vehicle Research and Test Center to provide an overview of the range of typical pedal dimensions in school buses.

[12] National Highway Traffic Safety Administration. (1999, January). *Investigation of Sudden Acceleration Incident in Minneapolis, MN, by Bob Young.* (Office of Defect Investigation, Memorandum Report MF99-002, pp 8). Washington, DC: Author.
[13] NHTSA Campaign ID Number:83V095000.

3. Three Dimensional (3D) Laser Scanning

The driver's seat was positioned in the full rearward position. If the vehicle was equipped with a tilt steering column, it was set to the position closest to the center of the arc of travel.

A hand-held 3D laser scanner was used to record the locations of the control pedals, driver's seat, and steering wheel. The scanner operated while tethered to a computer, and the data gathered was stored in a standard stereo lithography (*.stl) file format. A typical session of data being recorded is shown in Figure 1. The operator scanned the vehicle surfaces until the computer rendering showed that all required surfaces had been adequately covered. The accelerator pedal was scanned in three positions. The first was the static position, the second was the fully depressed wide open throttle position, and the third was a point of travel at the approximate center of the first two positions.

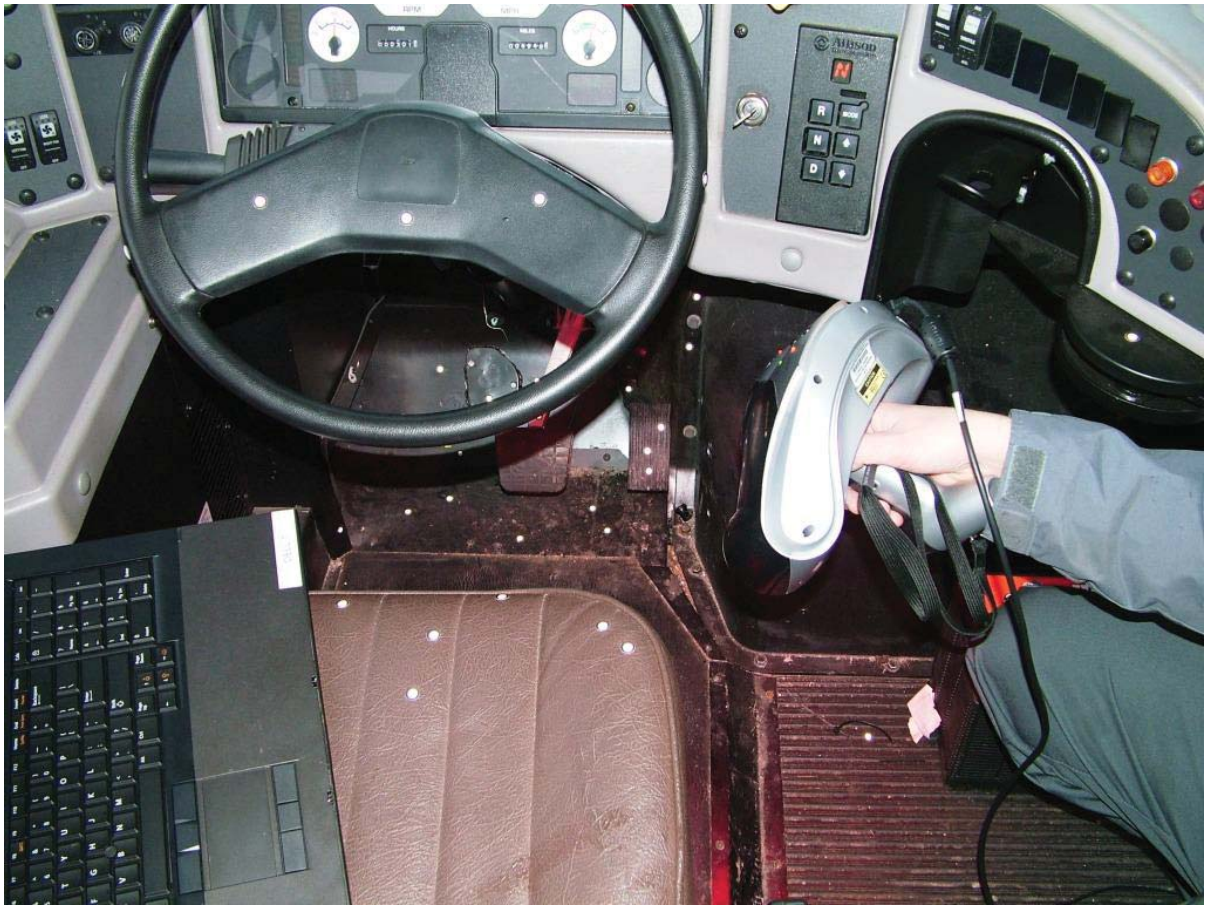


Figure 1 - Typical Scanning Session

4. Control Location Measurements

Twenty-one variables were identified, shown in Table 1, for which dimensional measurements were collected for analysis. Eighteen of these were identified in SAE J1100.[14] Three other measurements were defined and appear in the table as variables M, Arc, Chord, Left and Wall. In addition to the measurements of pedal position in the vehicle, several variables were identified that were important for the orientation of the driver to the position of the pedals.

Table 1 - List of Dimensions Analyzed

Letter Identifier	SAE Variable	Description
A	**PW-17**	Accelerator to tunnel
B	**PW-21**	Lateral spacing right edge of brake to left edge accelerator (arc)
C	**PW-27**	Right edge of brake to tunnel - horizontal
D	**PW-42**	Left edge of brake to vertical panel on left
E	**PW-82**	Brake centerline to accelerator centerline
F	**PW-92**	Driver centerline to right edge of brake
G	**PW-98**	Driver centerline to accelerator horizontal centerline
H	**PL-52**	Stepover - brake to accelerator - shortest arc distance
I	**PH-26**	Bottom edge of undepressed brake pedal to floor
J	**PH-16**	Bottom edge of undepressed accelerator pedal to floor
L	**SW-16**	Seat cushion width
M	**(not identified)**	Steering centerline to brake pedal center
N	**PL-1**	Distance between the planes of brake and accelerator pedal faces
O	**PW-47**	Overall width of floorpan @ 150 mm above floor
P	**H-17**	Height of steering wheel from floor
Q	**W-9**	Width of steering wheel
R	**L-6**	Ball of foot accelerator pedal to front center of steering wheel
S	**PW-22**	Brake pedal width
T	**PW-11**	Accelerator pedal width
Arc	**(not identified)**	Arc length of accelerator pedal
Chord	**(not identified)**	Chord length of accelerator pedal
Left*	**(not identified)**	Distance from left edge of brake pedal to steering column
Wall*	**(not identified)**	Distance from left edge of brake pedal to wall on left
* Dimensions added for Type D buses		

[14] Society of Automotive Engineers. (2009). SAE J1100 surface vehicle recommended practice, (R) Motor Vehicle Dimensions, Rev. 2009. Warrendale, PA: Author.

The data acquired by the 3D laser scan of the vehicle's driver controls was analyzed in a computer aided design (CAD) software program. The program allowed the 3D rendering of the vehicle to be rotated to the optimal viewing angle and measurements taken. A table of all measurement results can be found in Appendix A. Five views displaying the measurement results for each vehicle were identified, and examples are shown in Figure 2 to Figure 6. Images for each vehicle can be found in Appendix G.

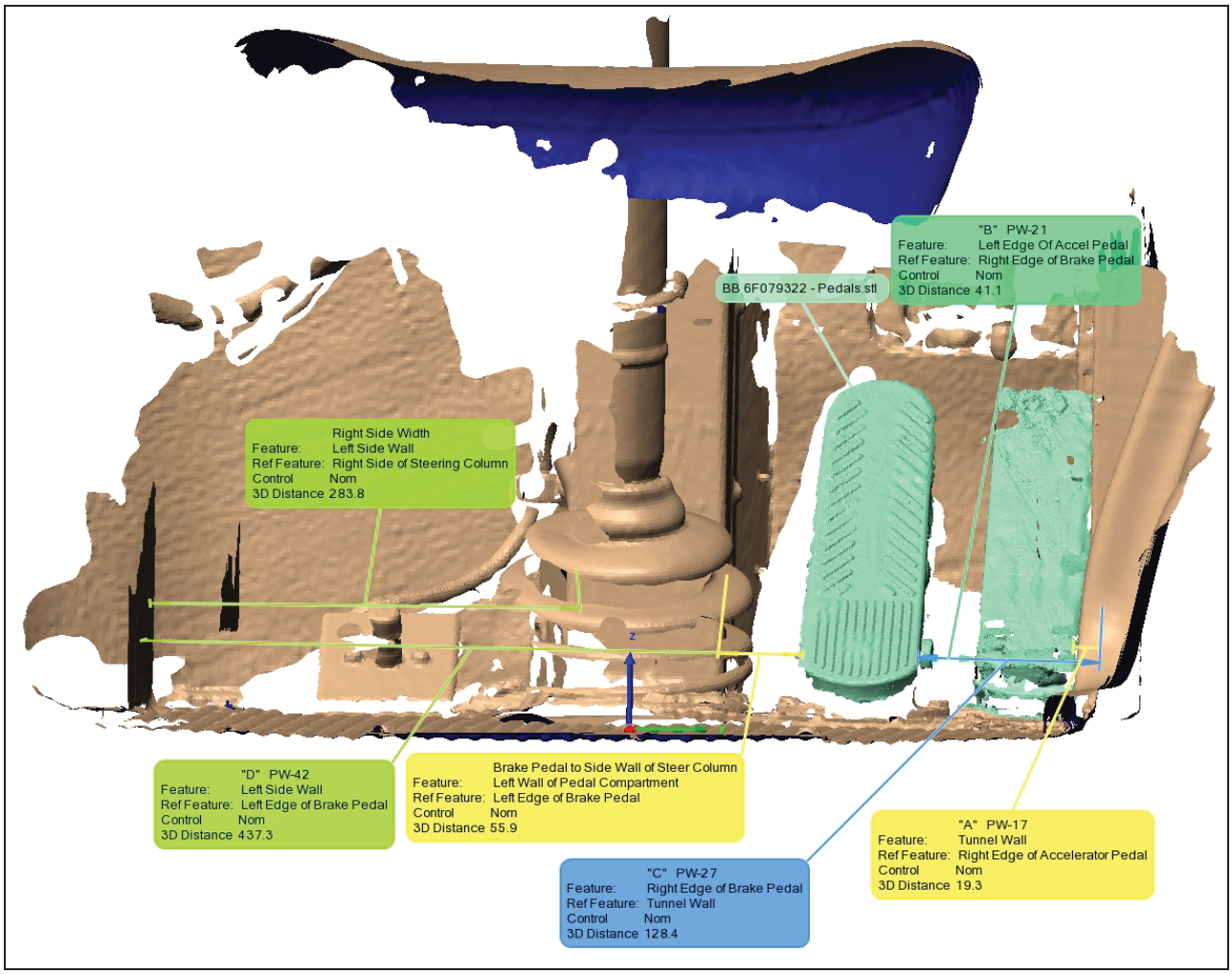


Figure 2 - Dimensions A, B, C, D

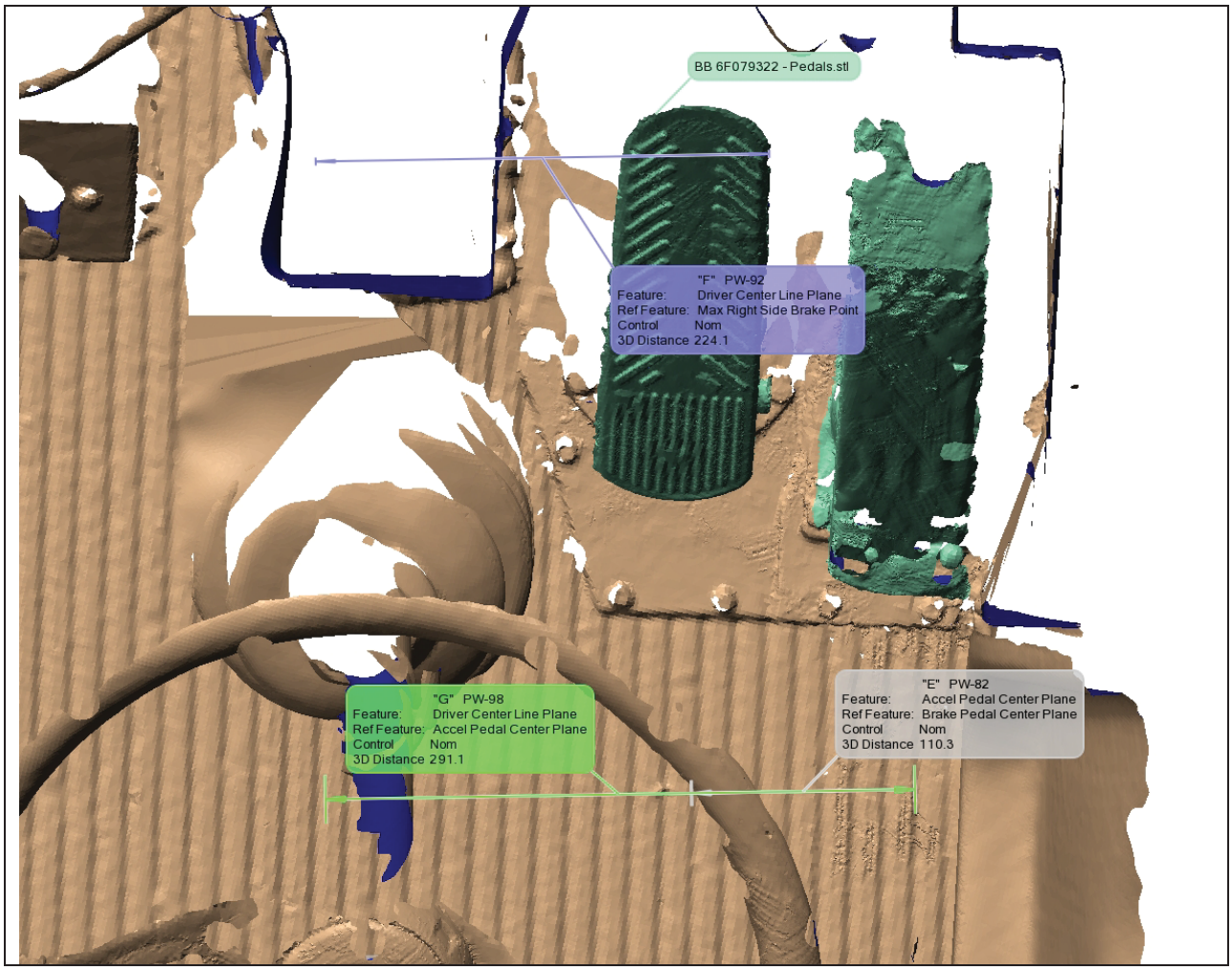


Figure 3 - Dimensions E, F, G

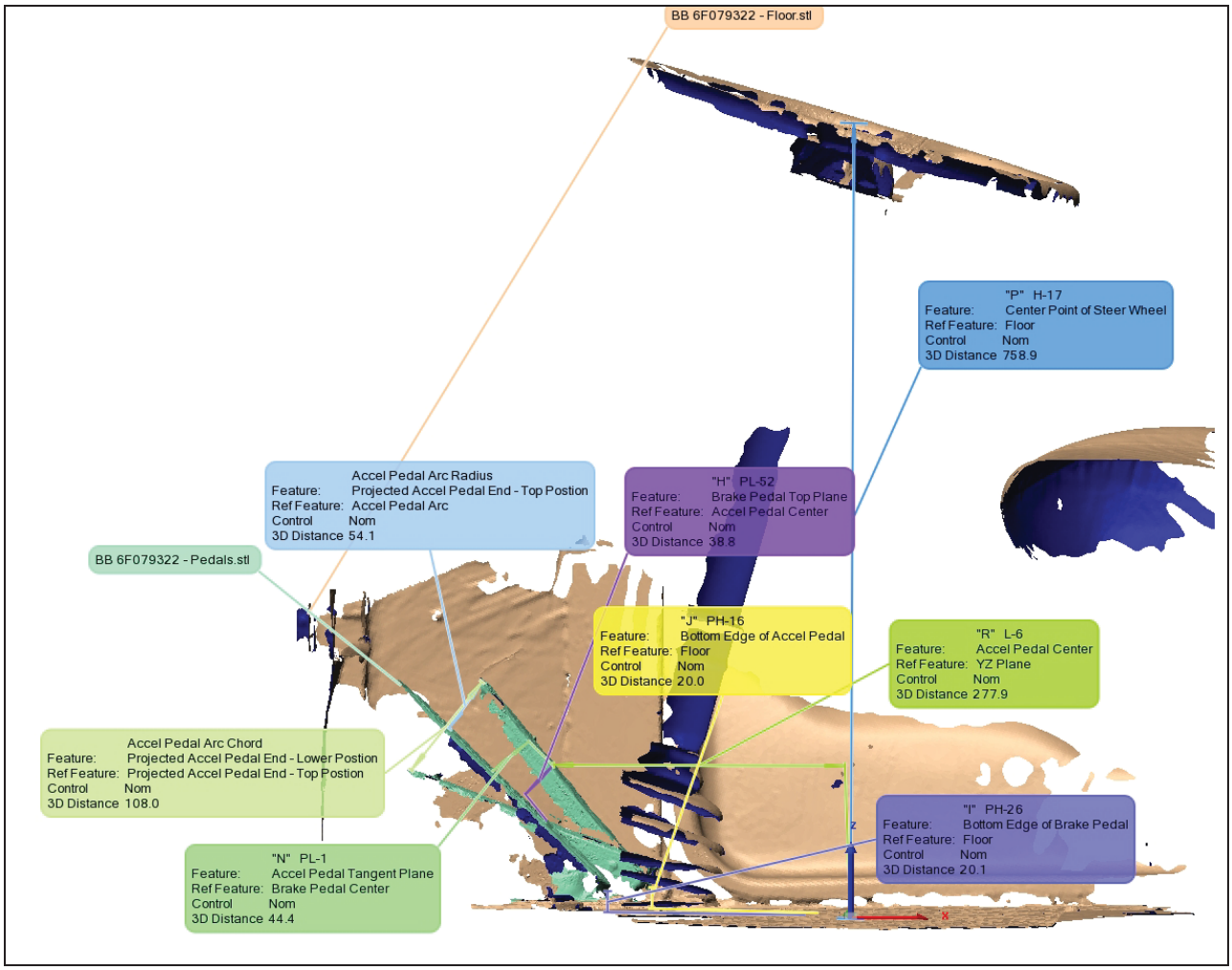


Figure 4 - Dimensions H, J, N, P, R, Pedal Arcs

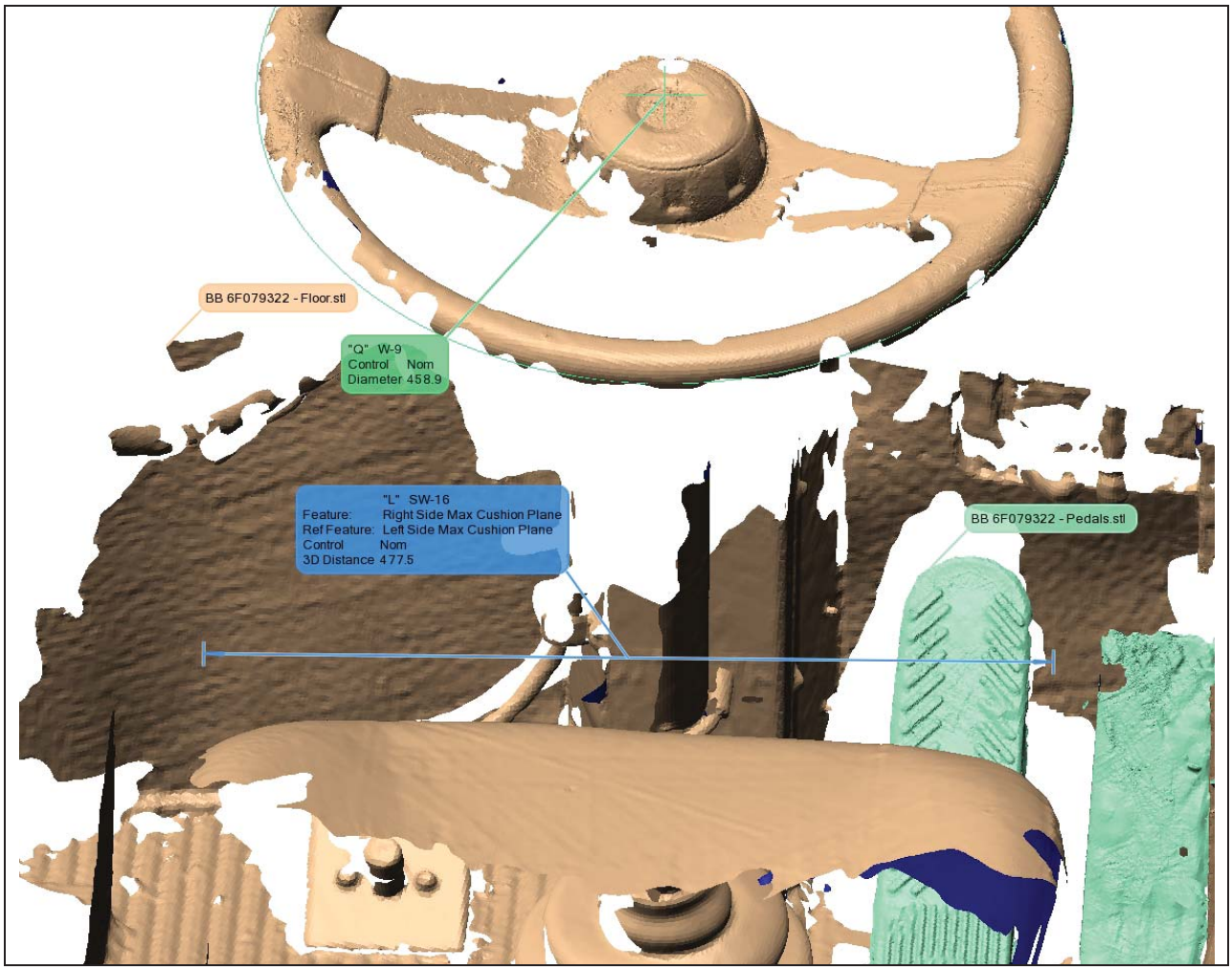


Figure 5 - Dimensions L, Q

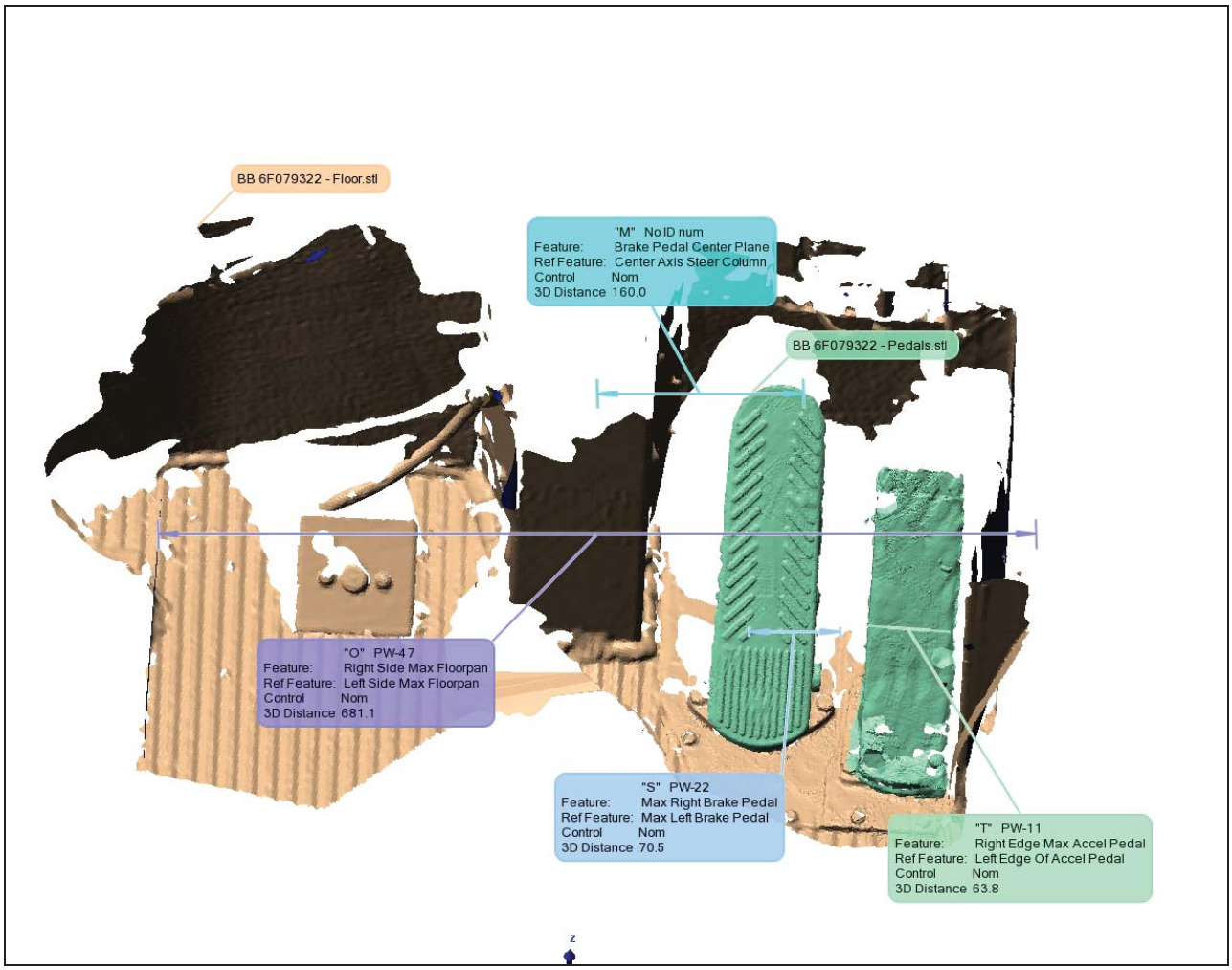


Figure 6 - Dimensions M, O, S, T

5. Pedal Dimensions Analysis

Dimensions by Bus Type

The dimensions for 24 Type C (conventional style) buses and 8 Type D (transit style) buses were measured. The average dimensions are shown in Table 2. All the horizontal pedal dimensions were significantly different between the two types of buses. For the other pedal dimensions, only the stepover distance was not significantly different. The driver position dimensions of seat cushion width and steering wheel width and height were not different. A *t* test comparison of the measurements and the distributions are shown in Appendix B.

Table 2 - Average Dimensions of Bus Types C (Conventional Style) and Type D (Transit Style)

Dimension	Type C Buses			Type D Buses			Significantly Different, (*t* test – α=0.05)
	Number of Vehicles	Average Dimension, mm	Standard Deviation, mm	Number of Vehicles	Average Dimension, mm	Standard Deviation, mm	
A	24	58.1	22.2	8	41.2	12.5	Yes
B	24	89.4	18.2	8	30.4	11	Yes
C	24	197	22.6	8	139.4	11.5	Yes
D	24	234.9	51.2	8	396.3	32.4	Yes
E	24	157.3	16.6	8	108.6	5.7	Yes
F	24	63.2	34.8	8	185.5	25	Yes
G	24	170.5	33.6	8	256	21.1	Yes
H	24	30.5	22.5	8	18.7	16.8	No
I	24	106.4	17.7	8	22.8	3	Yes
J	24	76.3	15.6	8	25.7	7.8	Yes
L	24	502.5	18.9	8	501.7	29.2	No
M	24	19	18.5	8	135.4	36.1	Yes
N	24	35.4	23.8	8	26.3	19.9	No
O	24	515.7	54	8	625.2	32.6	Yes
P	24	808	41.2	8	795.5	21.5	No
Q	24	453.6	8	8	468.3	20.3	No
R	24	386.7	42.3	8	275.5	40.8	Yes
S	24	99.8	3.8	8	71.3	1.2	Yes
T	24	53.3	3.4	8	67.1	5.5	Yes
ARC	24	253.6	89.8	8	203.4	105.5	No
CHORD	24	65.4	16	8	80.5	18	No
WALL	0	.	.	8	39.9	18.6	NA
LEFT	0	.	.	8	249.4	32	NA

Type C Buses by Manufacturer

The Type C buses measured were assembled by three different manufacturers, Bluebird , IC, and Thomas Built. The average dimensions are shown in Table 3. The Bluebird and Thomas Built buses were the most similar, but they had statistically significant differences in the brake pedal width and stepover in plane, as well as some differences in seating position. The IC buses were statistically different in 11 and 12 of 21 measurements from the Bluebird and Thomas Built buses, respectively. All comparisons are shown in Appendix C.

Table 3 - Average Dimensions of Type C Buses by Manufacturer

Variable	Manufacturer									Statistical Differences*		
	BlueBird			IC			Thomas			BB vs. IC	BB vs. Th.	IC vs. Th.
	N	Mean, mm	Std. Dev., mm	N	Mean, mm	Std. Dev., mm	N	Mean, mm	Std. Dev., mm			
A	13	64.3	27.5	9	45.9	2.4	2	71.9	1.7			
B	13	77.8	9.2	9	110.3	5.3	2	71.2	2.7	√		√
C	13	189.1	27.5	9	210.1	5	2	188.9	3.8			
D	13	265.5	35.1	9	179.9	12.9	2	282.8	13.7	√		√
E	13	146.9	7.4	9	176.8	2.4	2	137.2	0.9	√		√
F	13	56	31.1	9	55	10.7	2	147.1	0.5		√	√
G	13	151.8	29.4	9	182.7	9.6	2	237.2	2.5	√	√	√
H	13	16.9	14.1	9	55.5	1.5	2	6.5	3.5	√		√
I	13	99.1	17.3	9	121.3	4.6	2	86.9	0.4	√		√
J	13	76.9	14.1	9	83.4	3.7	2	40.2	1.2		√	√
L	13	491.3	18.2	9	516.1	8.9	2	514.8	1.8	√		
M	13	20.9	11.4	9	5.7	4	2	66.1	11.9	√	√	√
N	13	19.9	17.1	9	60.9	3.8	2	21.4	2.4	√	√	√
O	13	540.4	56.3	9	472.2	13.4	2	551.3	15.4	√		
P	13	801.2	51.8	9	823.8	17.7	2	781.7	0.8			
Q	13	454.9	2.3	9	447	3.5	2	474.8	0.6	√	√	√
R	13	399.6	52.7	9	371	17	2	374.2	28.8			
S	13	101.5	3.3	9	99.3	0.9	2	91	1.7		√	√
T	13	52.6	3.1	9	53.2	1.4	2	58.4	9			
ARC	13	263.6	114.2	9	231.3	51.1	2	289.3	10			
CHORD	13	62.3	18.2	9	74	1.3	2	47.3	21.1			

* Statistically significant differences at $\alpha = 0.05$ using Scheffe's test were indicated by a check (√)

Type D Buses by Manufacturer

The dimensions for six Type D buses manufactured by Bluebird and two by Thomas were measured. The average dimensions are shown in Table 4. The dimensions were statistically different in only 8 of the 23 dimension measured. Most of the differences were smaller distances from the pedals to the "tunnel" on the right side of the pedals for the Bluebird buses. All comparisons are shown in Appendix D.

Table 4 - Average Dimensions of Type D Buses by Manufacturer

Dimension	Bluebird			Thomas			Significantly Different, (*t* test – α=0.05)
	Number of Vehicles	Average Dimension, mm	Standard Deviation, mm	Number of Vehicles	Average Dimension, mm	Standard Deviation, mm	
A	6	37.0	11.7	2	53.6	0.4	Yes
B	6	25.9	8.4	2	43.9	2.6	Yes
C	6	133.5	4.8	2	156.9	0.2	Yes
D	6	410.9	19.5	2	352.6	19.4	Yes
E	6	108.1	2.3	2	110.4	13.9	No
F	6	184.6	25.4	2	188.4	33.6	No
G	6	254.4	23.4	2	260.8	17.5	No
H	6	13.3	13.0	2	34.8	21.1	No
I	6	22.5	3.0	2	23.9	4.0	No
J	6	25.0	7.8	2	28.0	10.3	No
L	6	499.7	33.3	2	507.7	18.2	No
M	6	130.4	41.2	2	150.6	7.2	No
N	6	18.8	13.5	2	48.5	23.3	No
O	6	633.6	33.8	2	600.1	5.9	No
P	6	792.4	24.4	2	804.8	7.0	No
Q	6	457.4	1.6	2	501.2	0.6	Yes
R	6	291.1	32.5	2	228.7	22.8	Yes
S	6	71.5	1.3	2	70.9	0.5	No
T	6	69.5	3.8	2	60.1	1.1	Yes
ARC	6	173.4	86.7	2	293.5	136.8	No
CHORD	6	74.7	16.8	2	98.1	5.7	No
WALL	6	34.1	18.0	2	57.4	0.4	Yes
LEFT	6	266.3	9.9	2	198	11.2	No

Buses Versus Passenger Vehicles

The measurements for the 32 buses were compared to the dimensions of 101 passenger vehicles previously reported by NHTSA.[2] The averages are shown in Table 5 and all comparisons are shown in Appendix E. Seventeen of the 21 dimensions were statistically different on average. The *T* test comparisons of the values and distributions are shown in Appendix E. From inspection of the distributions, even though the means were different, the distributions of values had considerable overlap for most values. The variables that had little overlap were that the bus accelerator and brake pedals had a shorter overall travel to the floor, and the steering wheel was farther from the floor and pedals for buses than for passenger vehicles.

Table 5 - Average Dimensions of Buses and Passenger Vehicles

Dimension	Buses			Passenger Vehicles			Significantly Different, (*t* test – α=0.05)
	Number of Vehicles	Average Dimension, mm	Standard Deviation, mm	Number of Vehicles	Average Dimension, mm	Standard Deviation, mm	
A	32	53.8	21.4	101	41.5	15.8	Yes
B	32	74.7	30.8	101	75.4	10.7	No
C	32	182.6	32.4	101	167.1	14.8	Yes
D	32	275.2	85.0	101	236.1	25.9	Yes
E	32	145.1	25.9	101	154.1	11.8	No
F	32	93.8	62.7	101	61.9	26.9	Yes
G	32	191.9	48.5	101	152.7	33.5	Yes
H	32	27.6	21.6	101	50.2	11.5	Yes
I	32	85.5	39.8	101	154.5	13.9	Yes
J	32	63.7	26.2	101	113.4	13.2	Yes
L	32	502.3	21.4	101	527.8	41.1	Yes
M	32	48.1	56.3	101	25.6	20.7	Yes
N	32	33.1	22.9	101	51.5	12.9	Yes
O	32	543.1	68.8	101	526.6	41.9	No
P	32	804.9	37.3	101	628.2	28.5	Yes
Q	32	457.2	13.5	101	381.6	8.0	Yes
R	32	358.9	64.0	101	561.8	33.8	Yes
S	32	92.7	13.0	101	120.7	16.2	Yes
T	32	56.8	7.2	101	46.5	8.6	Yes
ARC	32	241.1	94.8	101	205.1	83.9	No
CHORD	32	69.2	17.5	101	62.4	12.3	Yes

Buses Versus Passenger Vehicles by Type

The dimensions of both the Type C and Type D buses were compared to the average dimensions of the passenger cars previously measured by NHTSA. The average values and comparisons are shown in Table 6 and the comparisons are shown in Appendix F. The measurements of Type D buses differed from passenger cars in nearly every dimension. Only the distance from the accelerator to the tunnel (A) and seat cushion width (L) were not significantly different, and for 14 of the dimensions there was no overlap between the outliers of the 2 distributions. The Type C buses were more similar to passenger car dimensions, differing in 10 of the 21 dimensions measured, with only the height and size of the steering wheel having no overlap between the distributions.

Table 6 - Comparison of Dimensions for Passenger Cars and Type C and D Buses

Variable	Vehicle Category									Statistical Differences*		
	Type C Bus			Type D Bus			Passenger Car			C vs. D	C vs. Car	D vs. Car
	N	Mean, mm	Std. Dev., mm	N	Mean, mm	Std. Dev., mm	N	Mean, mm	Std. Dev., mm			
A	24	58.1	22.2	8	41.2	12.5	101	41.5	15.8		√	
B	24	89.4	18.2	8	30.4	11.0	101	75.4	10.7	√	√	√
C	24	197.0	22.6	8	139.4	11.5	101	167.1	14.8	√		√
D	24	234.9	51.2	8	396.3	32.4	101	236.1	25.9	√		√
E	24	157.3	16.6	8	108.6	5.7	101	154.1	11.8	√		√
F	24	63.2	34.8	8	185.5	25.0	101	61.9	26.9	√		√
G	24	170.5	33.6	8	256.0	21.1	101	152.7	33.5	√		√
H	24	30.5	22.5	8	18.7	16.8	101	50.2	11.5		√	√
I	24	106.4	17.7	8	22.8	3.0	101	154.5	13.9	√	√	√
J	24	76.3	15.6	8	25.7	7.8	101	113.4	13.2	√	√	√
L	24	502.5	18.9	8	501.7	29.2	101	527.8	41.1		√	
M	24	19.0	18.5	8	135.4	36.1	101	25.6	20.7	√		√
N	24	35.4	23.8	8	26.3	19.9	101	51.5	12.9		√	√
O	24	515.7	54.0	8	625.2	32.6	101	526.6	41.9	√		√
P	24	808.0	41.2	8	795.5	21.5	101	628.2	28.5		√	√
Q	24	453.6	8.0	8	468.3	20.3	101	381.6	8.0	√	√	√
R	24	386.7	42.3	8	275.5	40.8	101	561.8	33.8	√	√	√
S	24	99.8	3.8	8	71.3	1.2	101	120.7	16.2	√	√	√
T	24	53.3	3.4	8	67.1	5.5	101	46.5	8.6	√	√	√
ARC	24	253.6	89.8	8	203.4	105.5	101	205.1	83.9			
CHORD	24	65.4	16.0	8	80.5	18.0	101	62.4	12.3	√		√

* Statistically significant differences at $\alpha = 0.05$ using Scheffe's test were indicated by a check (√)

Summary

All of the horizontal pedal dimensions were significantly different between Type C and Type D buses. Only the stepover distance, seat cushion width, steering wheel width, and height were not different for Type C and Type D buses.

For Type C buses, the Bluebird and Thomas Built buses were the most similar, but they had statistically significant differences in the brake pedal width and stepover distance between the face planes of the pedals, as well as some differences in seating position. The IC buses were statistically different in 11 and 12 of 21 measurements from the Bluebird and Thomas Built buses, respectively.

The dimensions for Type D buses manufactured by Bluebird and by Thomas were statistically different in only 8 of the 23 dimension measured. Most of the differences were smaller distances from the pedals to the "tunnel" on the right side of the pedals for the Bluebird buses.

The measurements for the 32 buses were compared to the dimensions of 101 passenger vehicles. Seventeen of the 21 dimensions were statistically different on average. Even though the means were different, most of the distributions of values had considerable overlap. The variables that had little overlap were that the bus accelerator and brake pedals had a shorter overall travel to the floor, and the steering wheel was farther from the floor and pedals for buses than for the passenger vehicles.

The dimensions of both the Type C and Type D buses were compared to the average dimensions of the passenger cars. The measurements of Type D buses differed from passenger cars in nearly every dimension. Only the distances from the accelerator to the tunnel and seat cushion width were not significantly different, and for 14 of the dimensions there was no overlap between the outliers of the 2 distributions. The Type C buses were more similar to passenger car dimensions, differing in 10 of the 21 dimensions measured, with only the height and size of the steering wheel having no overlap between the distributions.

6. Appendix A - Bus Measurements

Type	A	B	C	D	E	F	G	H	I	J	L	M	N	O	P	Q	R	S	T	ARC	CHORD	WALL	LEFT
	70.7	73.1	186.2	292.5	137.8	147.4	238.9	4	86.6	39.3	513.5	74.5	23.1	562.2	781.1	475.2	353.8	92.2	52	296.3	32.4	.	.
C	73.1	69.3	191.6	273.1	136.5	146.7	235.4	8.9	87.1	41	516	57.7	19.7	540.4	782.3	474.3	394.5	89.8	64.7	282.2	62.3	.	.
C	31	80.3	160.8	265.1	147.2	54	153.6	16.2	116.1	76.8	486.4	24.7	11.8	513	804.1	454.5	352.5	98.6	51.6	223.8	37.2	.	.
C	53.7	77.6	173.3	243.3	149.9	34.5	134.3	13	117	77.9	485.1	30	11.1	501	775.3	453.5	392.5	99.6	52.2	253.5	81.4	.	.
C	35	84	163.9	232.1	153.4	42	144.6	15.7	107.3	50.6	473.8	21.3	22.3	481.4	668.6	454.7	485.7	99.4	51	260.2	33	.	.
C	99.8	74.3	217.9	260.5	144.5	67.7	159	8.3	73.8	90.3	471.9	4.5	19.6	564.9	818.6	458	423.8	105.8	48.4	289.9	56.9	.	.
C	87.5	82.9	219.3	254.9	145.4	83.7	175.1	3.5	73.6	94	471.5	2.4	11.4	559.2	858	457.5	473.2	106.8	53.8	302.9	43.9	.	.
C	83.6	80.3	214.7	253.1	145.8	43.4	137.5	7.8	83.2	87.1	481.4	2.6	4.7	560.8	850.5	457.2	461.8	105.2	52.6	281.2	65.5	.	.
C	101.7	80.3	230	340.1	145.2	135.7	228.5	19.6	77.4	68	527.7	37.6	24.3	652.3	832.2	457.4	410.4	104.7	49.3	208.7	74.6	.	.
C	104.9	74.1	228	339.6	143.3	92.2	179.8	31.5	86.9	70.8	527.1	17	34.2	651.7	730.7	451.2	385.8	103.8	50.6	185.6	72.7	.	.
C	37.8	92.4	171.6	236.7	162.6	36.1	148.3	0.3	110.8	89.8	484.2	29	0.5	495.6	826.9	457.2	305.3	99	51.5	259.1	56.8	.	.
C	36.9	86.5	171.7	236.9	156.4	37	143.2	7	110.7	90.6	491.2	31.5	2.5	495.8	830.7	453.9	347.4	99.4	60.2	254.4	56.9	.	.
C	48.4	78	170.8	271.9	143.6	30.4	125.6	10.4	119.3	84.3	498.9	21.2	11.6	527.4	809.8	453.8	360.6	99.7	52.2	248	61.3	.	.
C	54.9	57.5	170.2	263.7	138.1	33.2	121.5	45.1	106.8	58.1	491	25.9	54.5	517.1	820.2	452.6	386.4	97.1	53.3	588.3	99.3	.	.
C	60.9	63.5	166.3	254	134.6	38.5	122.2	41.2	104.9	61.5	496.7	24.4	49.9	504.8	789.8	451.8	409.3	100.2	57.1	70.6	70	.	.
C	46.9	100.3	203.7	192.9	172.9	66.5	189	57.1	120.5	85.1	518.8	9.5	56.9	478.6	825.1	444.7	370.1	99.5	54	247.7	75	.	.
C	45.6	119.5	214.1	165.7	180.9	48.9	182.2	53.1	125	82.9	525.3	7.2	64.3	460.5	814.6	450	382	98.1	51.4	191	72.5	.	.

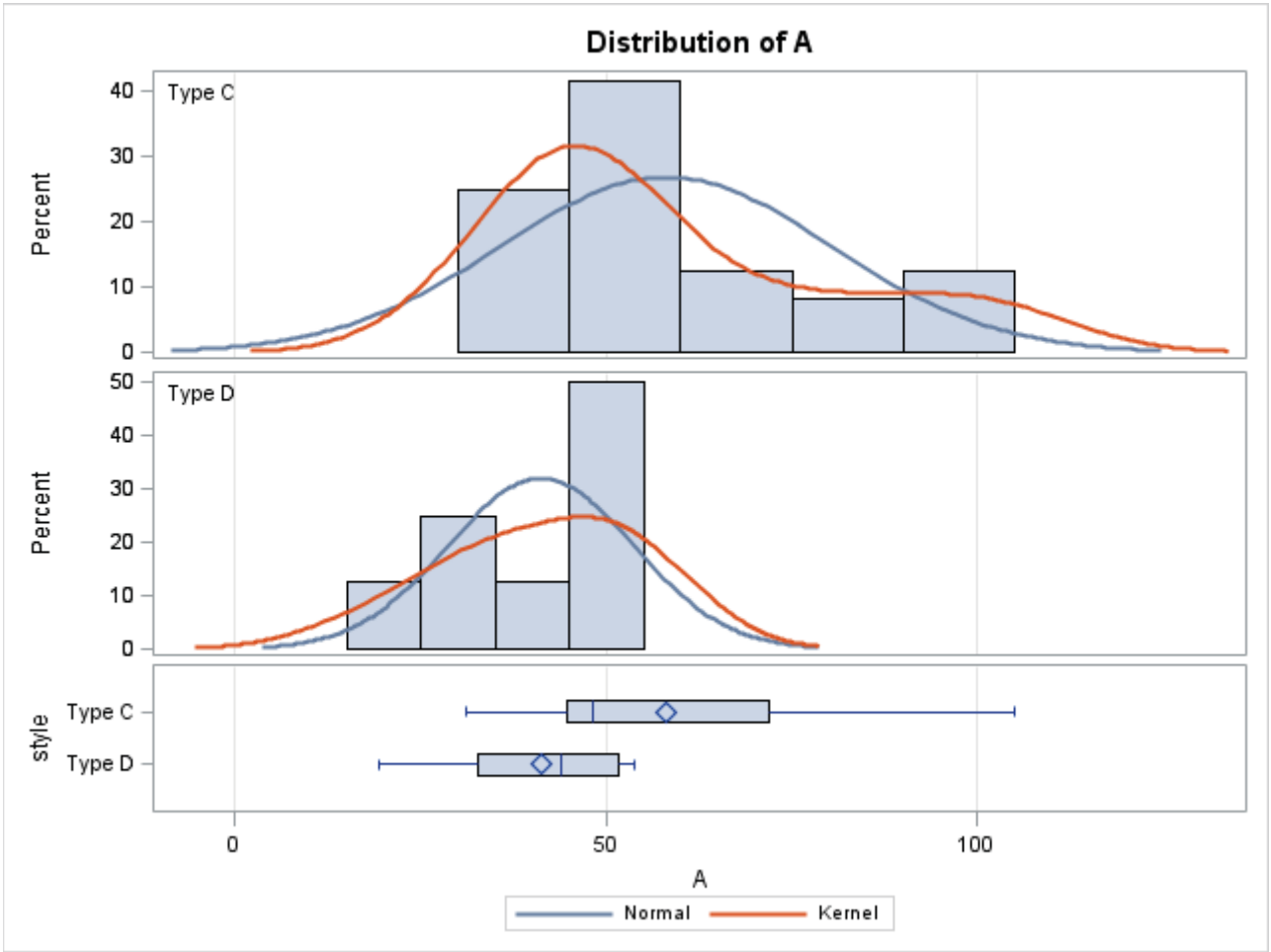
Type	A	B	C	D	E	F	G	H	I	J	L	M	N	O	P	Q	R	S	T	ARC	CHORD	WALL	LEFT
C	47.9	114.4	213.6	178	179.6	38.6	168.3	55	121.5	80.5	519.6	1.5	62.3	473.4	817.4	450.4	380.9	100	54.9	214.5	71.9	.	.
C	47.8	109.1	208.2	189.1	174.2	55.5	182.3	57.5	122.5	83.2	516	10.6	62.2	481.7	850.6	449.5	342.7	100.1	51.5	160.9	73	.	.
C	46.4	108.4	209.9	186.6	176.9	64.5	191.1	54.7	109.9	75.7	498.9	9.8	54.9	479.1	796.1	442.9	386.4	99.8	52.5	218.7	74.1	.	.
C	45.8	110	208.5	185	177.2	41.1	168.2	55.6	124.4	88.8	519.9	0.4	57.9	473.1	813.9	444	389.8	99.5	53.2	207.2	74.7	.	.
C	43.6	110	206.9	189.2	176.8	56.8	184.3	53.9	124.9	84.6	503.3	1.4	60.4	480	851.6	441.7	344.7	97.7	53.2	337.6	76.1	.	.
C	48.5	107.4	219.9	179.8	176.3	68.5	197	55.7	122.4	84.4	519.9	6.7	67.2	482.2	825.3	449.6	369.5	100.1	55.5	231.6	74.2	.	.
C	40.8	113.5	205.8	153	176.4	54.5	181.8	57.1	120.6	85.7	522.9	4	61.7	441.4	819.7	449.8	372.5	99	53	272.7	74.2	.	.
D	37.9	20.2	128.2	434.1	104.4	195.1	263.2	10.7	23.3	16.4	459.5	201.2	4.3	673.1	824.7	458.4	260.8	69.5	73.1	243.3	72.9	58.5	263.6
D	49.7	17.5	134.6	394.5	107.1	178.9	249.8	2.6	24.9	24.2	513.5	105.6	17.2	608.8	795	457.9	307.4	71.6	66.6	240.5	63.3	21.5	258.4
D	50	21.8	141	396.1	110.3	193.6	263	7.4	23.6	25.4	475.7	108.4	16.4	615.5	813.6	456.2	250.9	73.1	68.5	239.9	64.7	26.1	258.5
D	19.3	41.1	128.4	437.3	110.3	224.1	291.1	38.8	20.1	20	477.5	160	44.4	681.1	758.9	458.9	277.9	70.5	63.8	54.1	108	55.9	283.8
D	33.1	27.6	134.2	403.2	106.9	155.5	228.3	7.5	17.6	39.2	531.3	99	13.2	611.5	774.4	458	328.4	71.5	72.8	76.4	67.6	22.8	271.8
D	32.2	27.2	134.8	400	109.3	160.3	231.2	13	25.3	24.7	540.4	108.1	17.5	611.8	787.9	454.8	321.3	72.7	72.2	186.3	71.4	19.9	261.7
D	53.3	42	157	366.3	100.6	212.1	273.2	19.9	26.7	35.3	494.8	155.7	32	604.2	799.8	500.7	212.5	71.2	60.8	390.2	94	57.1	206.5
D	53.8	45.7	156.7	338.9	120.2	164.6	248.4	49.7	21.1	20.7	520.5	145.5	65	595.9	809.7	501.6	244.8	70.5	59.3	196.8	102.1	57.6	190.6

7. Appendix B - *T* Test Comparisons of Dimensions by Bus Type

Variable: A

style	N	Mean	Std Dev	Std Err	Minimum	Maximum
Type C	24	58.0500	22.2351	4.5387	31.0000	104.9
Type D	8	41.1625	12.4898	4.4158	19.3000	53.8000
Diff (1-2)		16.8875	20.3823	8.3210		

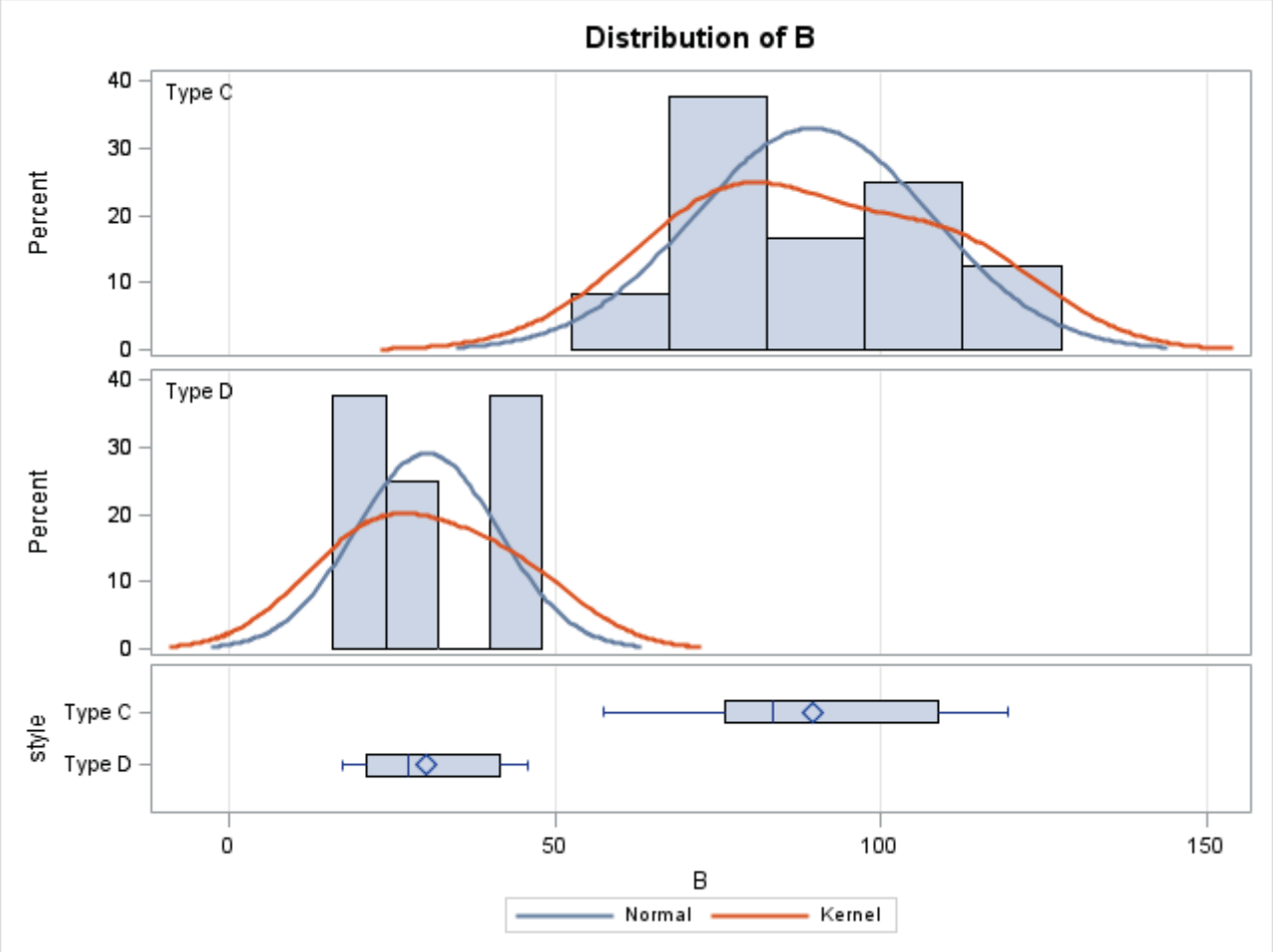
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	30	2.03	0.0514
Satterthwaite	Unequal	22.097	2.67	0.0141



Variable: B

style	N	Mean	Std Dev	Std Err	Minimum	Maximum
Type C	24	89.4458	18.1528	3.7054	57.5000	119.5
Type D	8	30.3875	10.9911	3.8859	17.5000	45.7000
Diff (1-2)		59.0583	16.7578	6.8413		

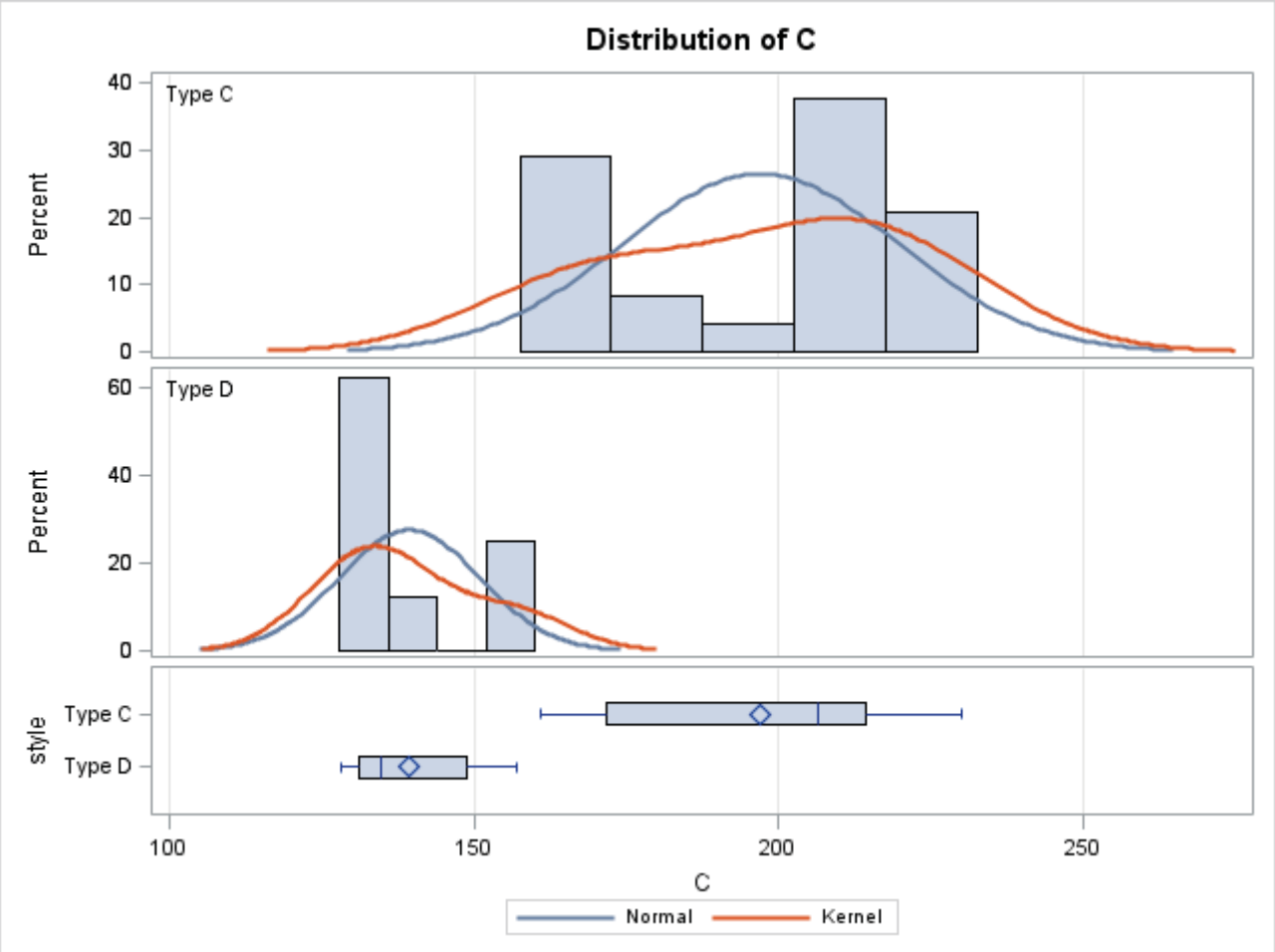
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	30	8.63	<.0001
Satterthwaite	Unequal	20.387	11.00	<.0001



Variable: C

style	N	Mean	Std Dev	Std Err	Minimum	Maximum
Type C	24	197.0	22.6314	4.6196	160.8	230.0
Type D	8	139.4	11.5219	4.0736	128.2	157.0
Diff (1-2)		57.5917	20.5827	8.4028		

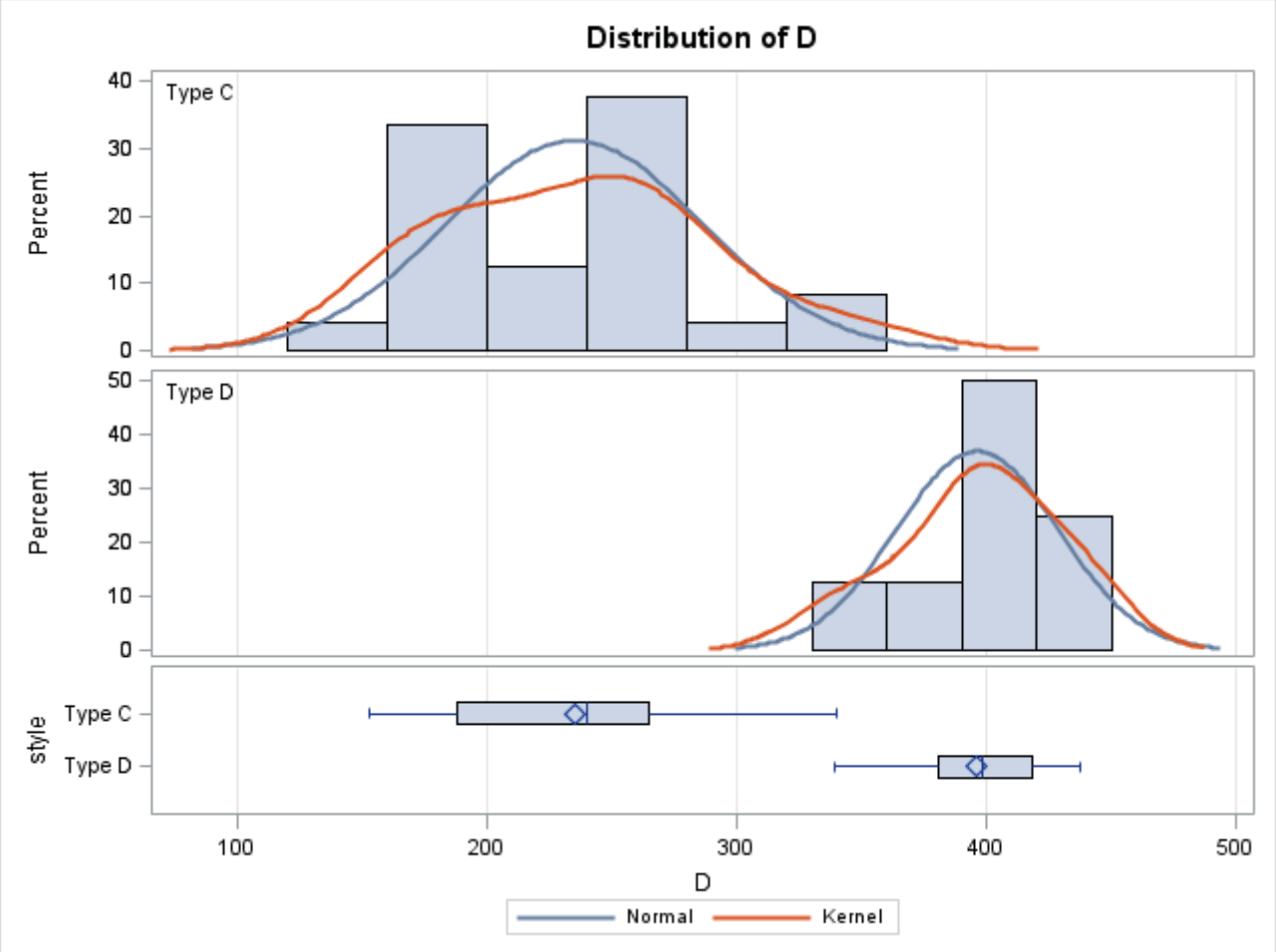
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	30	6.85	<.0001
Satterthwaite	Unequal	24.333	9.35	<.0001



Variable: D

style	N	Mean	Std Dev	Std Err	Minimum	Maximum
Type C	24	234.9	51.2014	10.4515	153.0	340.1
Type D	8	396.3	32.4460	11.4714	338.9	437.3
Diff (1-2)		-161.4	47.4924	19.3887		

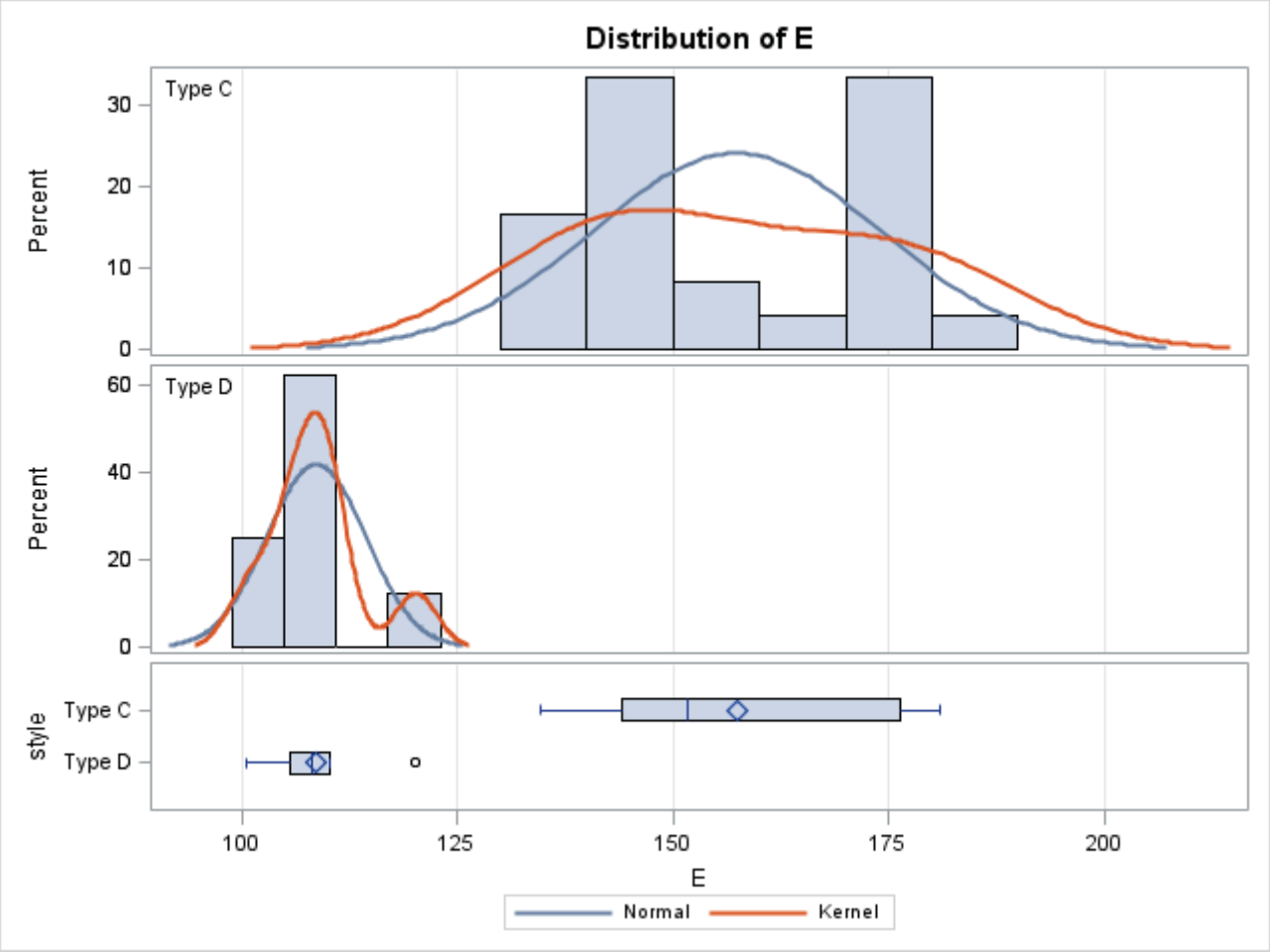
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	30	-8.33	<.0001
Satterthwaite	Unequal	19.38	-10.40	<.0001



Variable: E

style	N	Mean	Std Dev	Std Err	Minimum	Maximum
Type C	24	157.3	16.5962	3.3877	134.6	180.9
Type D	8	108.6	5.7021	2.0160	100.6	120.2
Diff (1-2)		48.6750	14.7903	6.0381		

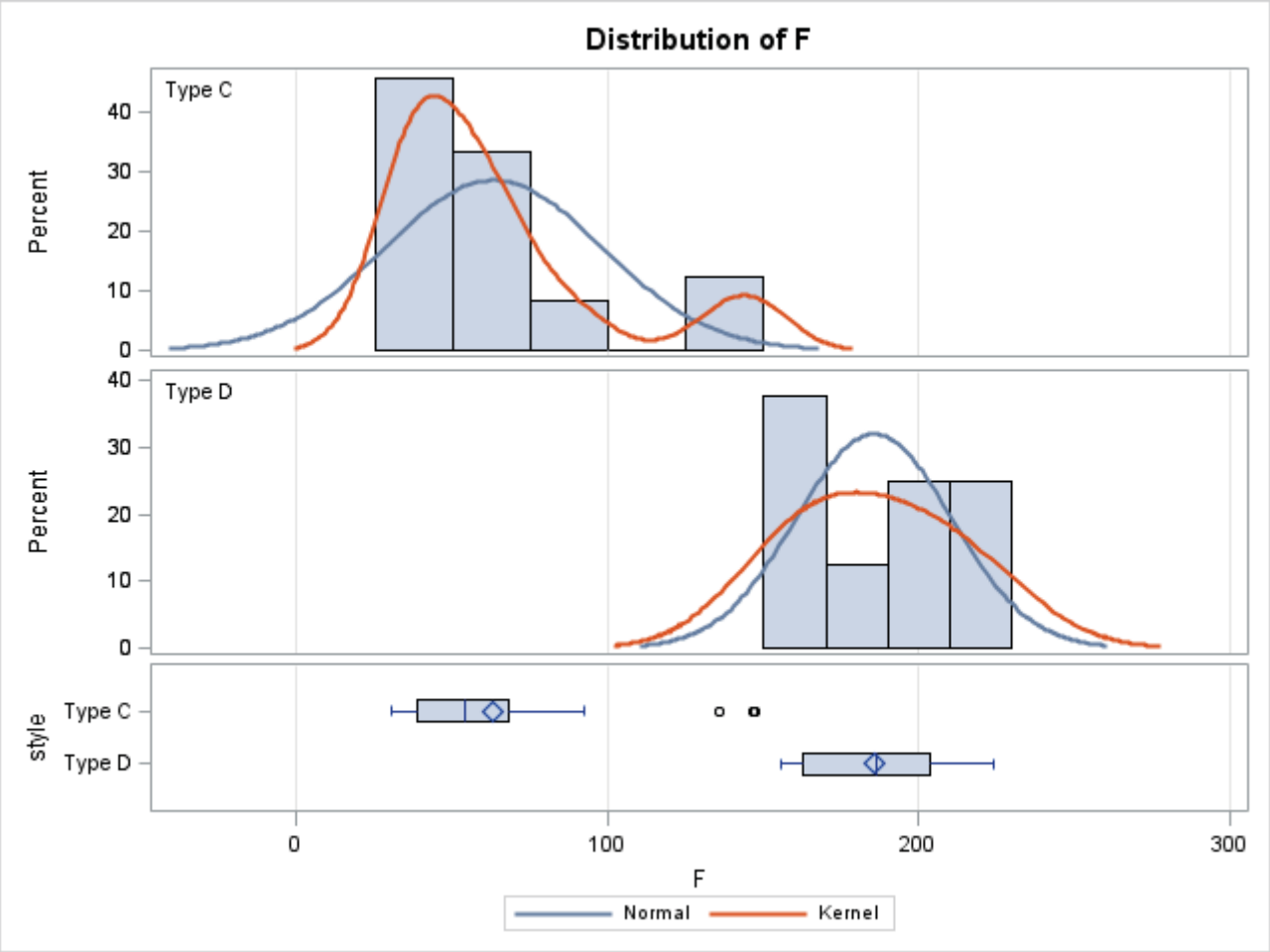
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	30	8.06	<.0001
Satterthwaite	Unequal	29.867	12.35	<.0001



Variable: F

style	N	Mean	Std Dev	Std Err	Minimum	Maximum
Type C	24	63.2250	34.8106	7.1057	30.4000	147.4
Type D	8	185.5	24.9877	8.8345	155.5	224.1
Diff (1-2)		-122.3	32.7829	13.3836		

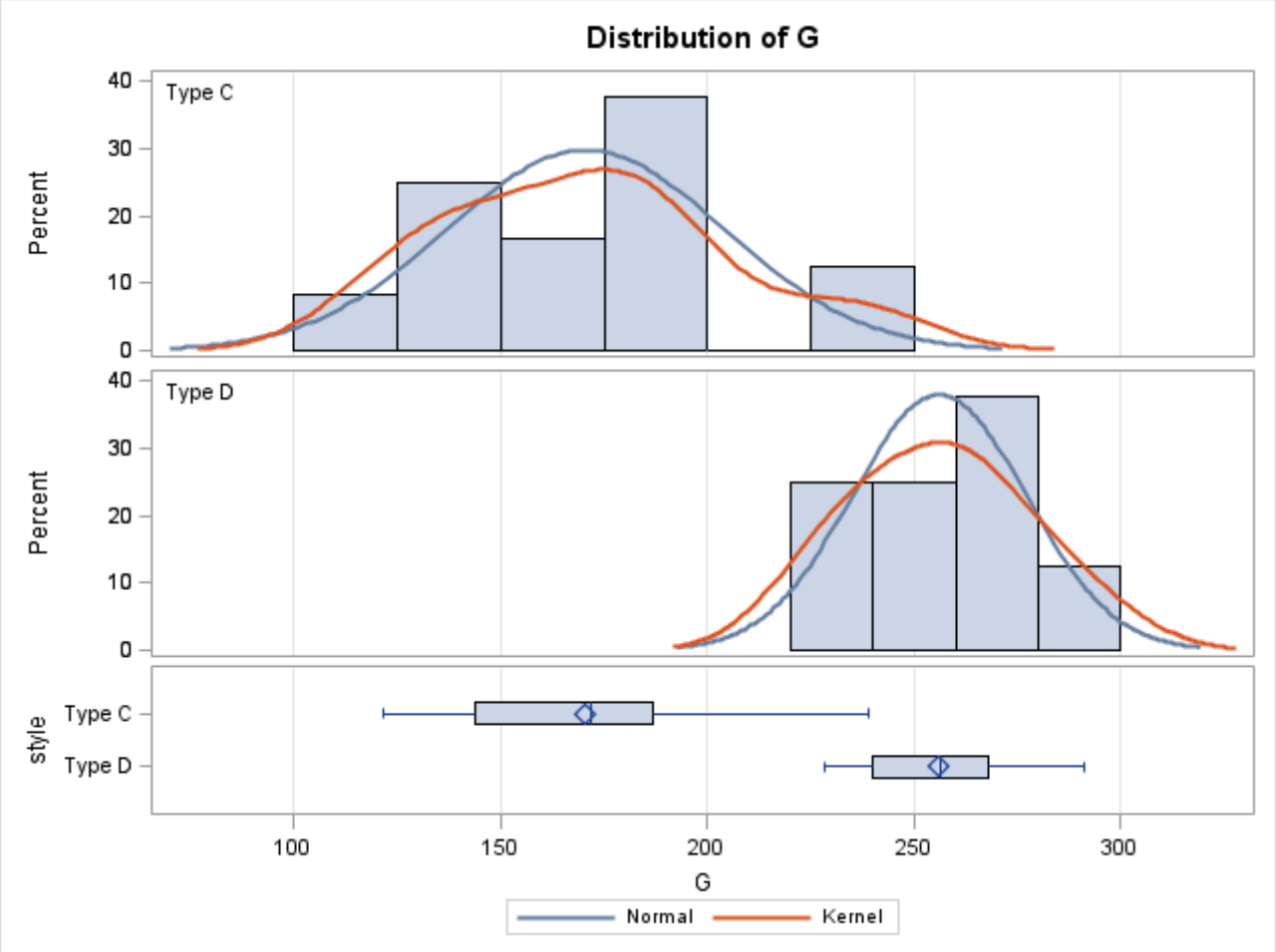
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	30	-9.14	<.0001
Satterthwaite	Unequal	16.841	-10.79	<.0001



Variable: G

style	N	Mean	Std Dev	Std Err	Minimum	Maximum
Type C	24	170.5	33.5647	6.8514	121.5	238.9
Type D	8	256.0	21.0686	7.4489	228.3	291.1
Diff (1-2)		-85.5375	31.1014	12.6971		

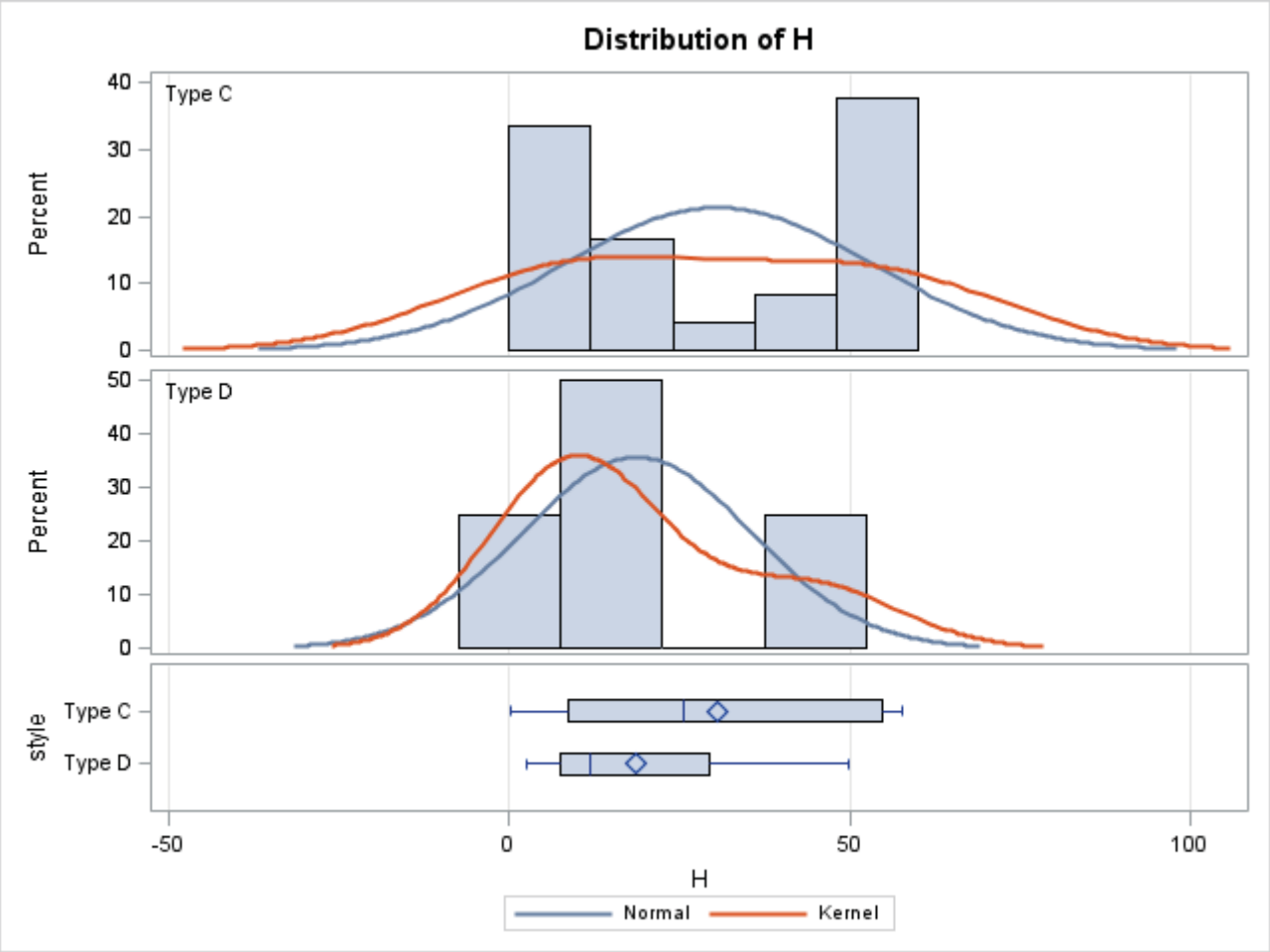
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	30	-6.74	<.0001
Satterthwaite	Unequal	19.587	-8.45	<.0001



Variable: H

style	N	Mean	Std Dev	Std Err	Minimum	Maximum
Type C	24	30.5083	22.4624	4.5851	0.3000	57.5000
Type D	8	18.7000	16.7983	5.9391	2.6000	49.7000
Diff (1-2)		11.8083	21.2761	8.6859		

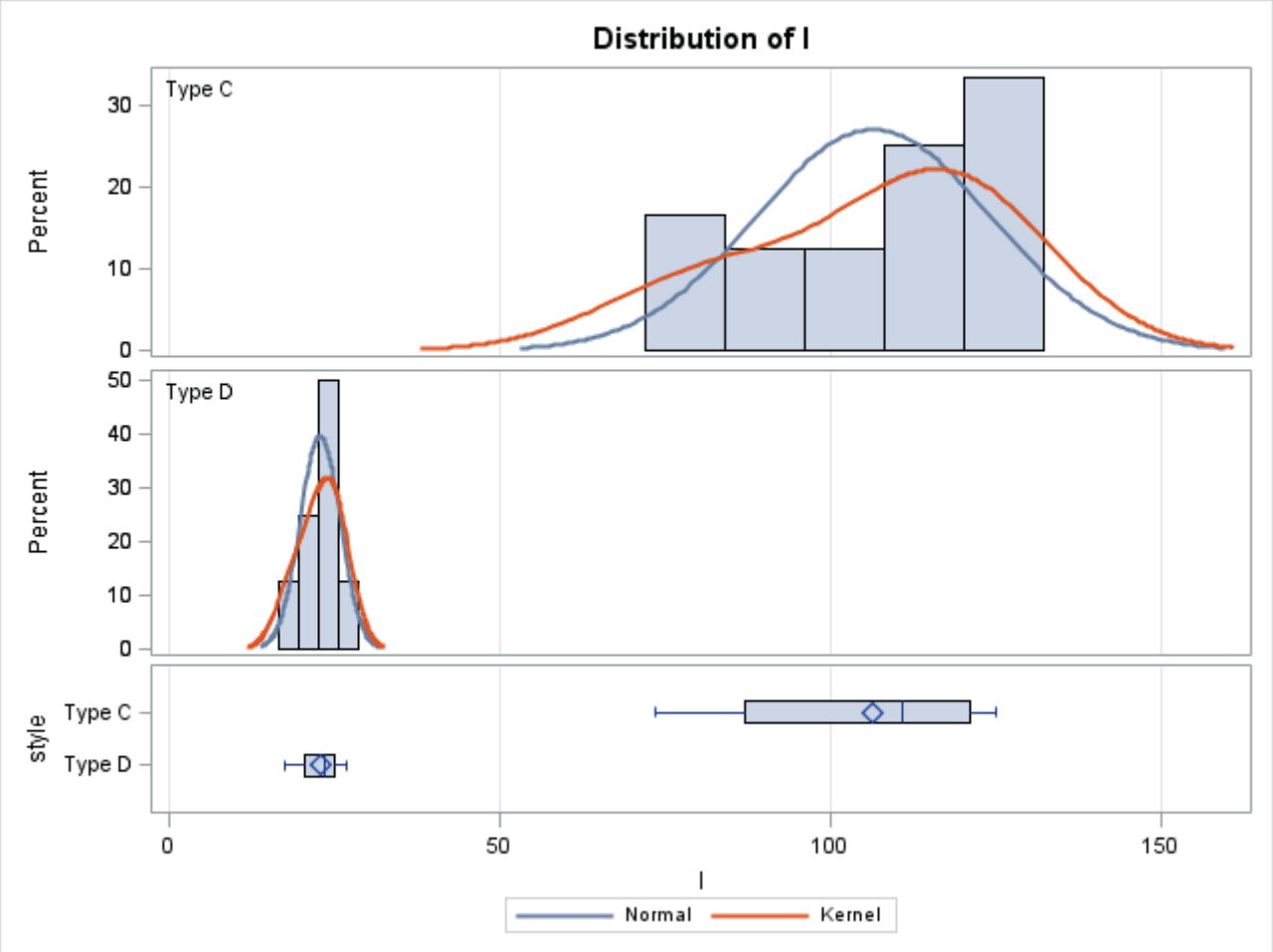
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	30	1.36	0.1841
Satterthwaite	Unequal	16.091	1.57	0.1350



Variable: I

style	N	Mean	Std Dev	Std Err	Minimum	Maximum
Type C	24	106.4	17.7478	3.6228	73.6000	125.0
Type D	8	22.8250	3.0231	1.0688	17.6000	26.7000
Diff (1-2)		83.5583	15.6084	6.3721		

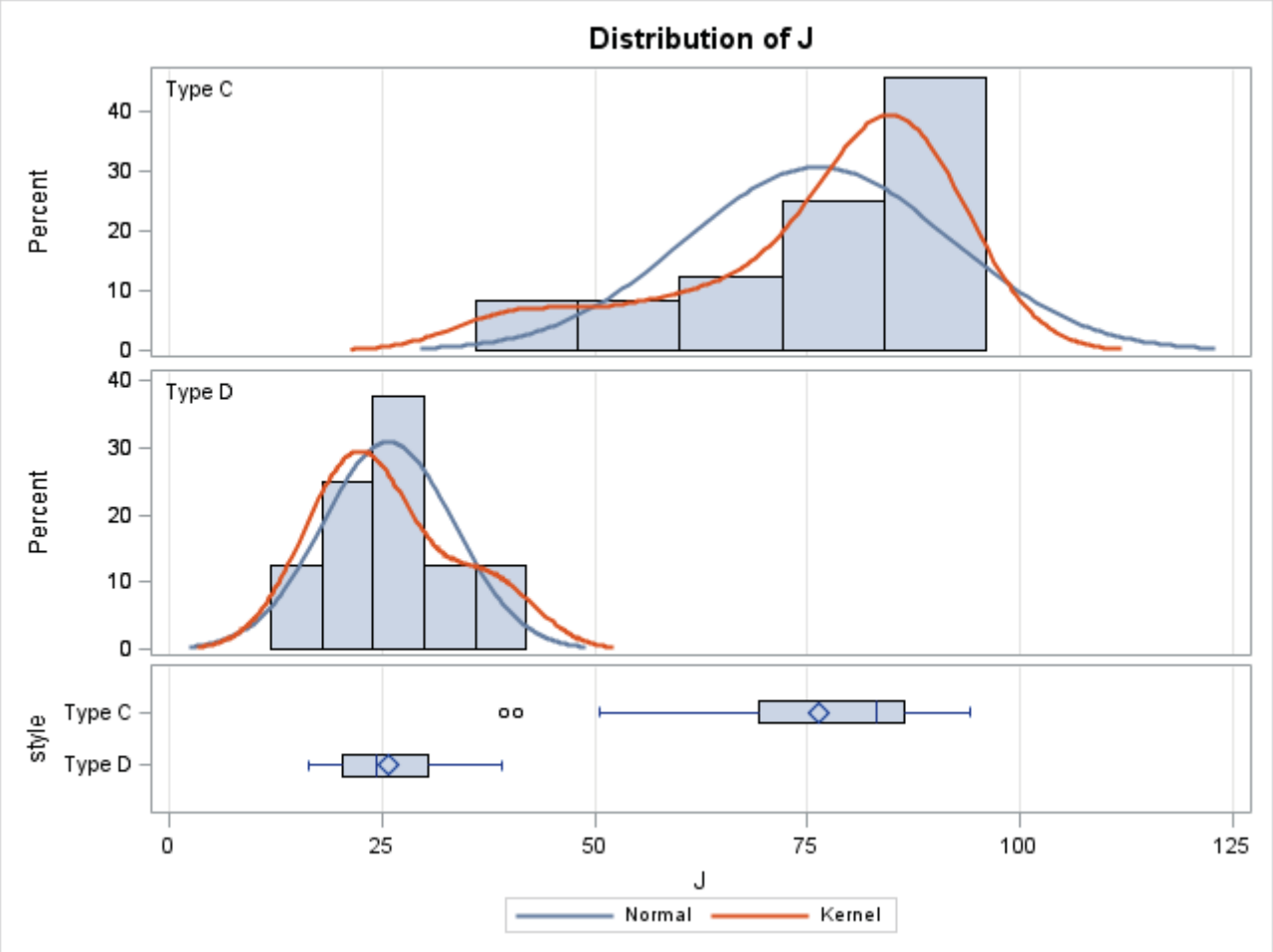
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	30	13.11	<.0001
Satterthwaite	Unequal	26.518	22.12	<.0001



Variable: J

style	N	Mean	Std Dev	Std Err	Minimum	Maximum
Type C	24	76.2917	15.5622	3.1766	39.3000	94.0000
Type D	8	25.7375	7.7618	2.7442	16.4000	39.2000
Diff (1-2)		50.5542	14.1326	5.7696		

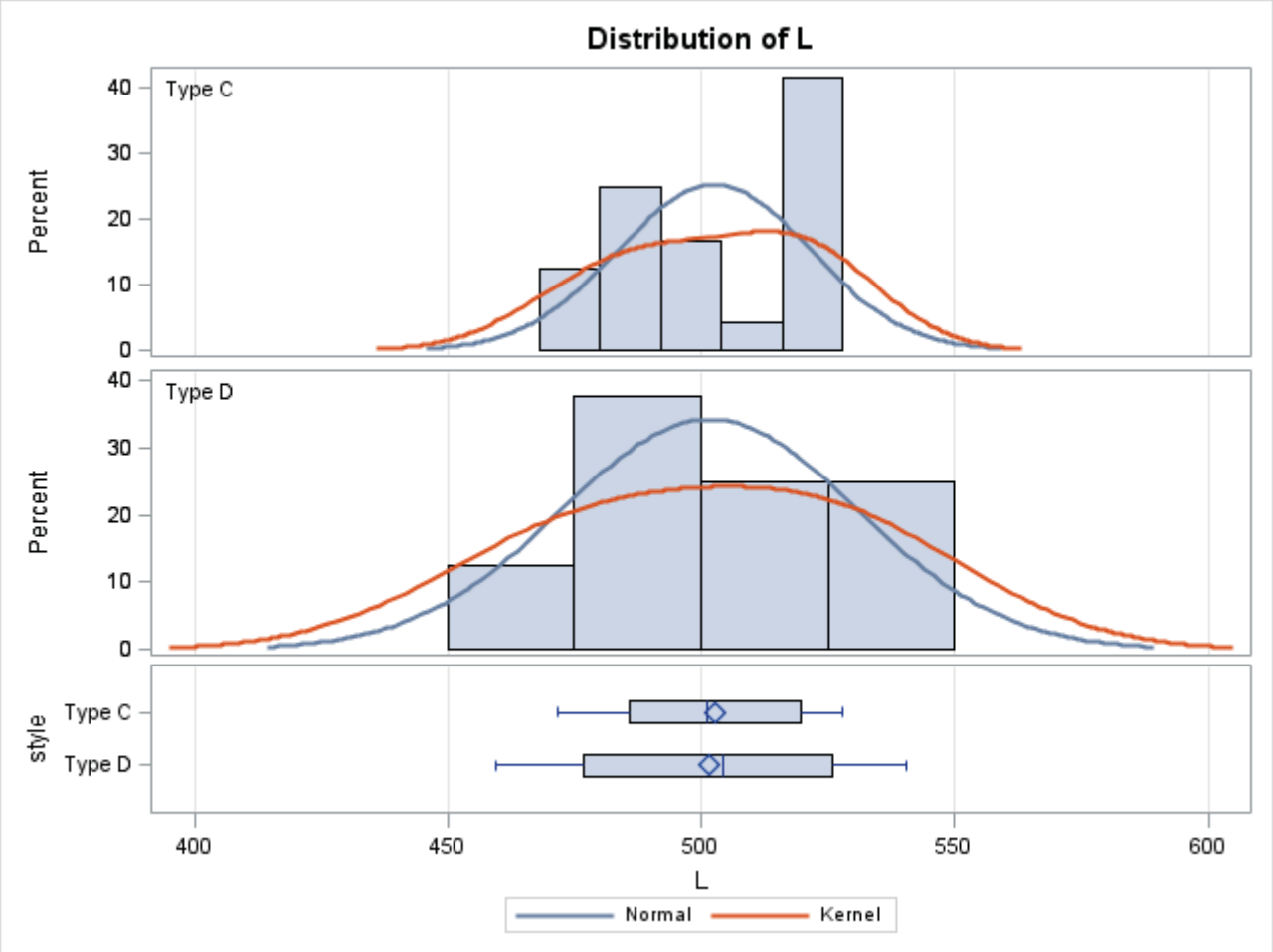
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	30	8.76	<.0001
Satterthwaite	Unequal	24.784	12.04	<.0001



Variable: L

style	N	Mean	Std Dev	Std Err	Minimum	Maximum
Type C	24	502.5	18.8916	3.8562	471.5	527.7
Type D	8	501.7	29.1709	10.3135	459.5	540.4
Diff (1-2)		0.8917	21.7295	8.8710		

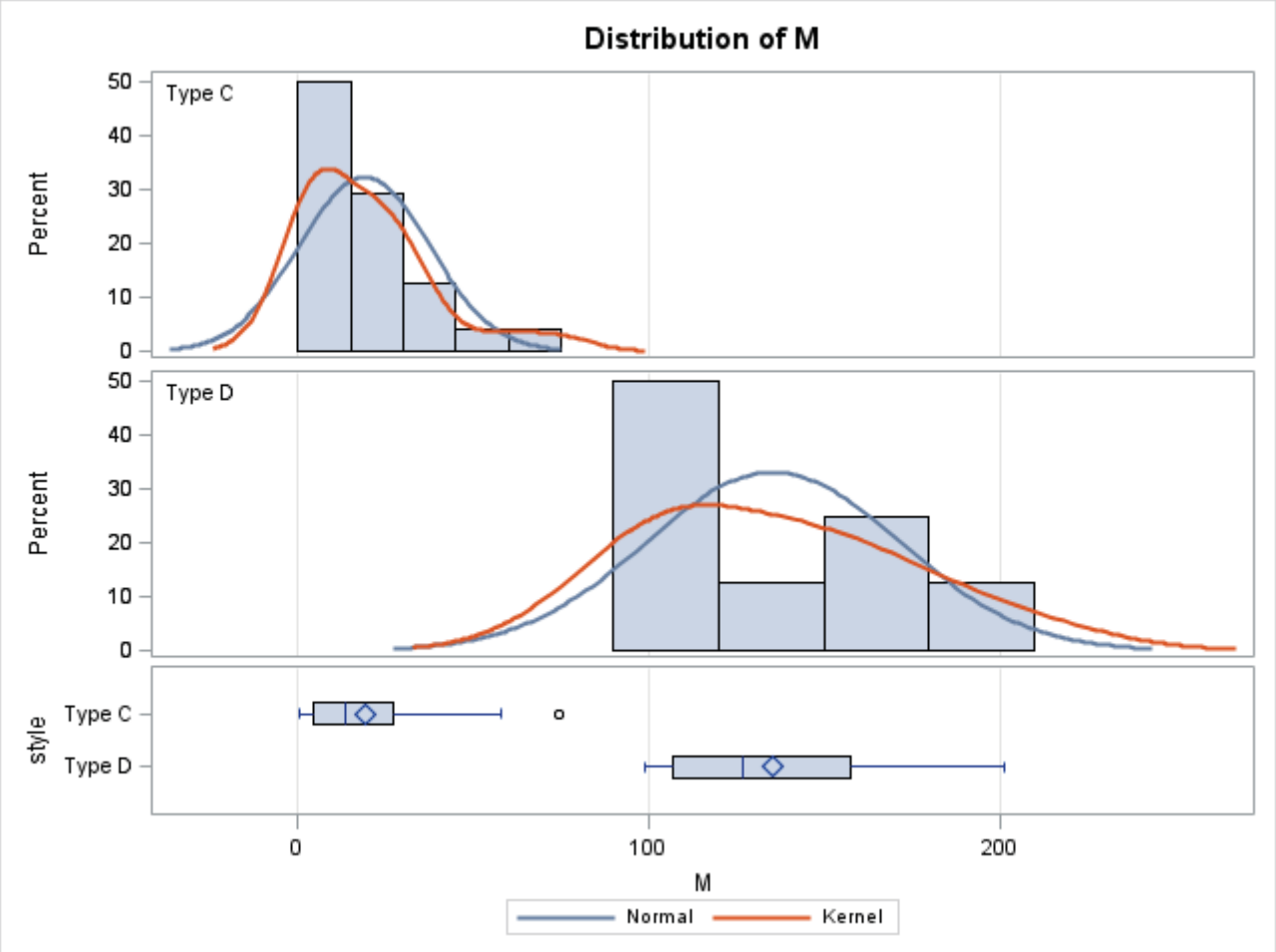
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	30	0.10	0.9206
Satterthwaite	Unequal	9.0403	0.08	0.9372



Variable: M

style	N	Mean	Std Dev	Std Err	Minimum	Maximum
Type C	24	18.9750	18.5358	3.7836	0.4000	74.5000
Type D	8	135.4	36.1271	12.7729	99.0000	201.2
Diff (1-2)		-116.5	23.8316	9.7292		

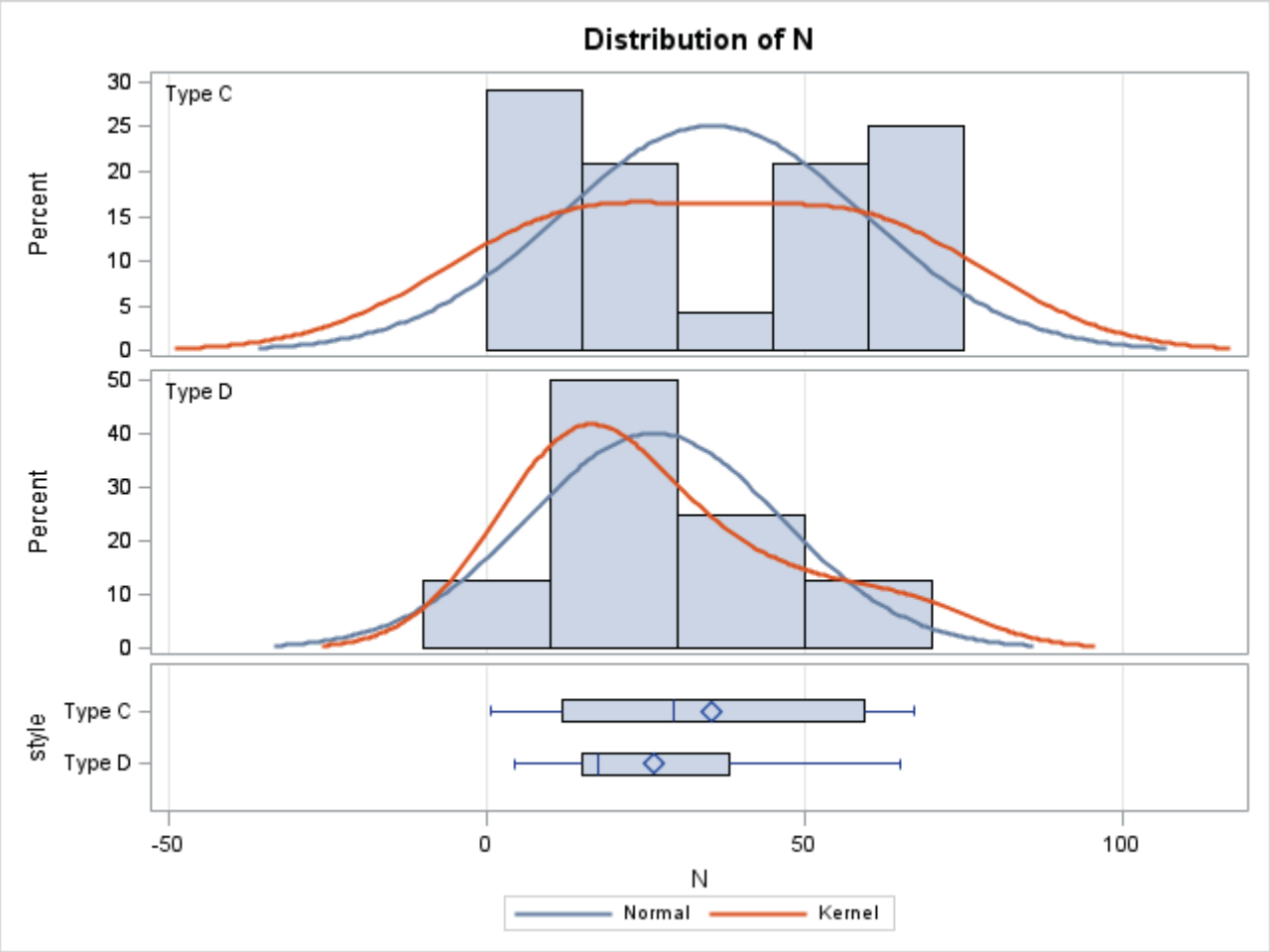
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	30	-11.97	<.0001
Satterthwaite	Unequal	8.263	-8.74	<.0001



Variable: N

style	N	Mean	Std Dev	Std Err	Minimum	Maximum
Type C	24	35.3750	23.7791	4.8539	0.5000	67.2000
Type D	8	26.2500	19.8985	7.0352	4.3000	65.0000
Diff (1-2)		9.1250	22.9324	9.3621		

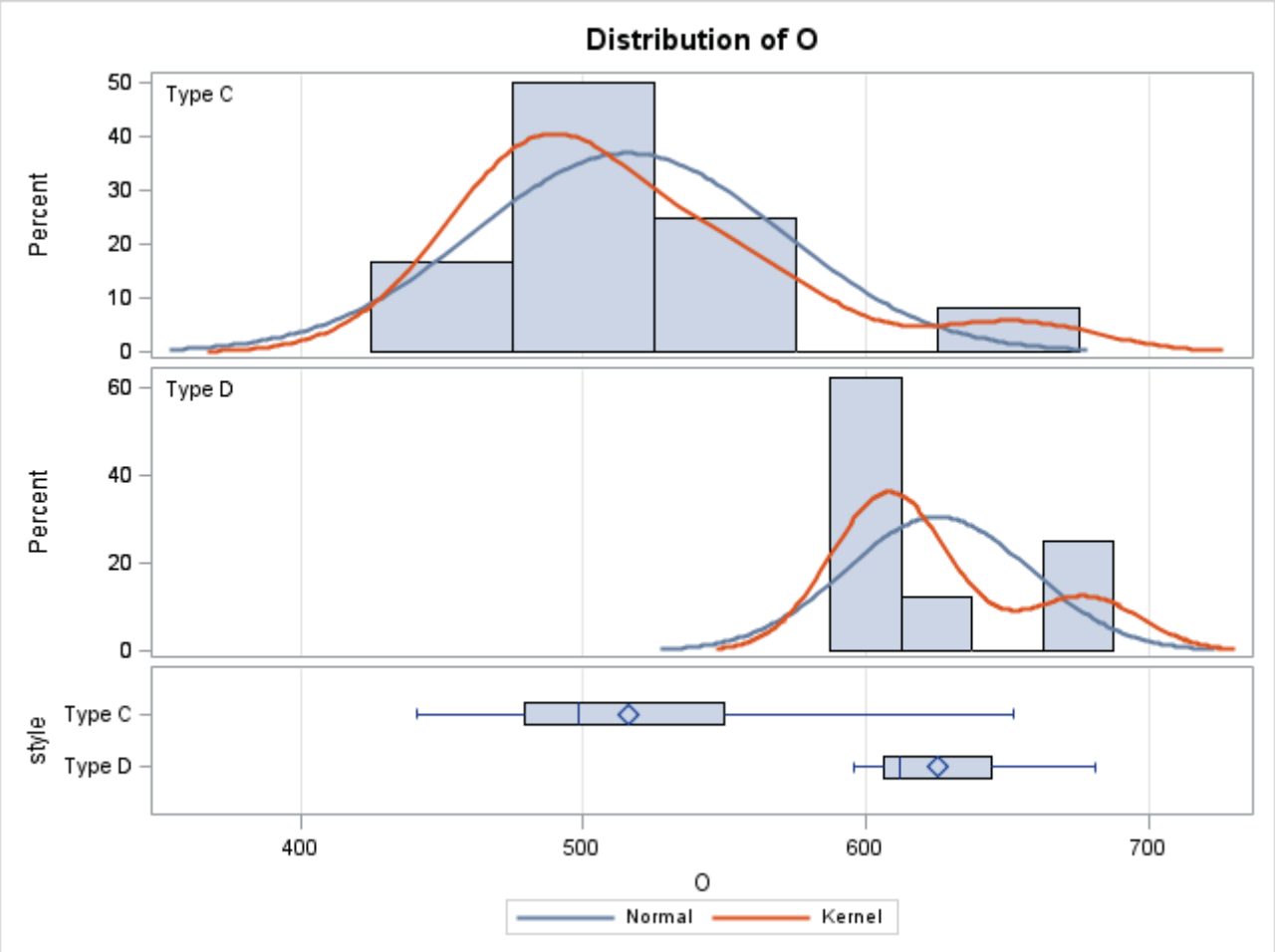
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	30	0.97	0.3375
Satterthwaite	Unequal	14.267	1.07	0.3034



Variable: O

style	N	Mean	Std Dev	Std Err	Minimum	Maximum
Type C	24	515.7	54.0421	11.0313	441.4	652.3
Type D	8	625.2	32.6212	11.5333	595.9	681.1
Diff (1-2)		-109.5	49.8737	20.3609		

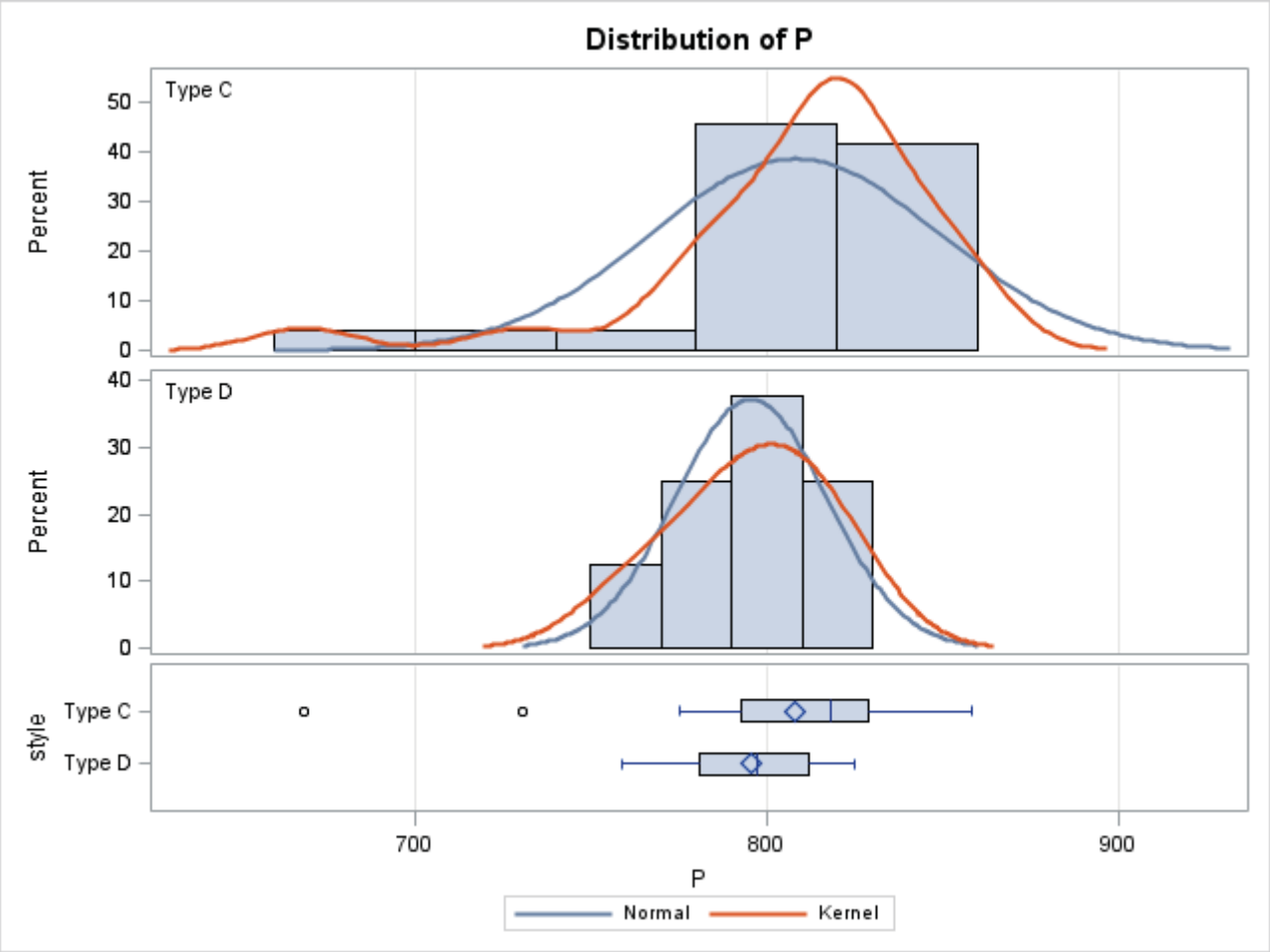
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	30	-5.38	<.0001
Satterthwaite	Unequal	20.456	-6.86	<.0001



Variable: P

style	N	Mean	Std Dev	Std Err	Minimum	Maximum
Type C	24	808.0	41.1724	8.4043	668.6	858.0
Type D	8	795.5	21.5246	7.6101	758.9	824.7
Diff (1-2)		12.5458	37.5198	15.3174		

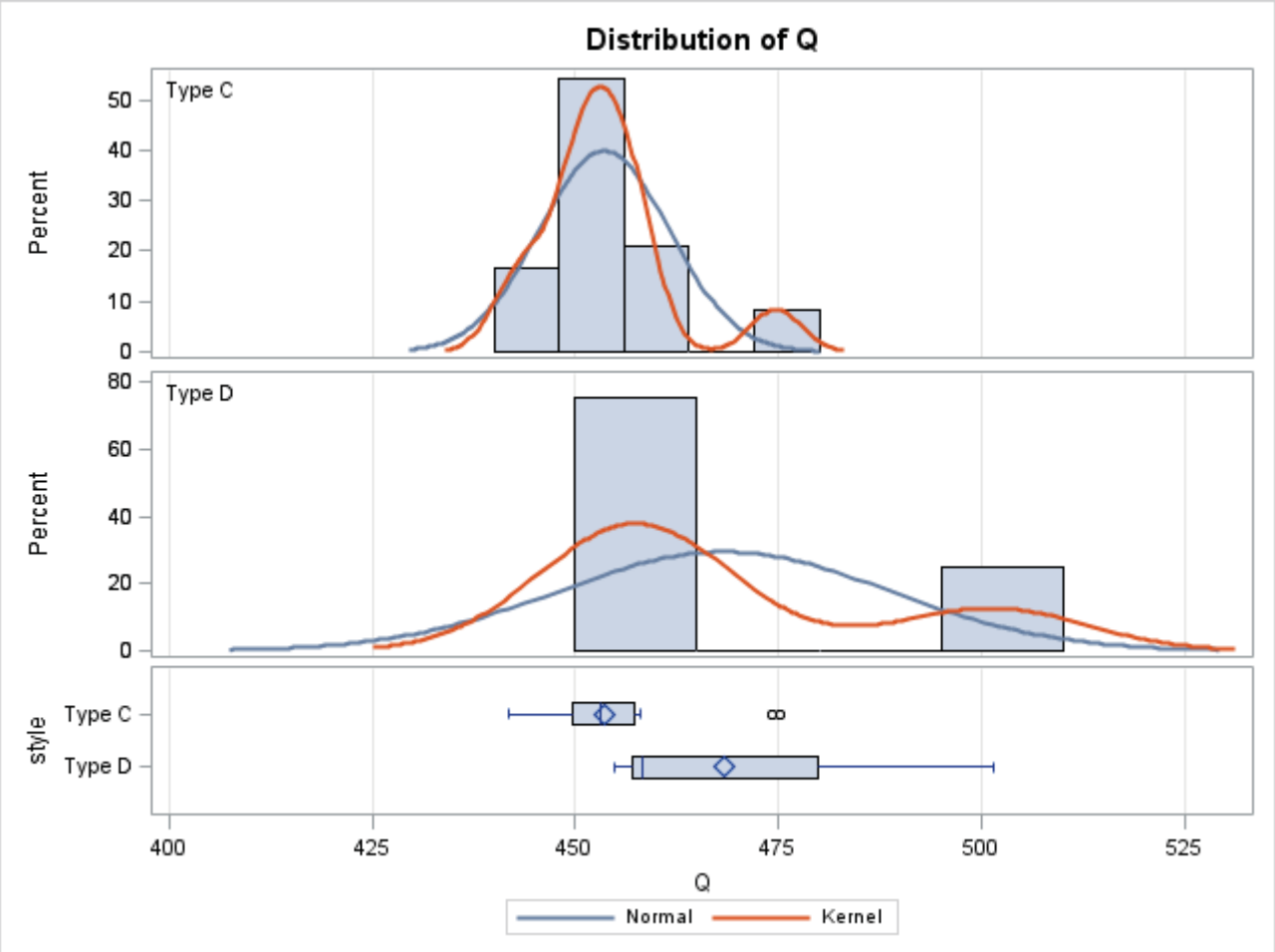
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	30	0.82	0.4192
Satterthwaite	Unequal	23.74	1.11	0.2796



Variable: Q

style	N	Mean	Std Dev	Std Err	Minimum	Maximum
Type C	24	453.6	8.0218	1.6374	441.7	475.2
Type D	8	468.3	20.3116	7.1812	454.8	501.6
Diff (1-2)		-14.7542	12.0664	4.9261		

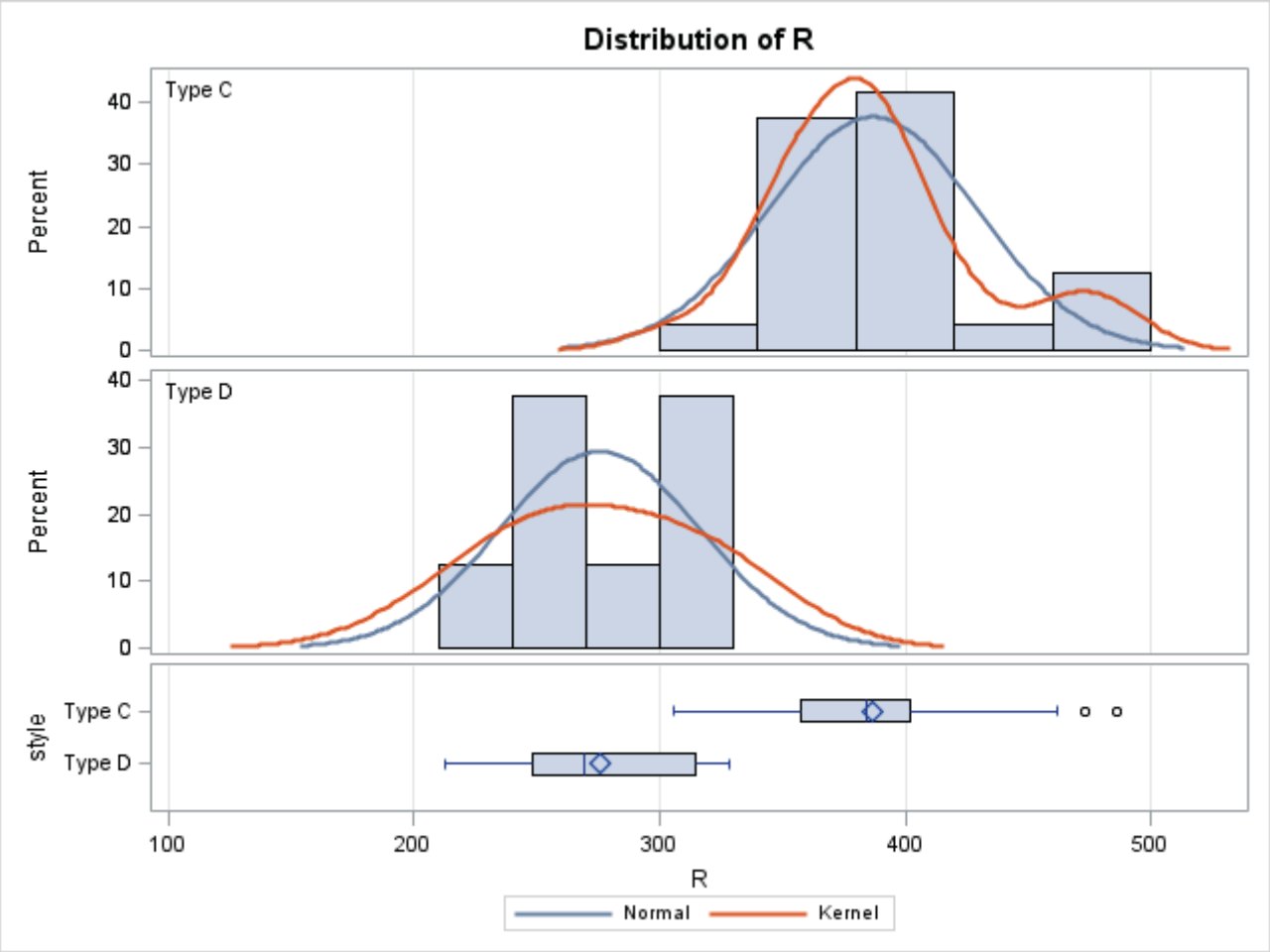
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	30	-3.00	0.0055
Satterthwaite	Unequal	7.7404	-2.00	0.0813



Variable: R

style	N	Mean	Std Dev	Std Err	Minimum	Maximum
Type C	24	386.7	42.2774	8.6298	305.3	485.7
Type D	8	275.5	40.7994	14.4248	212.5	328.4
Diff (1-2)		111.2	41.9372	17.1208		

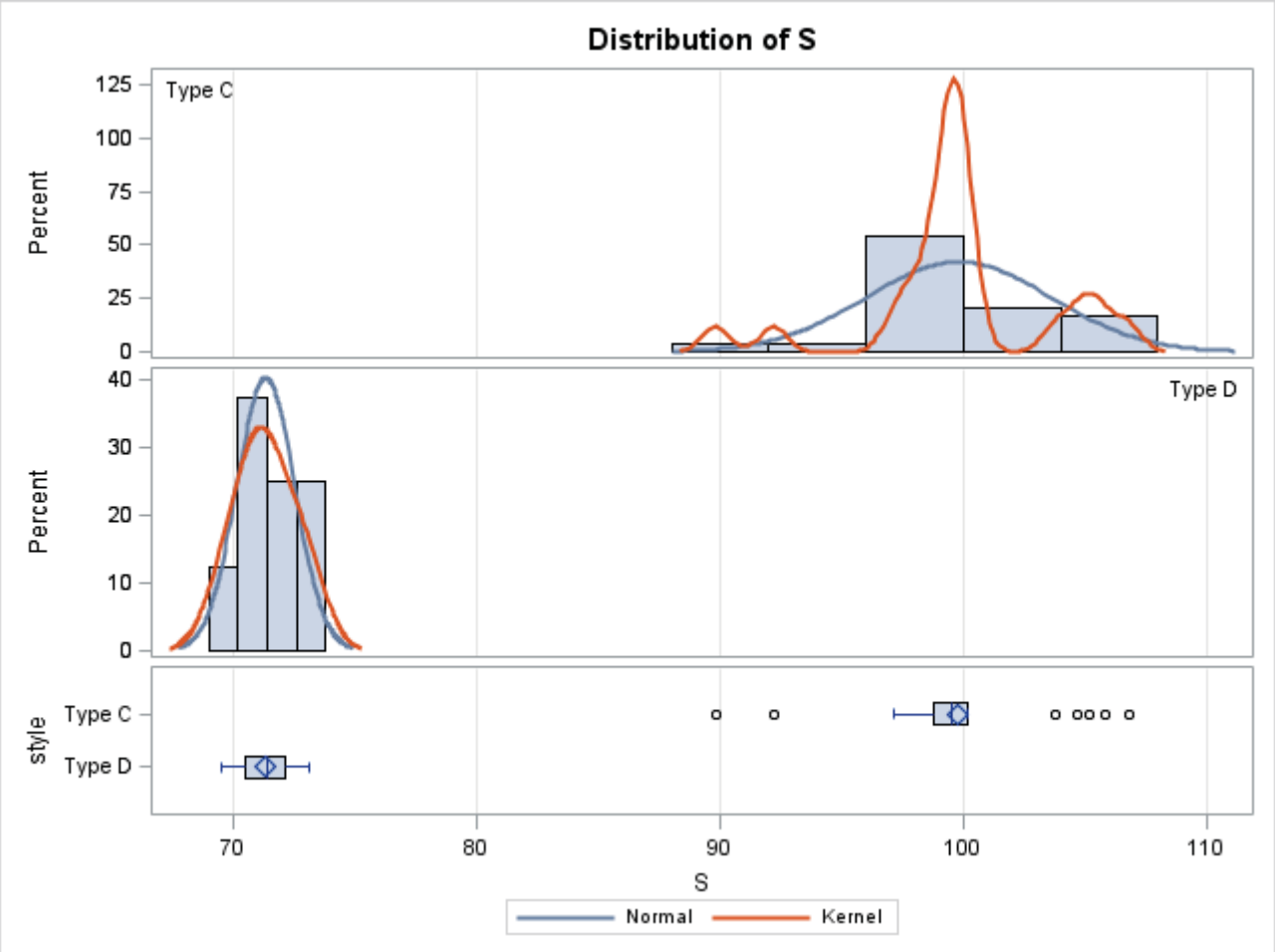
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	30	6.50	<.0001
Satterthwaite	Unequal	12.423	6.62	<.0001



Variable: S

style	N	Mean	Std Dev	Std Err	Minimum	Maximum
Type C	24	99.7958	3.7888	0.7734	89.8000	106.8
Type D	8	71.3250	1.1865	0.4195	69.5000	73.1000
Diff (1-2)		28.4708	3.3666	1.3744		

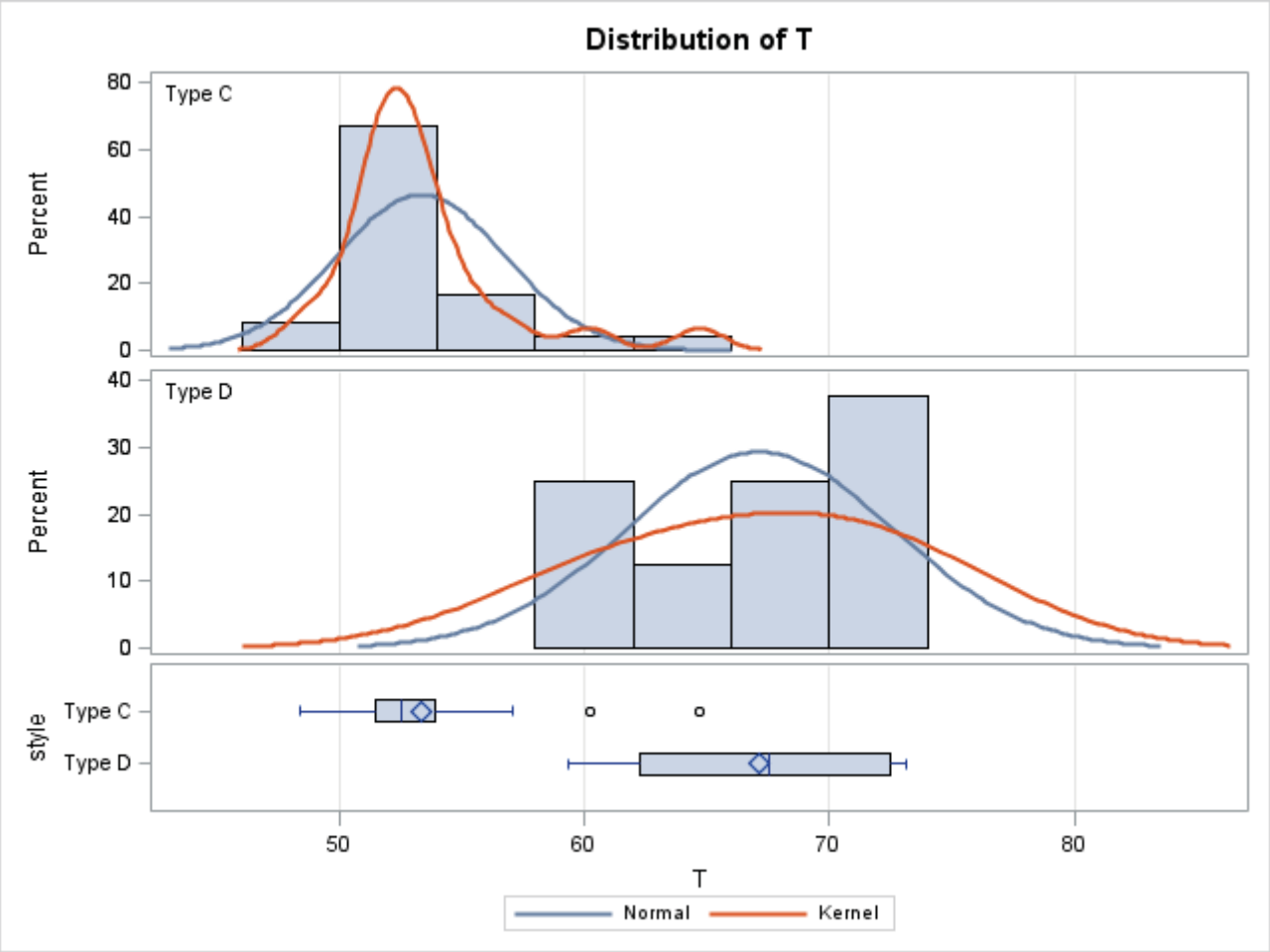
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	30	20.71	<.0001
Satterthwaite	Unequal	29.994	32.36	<.0001



Variable: T

style	N	Mean	Std Dev	Std Err	Minimum	Maximum
Type C	24	53.3208	3.4330	0.7007	48.4000	64.7000
Type D	8	67.1375	5.4526	1.9278	59.3000	73.1000
Diff (1-2)		-13.8167	3.9966	1.6316		

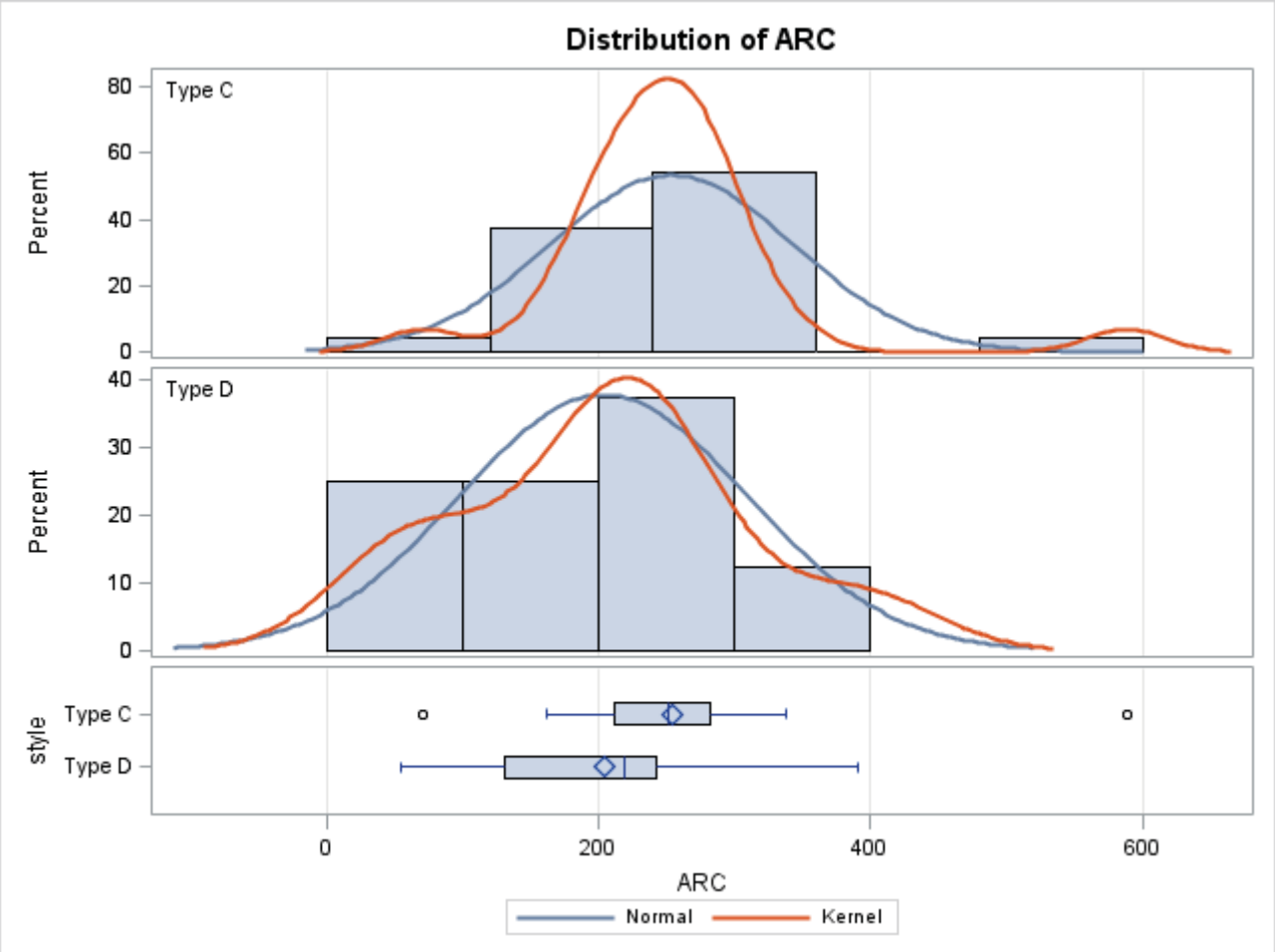
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	30	-8.47	<.0001
Satterthwaite	Unequal	8.9246	-6.74	<.0001



Variable: ARC

style	N	Mean	Std Dev	Std Err	Minimum	Maximum
Type C	24	253.6	89.8428	18.3391	70.6000	588.3
Type D	8	203.4	105.5	37.3091	54.1000	390.2
Diff (1-2)		50.1708	93.7372	38.2681		

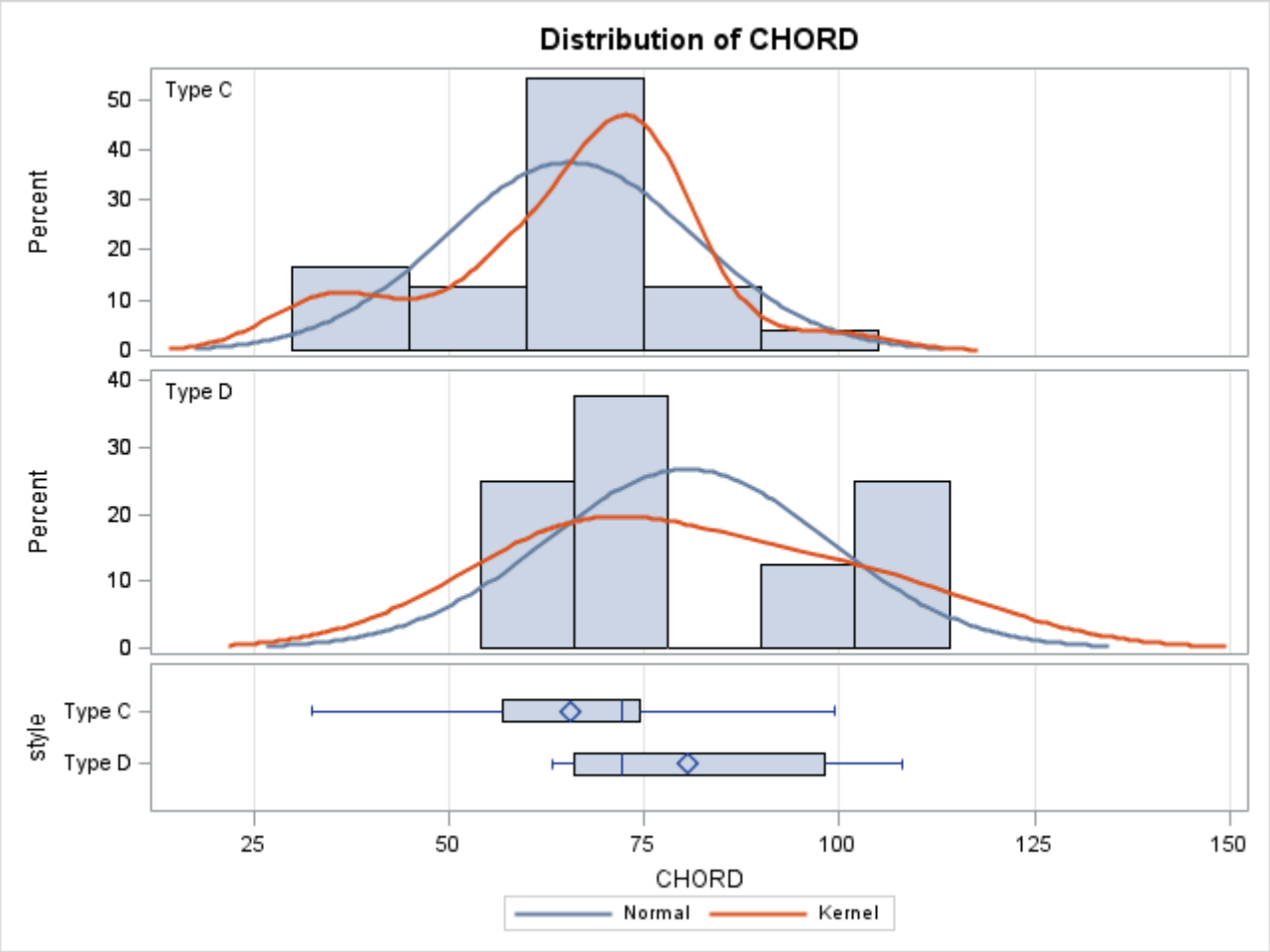
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	30	1.31	0.1998
Satterthwaite	Unequal	10.603	1.21	0.2537



Variable: CHORD

style	N	Mean	Std Dev	Std Err	Minimum	Maximum
Type C	24	65.4125	15.9885	3.2636	32.4000	99.3000
Type D	8	80.5000	17.9584	6.3492	63.3000	108.0
Diff (1-2)		-15.0875	16.4693	6.7235		

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	30	-2.24	0.0324
Satterthwaite	Unequal	10.955	-2.11	0.0583

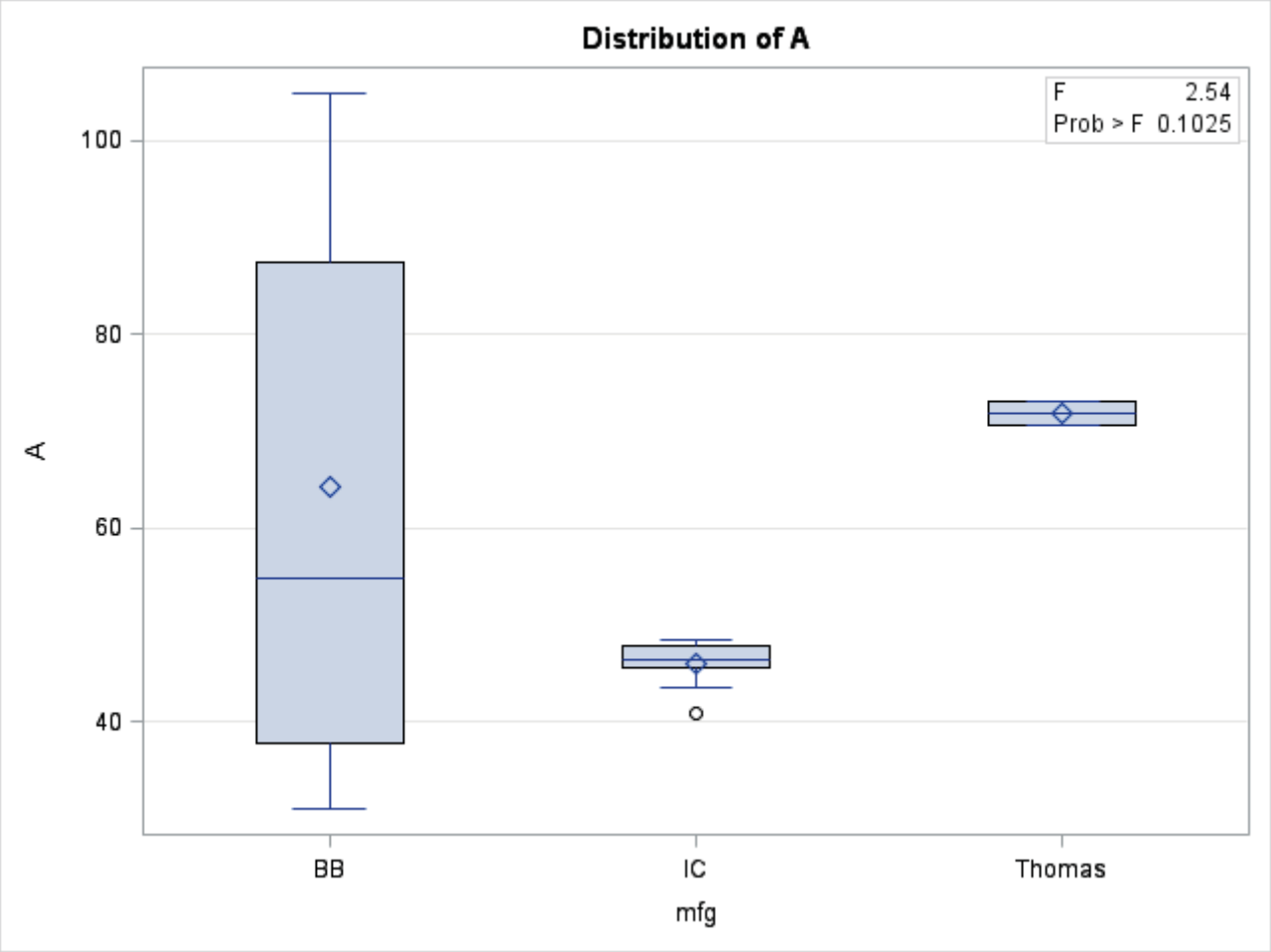


8. Appendix C - Comparison of Type C Bus Measurements by Manufacturer

Dependent Variable: A

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	2217.70752	1108.85376	2.54	0.1025
Error	21	9153.47248	435.87964		
Corrected Total	23	11371.18000			

R-Square	Coeff Var	Root MSE	A Mean
0.195029	35.96508	20.87773	58.05000



Scheffe's Test for A

Alpha	0.05
Error Degrees of Freedom	21
Error Mean Square	435.8796
Critical Value of F	3.46680

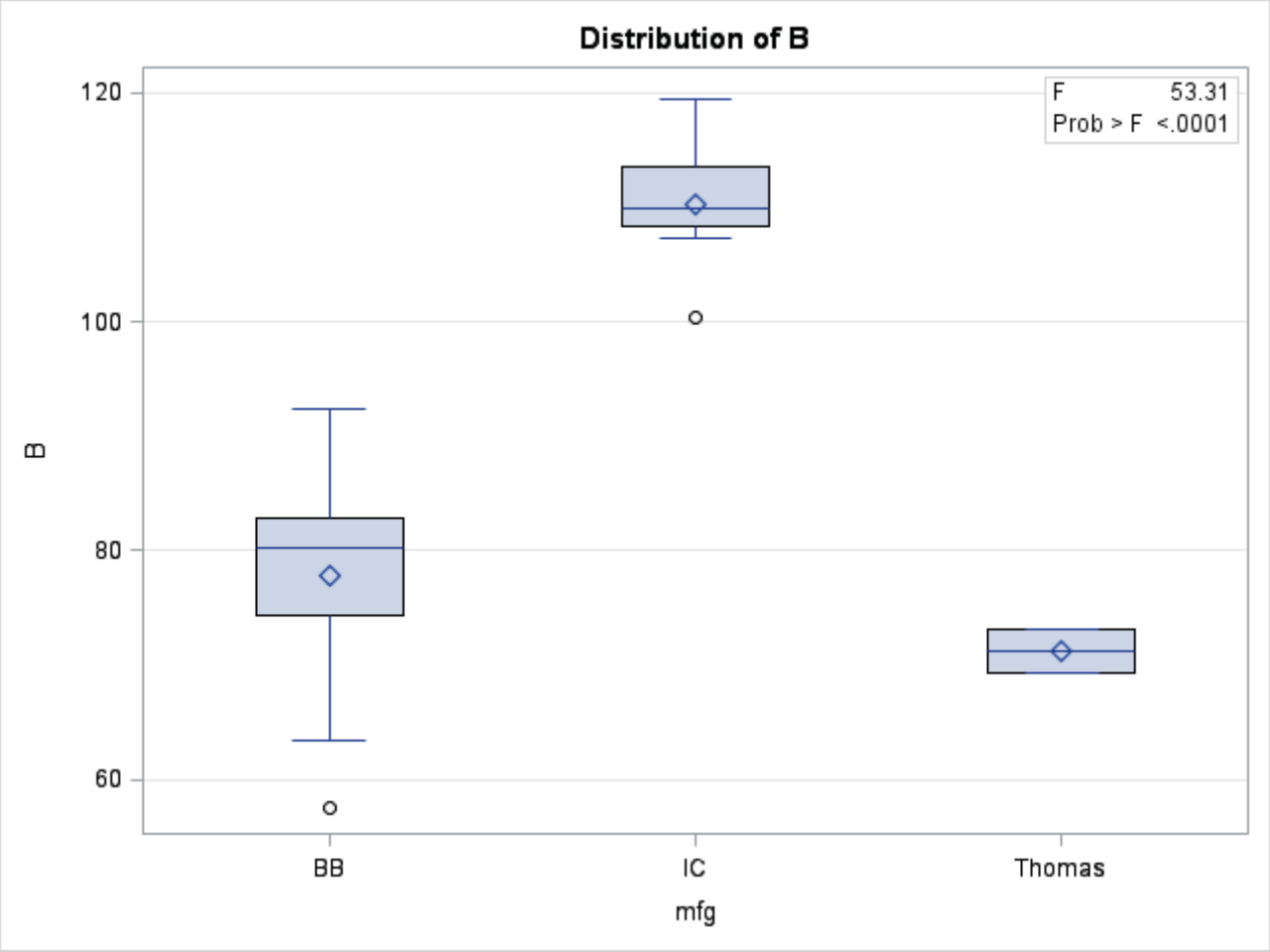
Comparisons significant at the 0.05 level were indicated by *.**

mfg Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
Thomas - BB	7.585	-34.172	49.341
Thomas - IC	25.978	-16.998	68.953
BB - Thomas	-7.585	-49.341	34.172
BB - IC	18.393	-5.445	42.232
IC - Thomas	-25.978	-68.953	16.998
IC - BB	-18.393	-42.232	5.445

Dependent Variable: B

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	6331.867618	3165.933809	53.31	<.0001
Error	21	1247.191966	59.390094		
Corrected Total	23	7579.059583			

R-Square	Coeff Var	Root MSE	B Mean
0.835442	8.615825	7.706497	89.44583



Scheffe's Test for B

Alpha	0.05
Error Degrees of Freedom	21
Error Mean Square	59.39009
Critical Value of F	3.46680

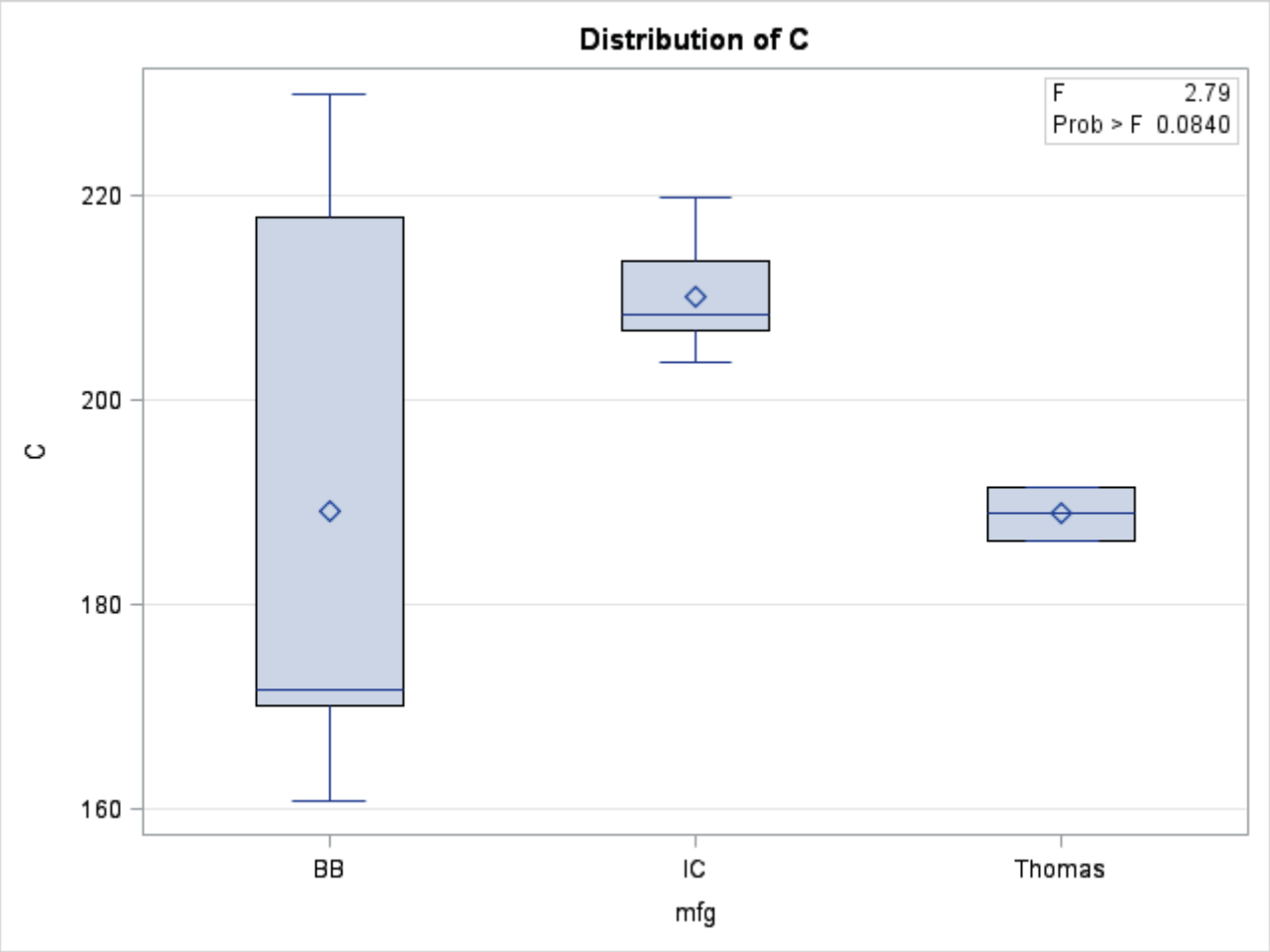
Comparisons significant at the 0.05 level were indicated by *.**

mfg Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
IC - BB	32.466	23.666	41.265	***
IC - Thomas	39.089	23.225	54.952	***
BB - IC	-32.466	-41.265	-23.666	***
BB - Thomas	6.623	-8.790	22.036	
Thomas - IC	-39.089	-54.952	-23.225	***
Thomas - BB	-6.623	-22.036	8.790	

Dependent Variable: C

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	2475.98266	1237.99133	2.79	0.0840
Error	21	9304.13692	443.05414		
Corrected Total	23	11780.11958			

R-Square	Coeff Var	Root MSE	C Mean
0.210183	10.68718	21.04885	196.9542



Scheffe's Test for C

Alpha	0.05
Error Degrees of Freedom	21
Error Mean Square	443.0541
Critical Value of F	3.46680

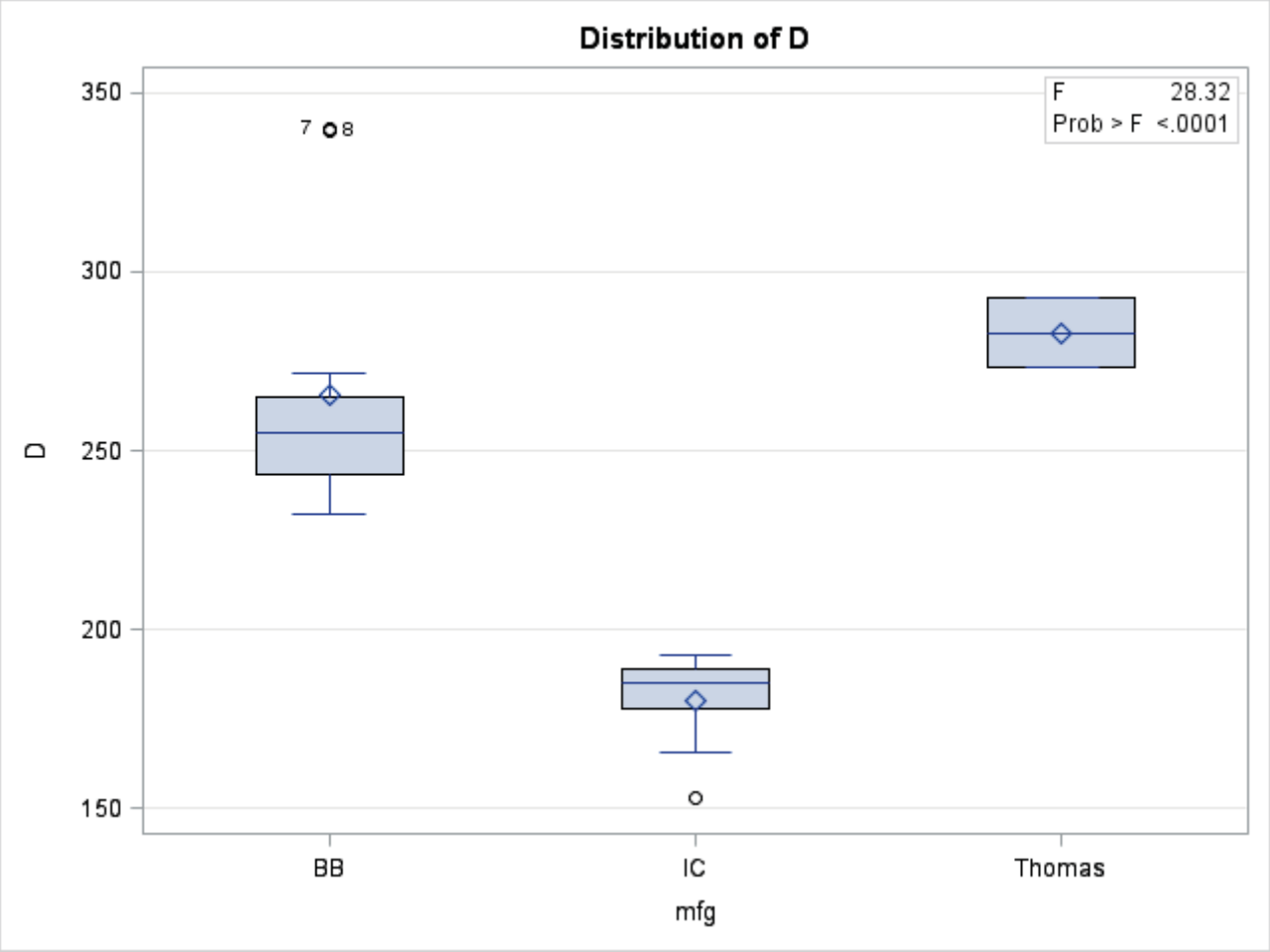
Comparisons significant at the 0.05 level were indicated by *.**

mfg Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
IC - BB	20.951	-3.083	44.985
IC - Thomas	21.167	-22.161	64.495
BB - IC	-20.951	-44.985	3.083
BB - Thomas	0.215	-41.883	42.314
Thomas - IC	-21.167	-64.495	22.161
Thomas - BB	-0.215	-42.314	41.883

Dependent Variable: D

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	43988.97009	21994.48504	28.32	<.0001
Error	21	16307.56325	776.55063		
Corrected Total	23	60296.53333			

R-Square	Coeff Var	Root MSE	D Mean
0.729544	11.86488	27.86666	234.8667



Scheffe's Test for D

Alpha	0.05
Error Degrees of Freedom	21
Error Mean Square	776.5506
Critical Value of F	3.46680

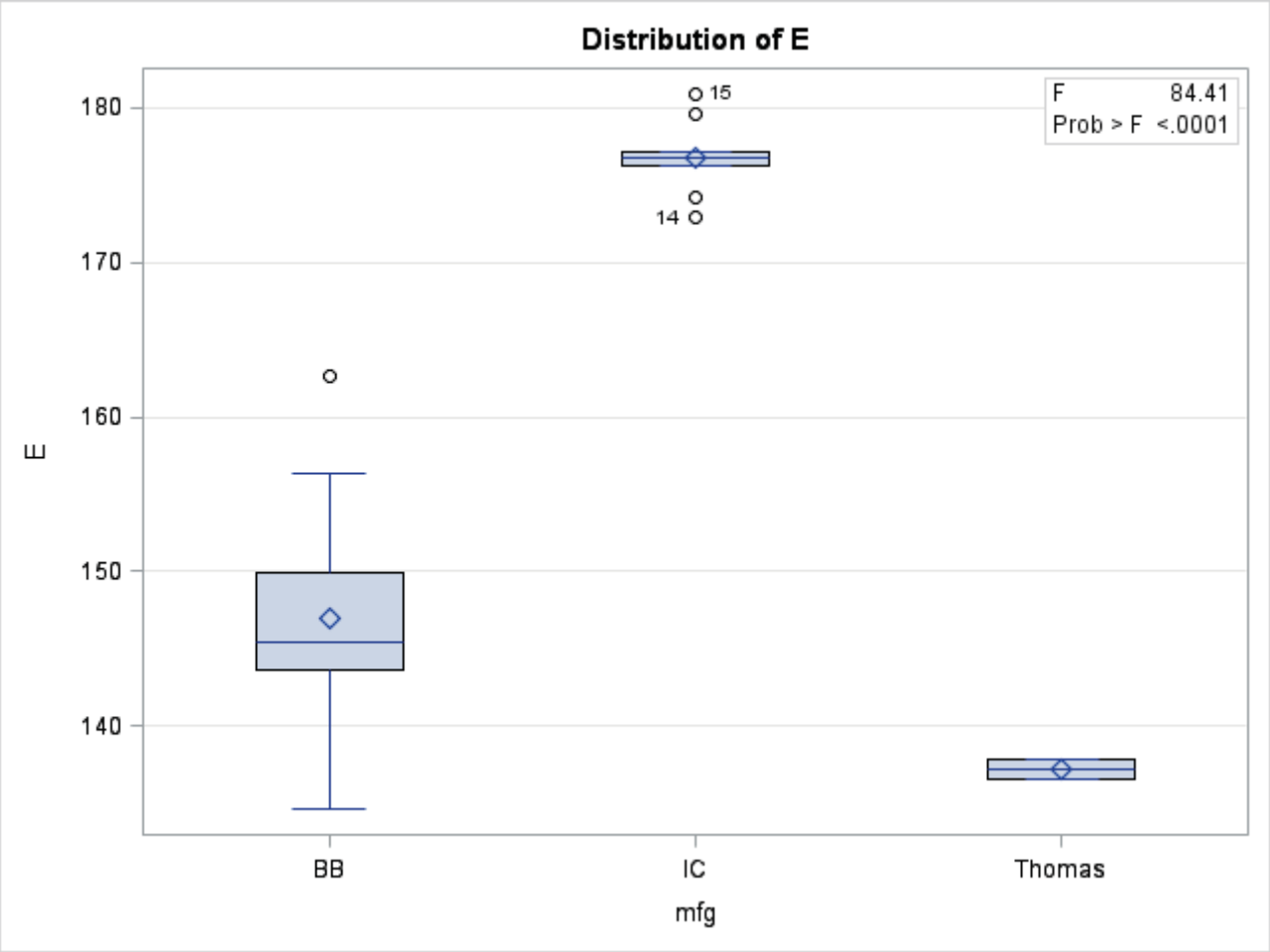
Comparisons significant at the 0.05 level were indicated by *.**

mfg Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Thomas - BB	17.27	-38.47	73.00	
Thomas - IC	102.88	45.52	160.24	***
BB - Thomas	-17.27	-73.00	38.47	
BB - IC	85.61	53.79	117.43	***
IC - Thomas	-102.88	-160.24	-45.52	***
IC - BB	-85.61	-117.43	-53.79	***

Dependent Variable: E

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	5634.138173	2817.069087	84.41	<.0001
Error	21	700.808077	33.371813		
Corrected Total	23	6334.946250			

R-Square	Coeff Var	Root MSE	E Mean
0.889374	3.672203	5.776834	157.3125



Scheffe's Test for E

Alpha	0.05
Error Degrees of Freedom	21
Error Mean Square	33.37181
Critical Value of F	3.46680

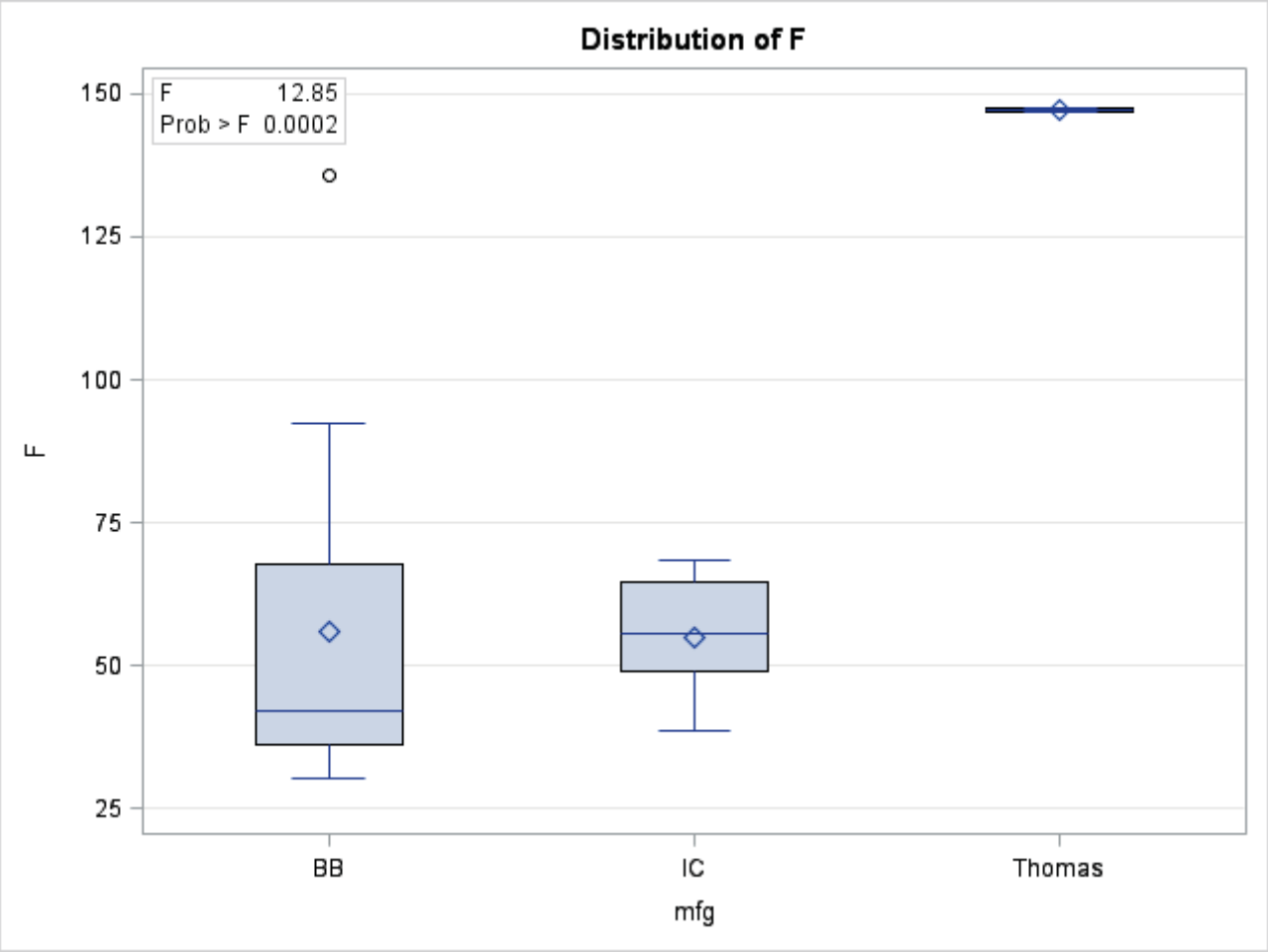
Comparisons significant at the 0.05 level were indicated by *.**

mfg Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
IC - BB	29.877	23.281	36.473	***
IC - Thomas	39.650	27.759	51.541	***
BB - IC	-29.877	-36.473	-23.281	***
BB - Thomas	9.773	-1.781	21.327	
Thomas - IC	-39.650	-51.541	-27.759	***
Thomas - BB	-9.773	-21.327	1.781	

Dependent Variable: F

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	15336.60342	7668.30171	12.85	0.0002
Error	21	12534.28158	596.87055		
Corrected Total	23	27870.88500			

R-Square	Coeff Var	Root MSE	F Mean
0.550273	38.64126	24.43093	63.22500



Scheffe's Test for F

Alpha	0.05
Error Degrees of Freedom	21
Error Mean Square	596.8706
Critical Value of F	3.46680

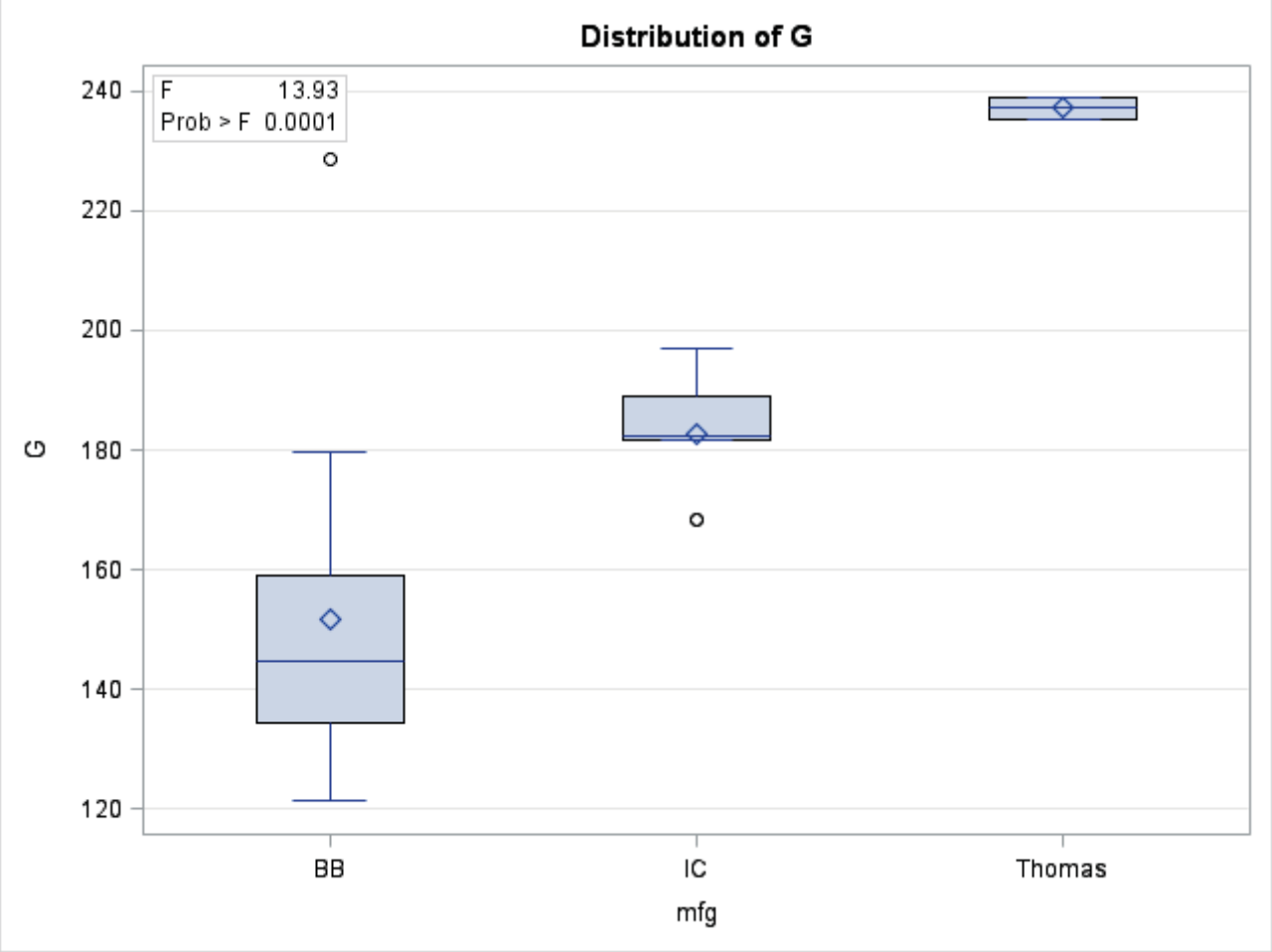
Comparisons significant at the 0.05 level were indicated by *.**

mfg Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Thomas - BB	91.019	42.156	139.882	***
Thomas - IC	92.061	41.771	142.351	***
BB - Thomas	-91.019	-139.882	-42.156	***
BB - IC	1.042	-26.854	28.938	
IC - Thomas	-92.061	-142.351	-41.771	***
IC - BB	-1.042	-28.938	26.854	

Dependent Variable: G

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	14775.01544	7387.50772	13.93	0.0001
Error	21	11136.59081	530.31385		
Corrected Total	23	25911.60625			

R-Square	Coeff Var	Root MSE	G Mean
0.570208	13.50747	23.02854	170.4875



Scheffe's Test for G

Alpha	0.05
Error Degrees of Freedom	21
Error Mean Square	530.3138
Critical Value of F	3.46680

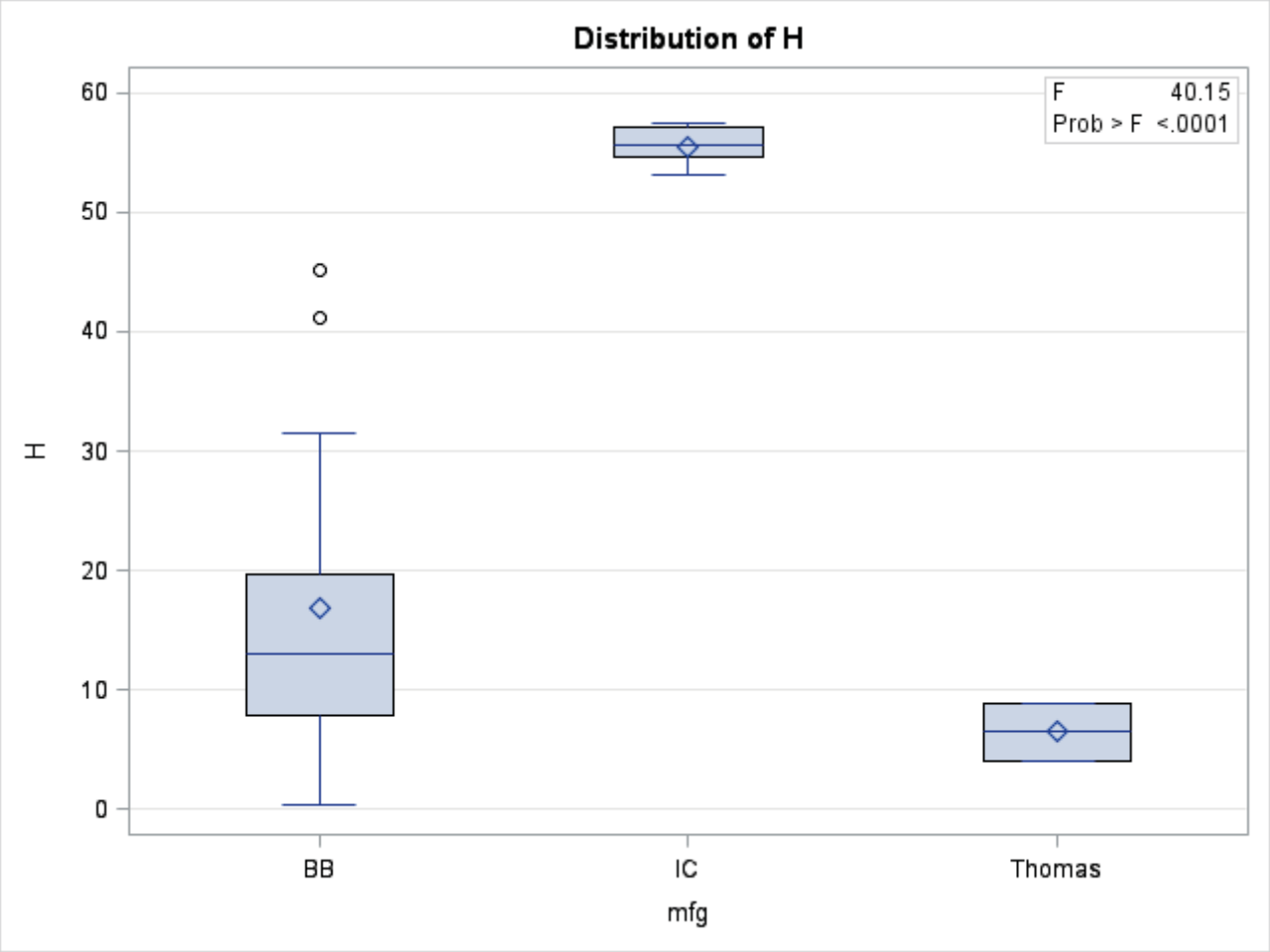
Comparisons significant at the 0.05 level were indicated by *.**

mfg Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Thomas - IC	54.461	7.058	101.864	***
Thomas - BB	85.365	39.307	131.423	***
IC - Thomas	-54.461	-101.864	-7.058	***
IC - BB	30.904	4.610	57.199	***
BB - Thomas	-85.365	-131.423	-39.307	***
BB - IC	-30.904	-57.199	-4.610	***

Dependent Variable: H

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	9199.00855	4599.50427	40.15	<.0001
Error	21	2405.84979	114.56428		
Corrected Total	23	11604.85833			

R-Square	Coeff Var	Root MSE	H Mean
0.792686	35.08376	10.70347	30.50833



Scheffe's Test for H

Alpha	0.05
Error Degrees of Freedom	21
Error Mean Square	114.5643
Critical Value of F	3.46680

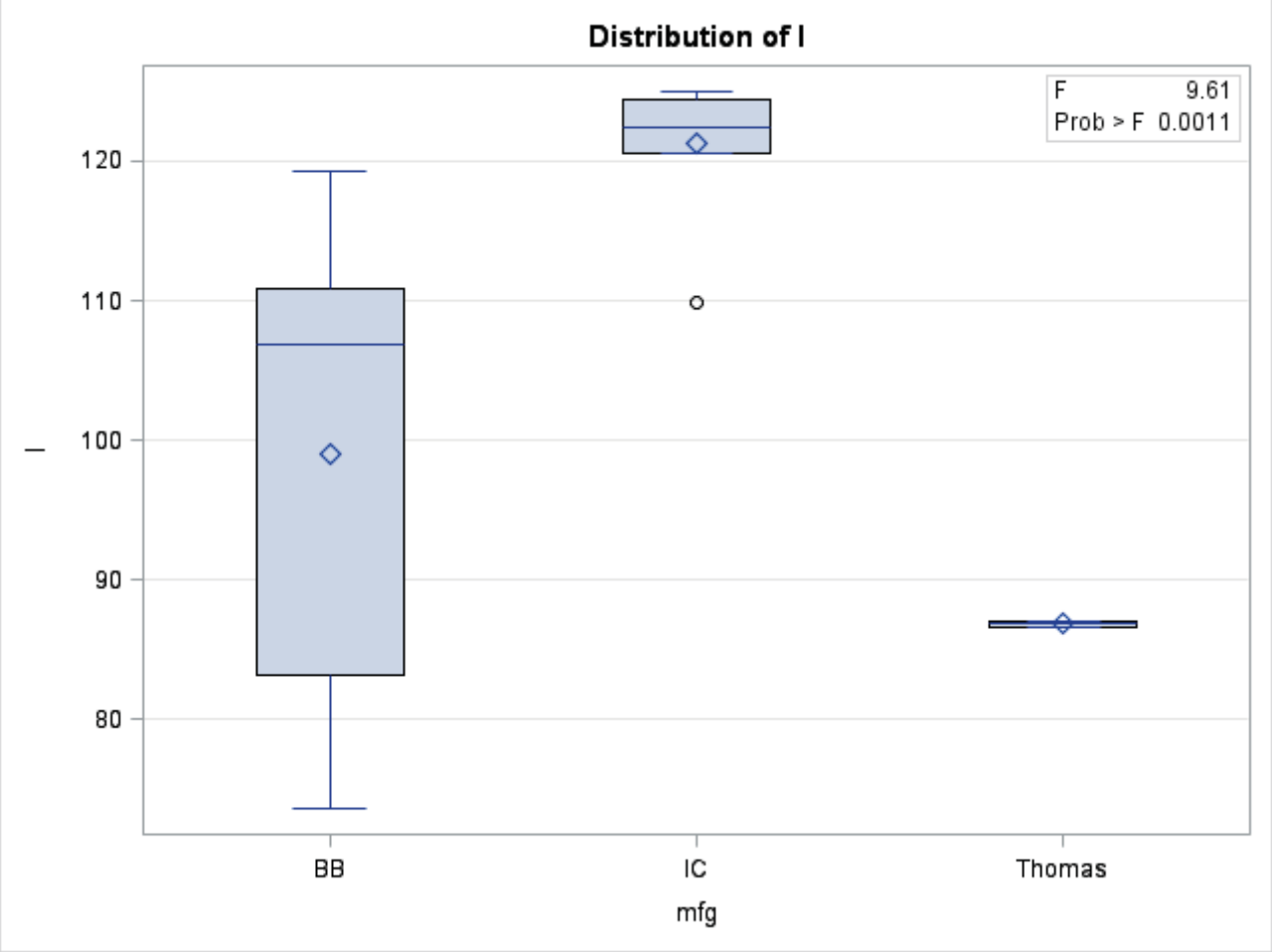
Comparisons significant at the 0.05 level were indicated by *.**

mfg Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
IC - BB	38.630	26.408	50.851	***
IC - Thomas	49.072	27.040	71.105	***
BB - IC	-38.630	-50.851	-26.408	***
BB - Thomas	10.442	-10.965	31.850	
Thomas - IC	-49.072	-71.105	-27.040	***
Thomas - BB	-10.442	-31.850	10.965	

Dependent Variable: I

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	3462.577564	1731.288782	9.61	0.0011
Error	21	3782.095769	180.099799		
Corrected Total	23	7244.673333			

R-Square	Coeff Var	Root MSE	I Mean
0.477948	12.61488	13.42013	106.3833



Scheffe's Test for I

Alpha	0.05
Error Degrees of Freedom	21
Error Mean Square	180.0998
Critical Value of F	3.46680

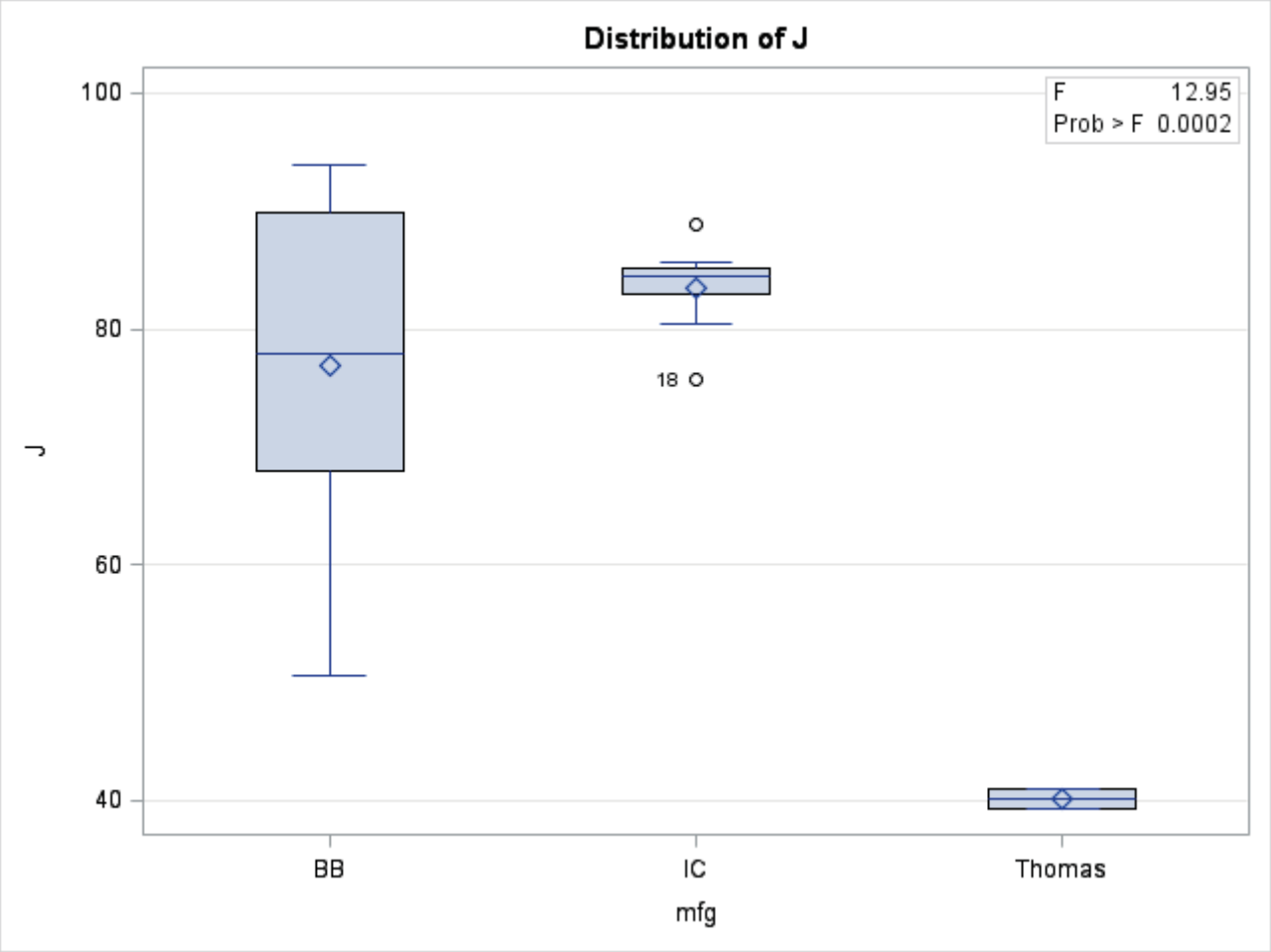
Comparisons significant at the 0.05 level were indicated by *.**

mfg Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
IC - BB	22.238	6.915	37.562	***
IC - Thomas	34.450	6.825	62.075	***
BB - IC	-22.238	-37.562	-6.915	***
BB - Thomas	12.212	-14.629	39.052	
Thomas - IC	-34.450	-62.075	-6.825	***
Thomas - BB	-12.212	-39.052	14.629	

Dependent Variable: J

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	3076.404103	1538.202051	12.95	0.0002
Error	21	2493.794231	118.752106		
Corrected Total	23	5570.198333			

R-Square	Coeff Var	Root MSE	J Mean
0.552297	14.28379	10.89734	76.29167



Scheffe's Test for J

Alpha	0.05
Error Degrees of Freedom	21
Error Mean Square	118.7521
Critical Value of F	3.46680

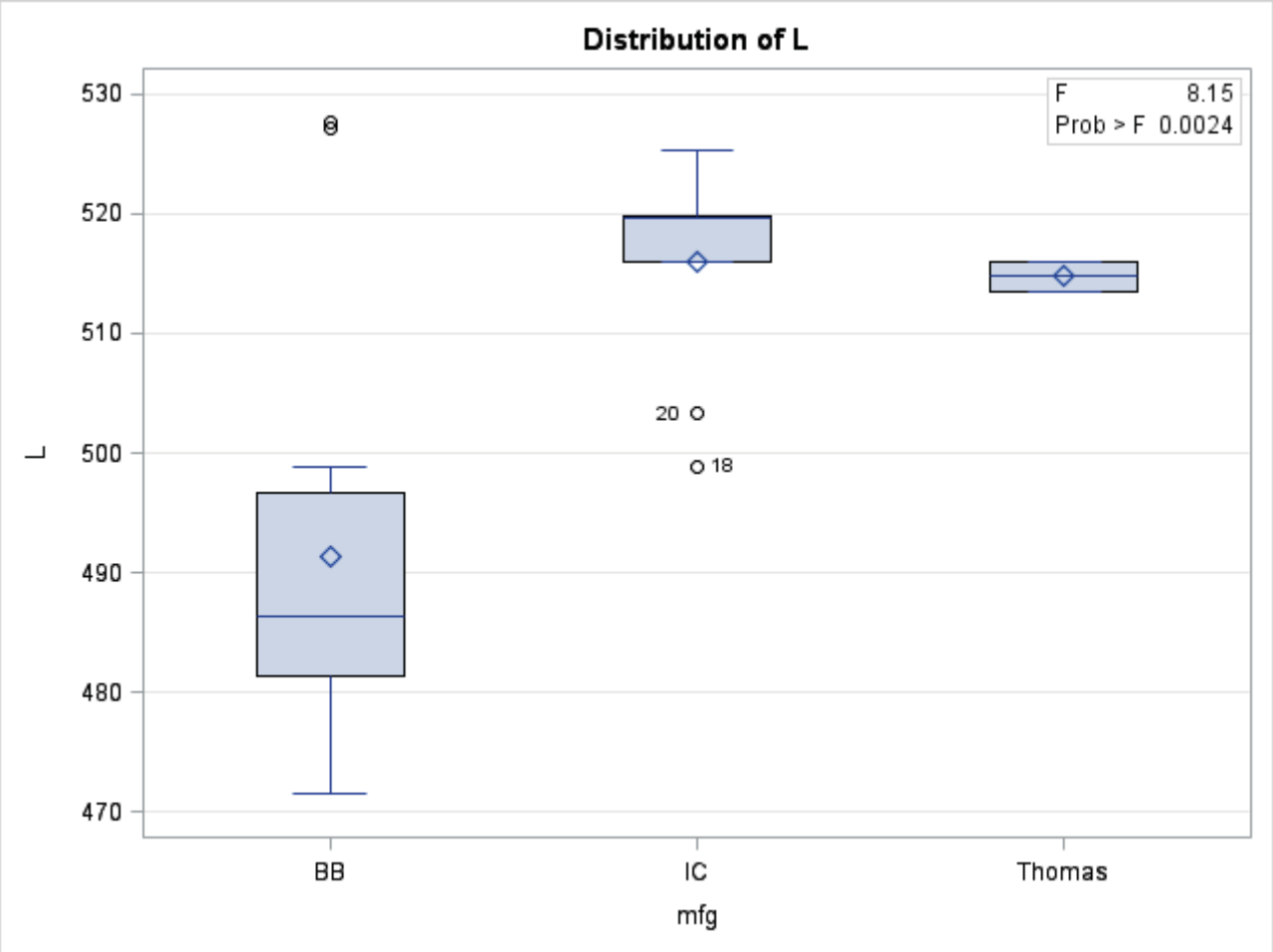
Comparisons significant at the 0.05 level were indicated by *.**

mfg Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
IC - BB	6.526	-5.917	18.968	
IC - Thomas	43.283	20.852	65.715	***
BB - IC	-6.526	-18.968	5.917	
BB - Thomas	36.758	14.963	58.553	***
Thomas - IC	-43.283	-65.715	-20.852	***
Thomas - BB	-36.758	-58.553	-14.963	***

Dependent Variable: L

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	3587.293333	1793.646667	8.15	0.0024
Error	21	4621.245000	220.059286		
Corrected Total	23	8208.538333			

R-Square	Coeff Var	Root MSE	L Mean
0.437020	2.951874	14.83440	502.5417



Scheffe's Test for L

Alpha	0.05
Error Degrees of Freedom	21
Error Mean Square	220.0593
Critical Value of F	3.46680

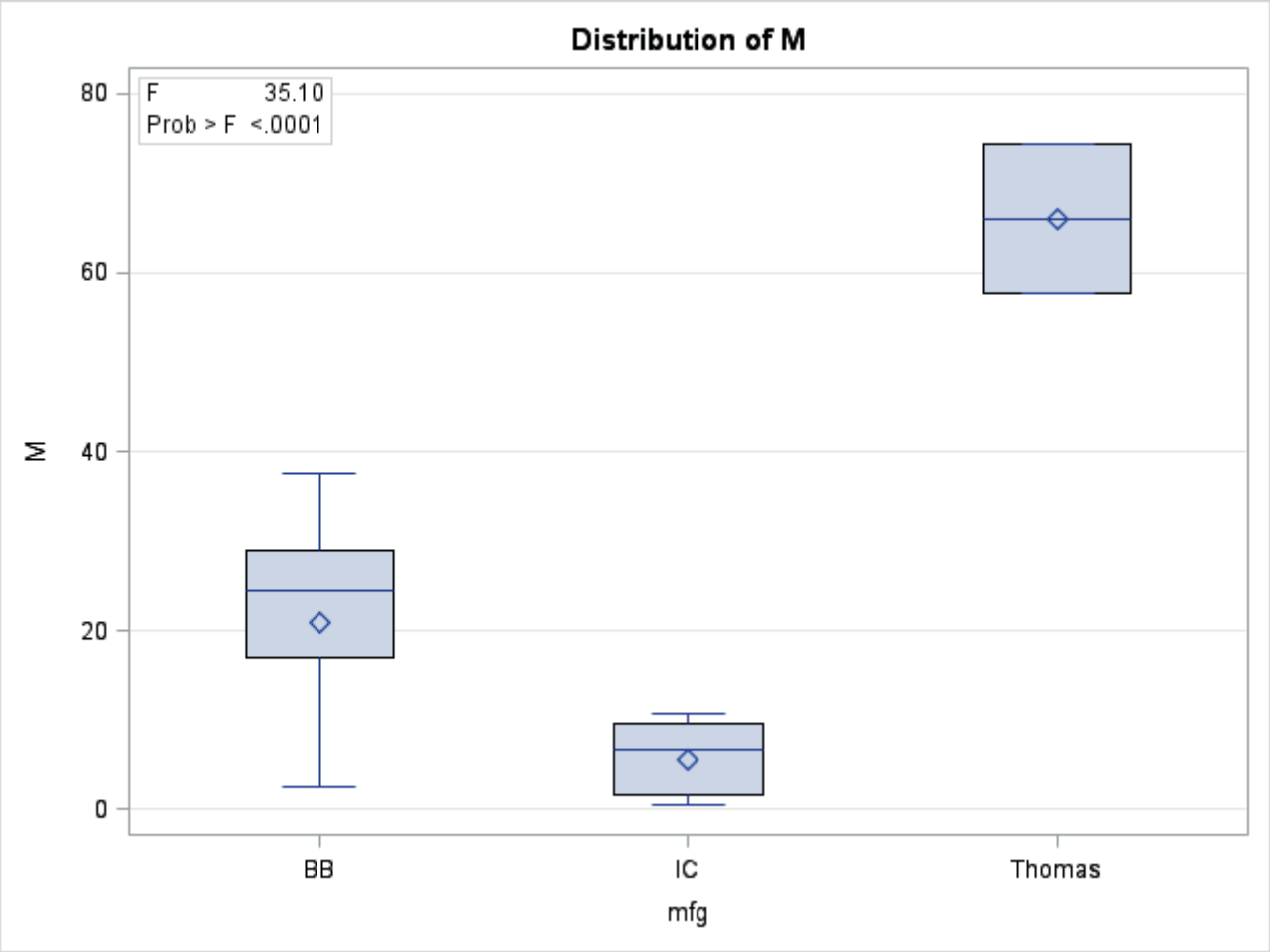
Comparisons significant at the 0.05 level were indicated by *.**

mfg Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
IC - Thomas	1.317	-29.219	31.852	
IC - BB	24.767	7.828	41.705	***
Thomas - IC	-1.317	-31.852	29.219	
Thomas - BB	23.450	-6.219	53.119	
BB - IC	-24.767	-41.705	-7.828	***
BB - Thomas	-23.450	-53.119	6.219	

Dependent Variable: M

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	6082.601752	3041.300876	35.10	<.0001
Error	21	1819.643248	86.649678		
Corrected Total	23	7902.245000			

R-Square	Coeff Var	Root MSE	M Mean
0.769731	49.05708	9.308581	18.97500



Scheffe's Test for M

Alpha	0.05
Error Degrees of Freedom	21
Error Mean Square	86.64968
Critical Value of F	3.46680

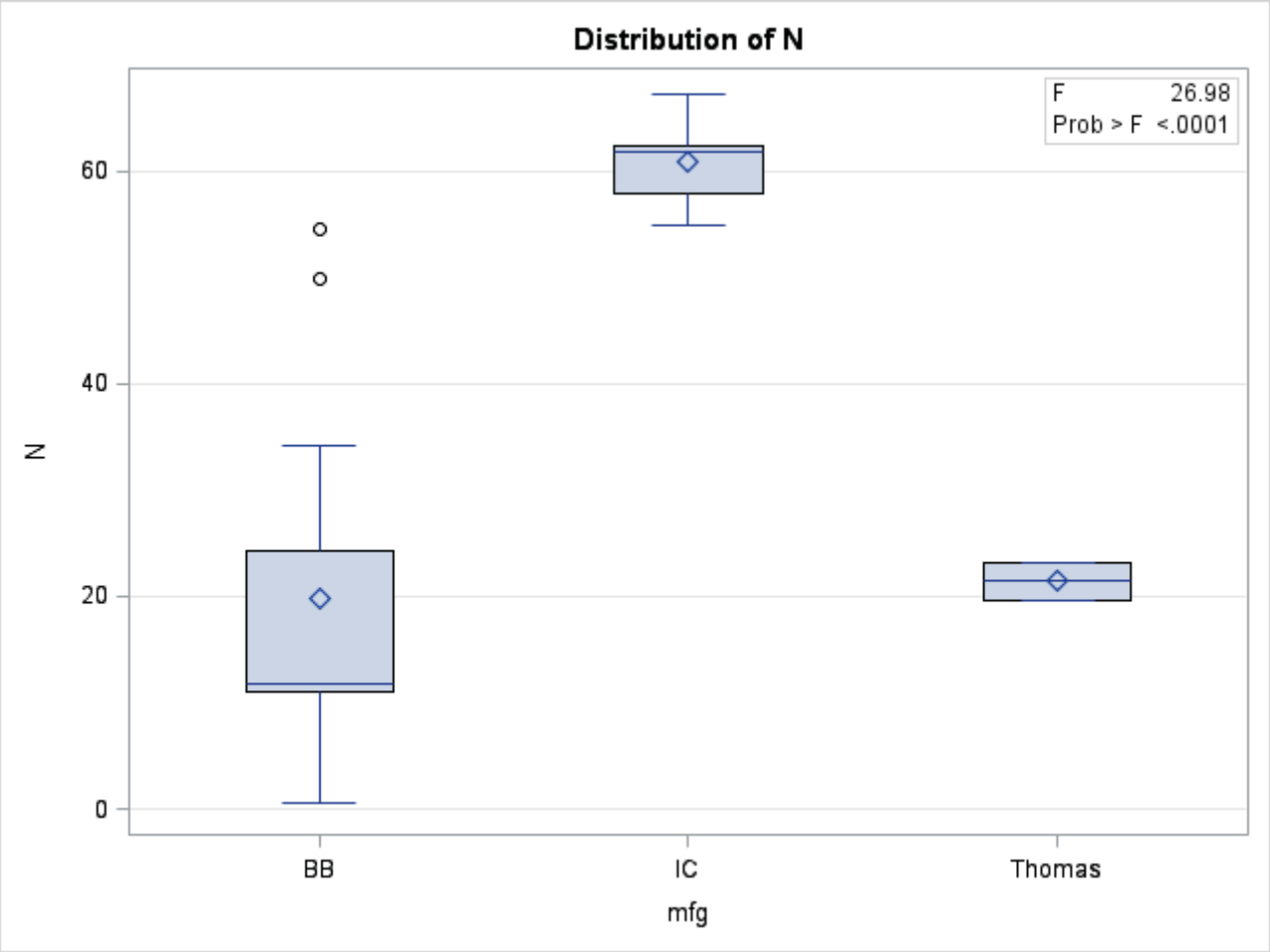
Comparisons significant at the 0.05 level were indicated by *.**

mfg Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Thomas - BB	45.169	26.552	63.787	***
Thomas - IC	60.422	41.261	79.583	***
BB - Thomas	-45.169	-63.787	-26.552	***
BB - IC	15.253	4.624	25.882	***
IC - Thomas	-60.422	-79.583	-41.261	***
IC - BB	-15.253	-25.882	-4.624	***

Dependent Variable: N

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	9361.50192	4680.75096	26.98	<.0001
Error	21	3643.76308	173.51253		
Corrected Total	23	13005.26500			

R-Square	Coeff Var	Root MSE	N Mean
0.719824	37.23651	13.17242	35.37500



Scheffe's Test for N

Alpha	0.05
Error Degrees of Freedom	21
Error Mean Square	173.5125
Critical Value of F	3.46680

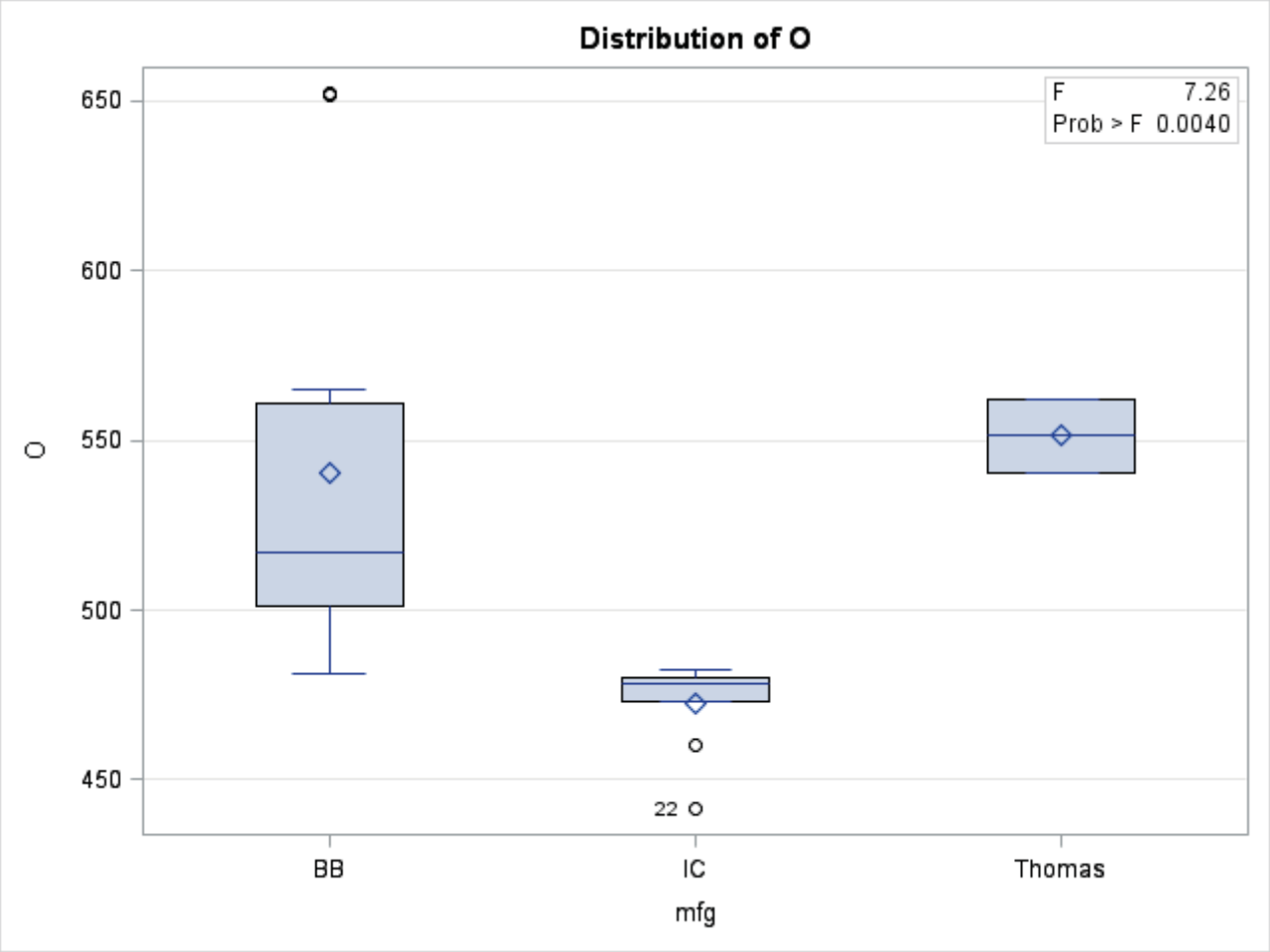
Comparisons significant at the 0.05 level were indicated by *.**

mfg Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
IC - Thomas	39.467	12.352	66.581	***
IC - BB	40.990	25.949	56.030	***
Thomas - IC	-39.467	-66.581	-12.352	***
Thomas - BB	1.523	-24.822	27.868	
BB - IC	-40.990	-56.030	-25.949	***
BB - Thomas	-1.523	-27.868	24.822	

Dependent Variable: O

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	27468.84085	13734.42043	7.26	0.0040
Error	21	39703.77248	1890.65583		
Corrected Total	23	67172.61333			

R-Square	Coeff Var	Root MSE	O Mean
0.408929	8.431038	43.48167	515.7333



Scheffe's Test for O

Alpha	0.05
Error Degrees of Freedom	21
Error Mean Square	1890.656
Critical Value of F	3.46680

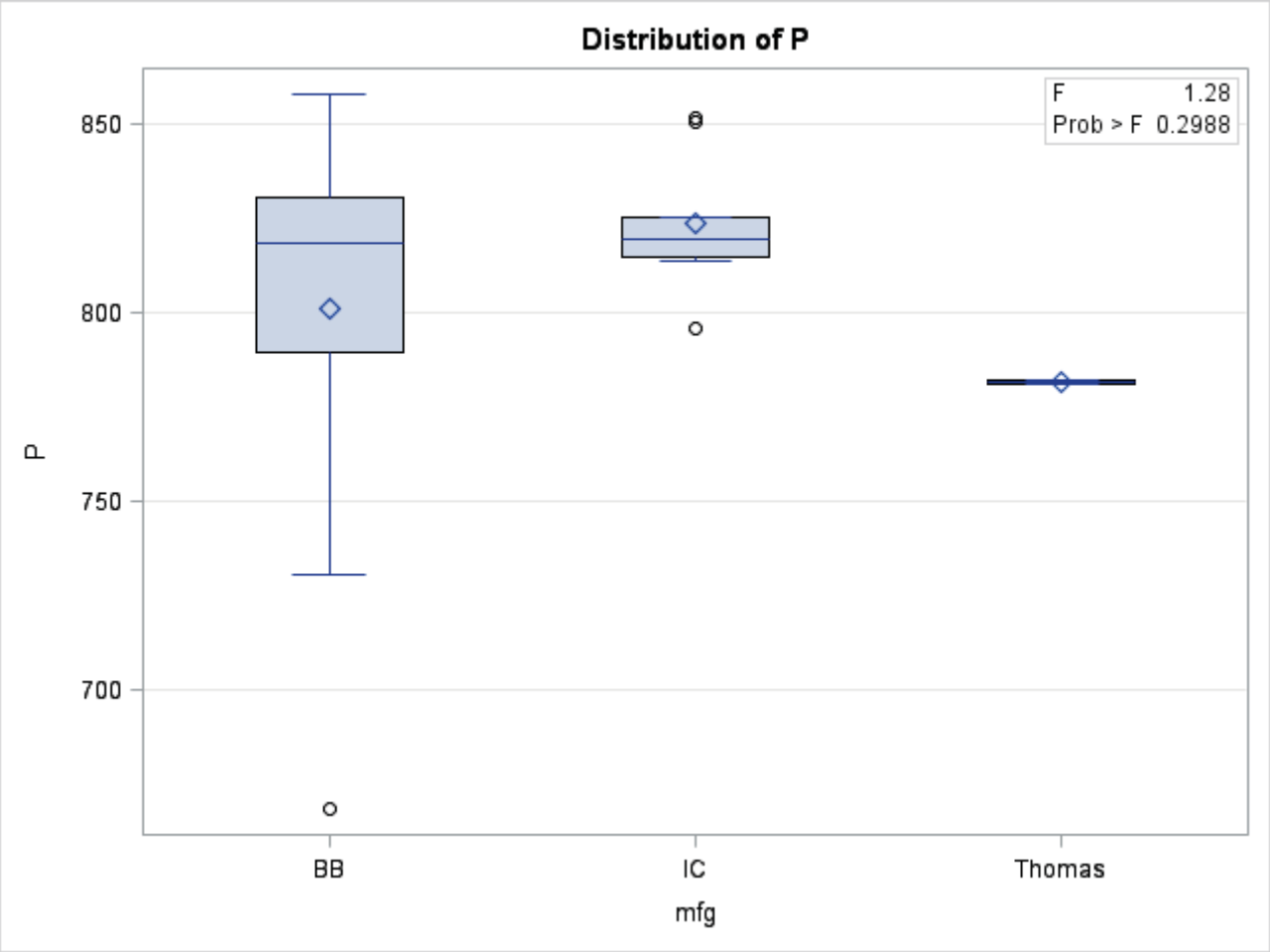
Comparisons significant at the 0.05 level were indicated by *.**

mfg Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Thomas - BB	10.92	-76.05	97.88	
Thomas - IC	79.08	-10.43	168.58	
BB - Thomas	-10.92	-97.88	76.05	
BB - IC	68.16	18.51	117.81	***
IC - Thomas	-79.08	-168.58	10.43	
IC - BB	-68.16	-117.81	-18.51	***

Dependent Variable: P

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	4237.09377	2118.54689	1.28	0.2988
Error	21	34751.82581	1654.84885		
Corrected Total	23	38988.91958			

R-Square	Coeff Var	Root MSE	P Mean
0.108674	5.034347	40.67983	808.0458



Scheffe's Test for P

Alpha	0.05
Error Degrees of Freedom	21
Error Mean Square	1654.849
Critical Value of F	3.46680

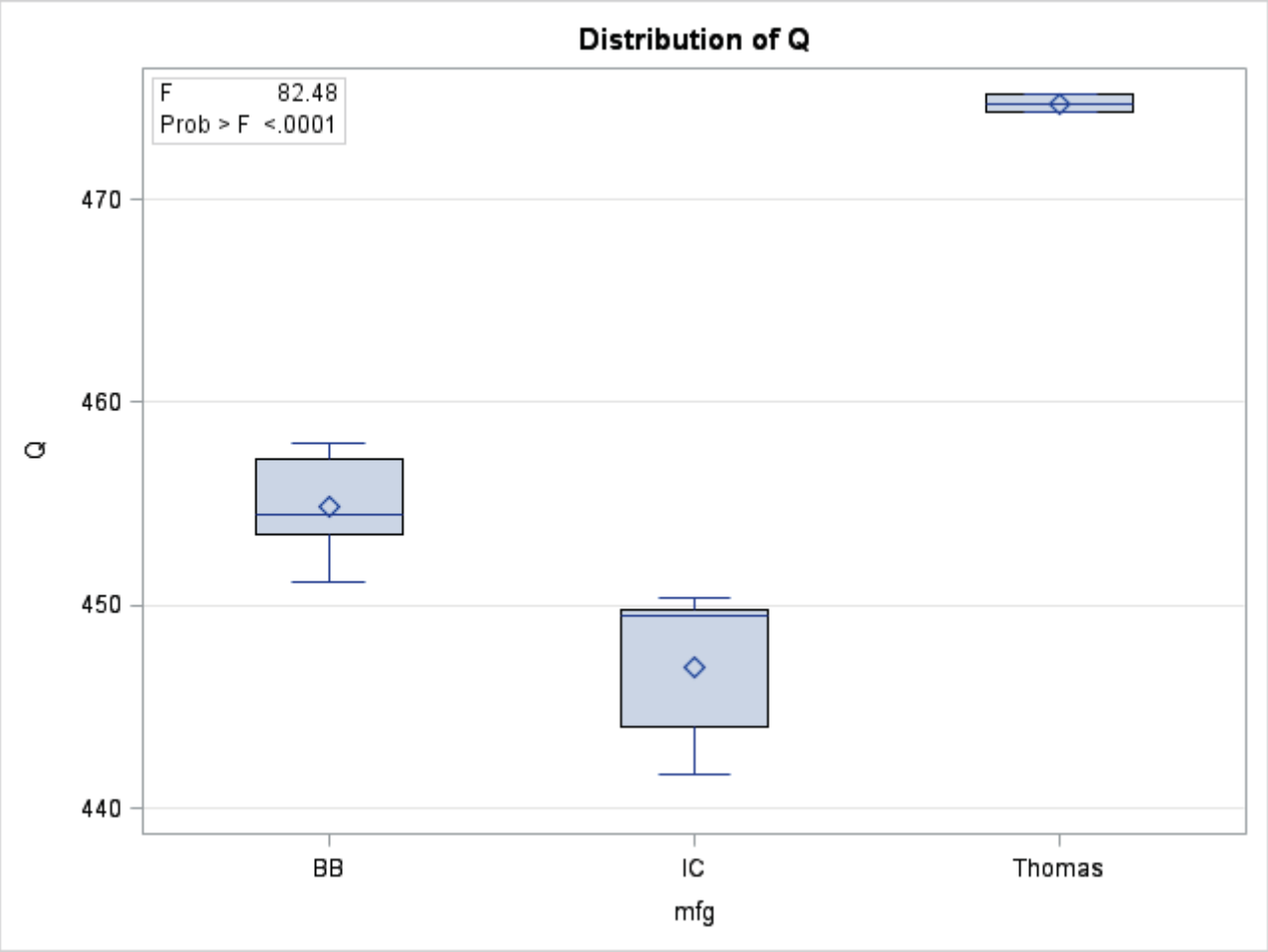
Comparisons significant at the 0.05 level were indicated by *.**

mfg Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
IC - BB	22.63	-23.82	69.08
IC - Thomas	42.11	-41.63	125.85
BB - IC	-22.63	-69.08	23.82
BB - Thomas	19.48	-61.88	100.85
Thomas - IC	-42.11	-125.85	41.63
Thomas - BB	-19.48	-100.85	61.88

Dependent Variable: Q

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	1312.883419	656.441709	82.48	<.0001
Error	21	167.134915	7.958805		
Corrected Total	23	1480.018333			

R-Square	Coeff Var	Root MSE	Q Mean
0.887072	0.622001	2.821135	453.5583



Scheffe's Test for Q

Alpha	0.05
Error Degrees of Freedom	21
Error Mean Square	7.958805
Critical Value of F	3.46680

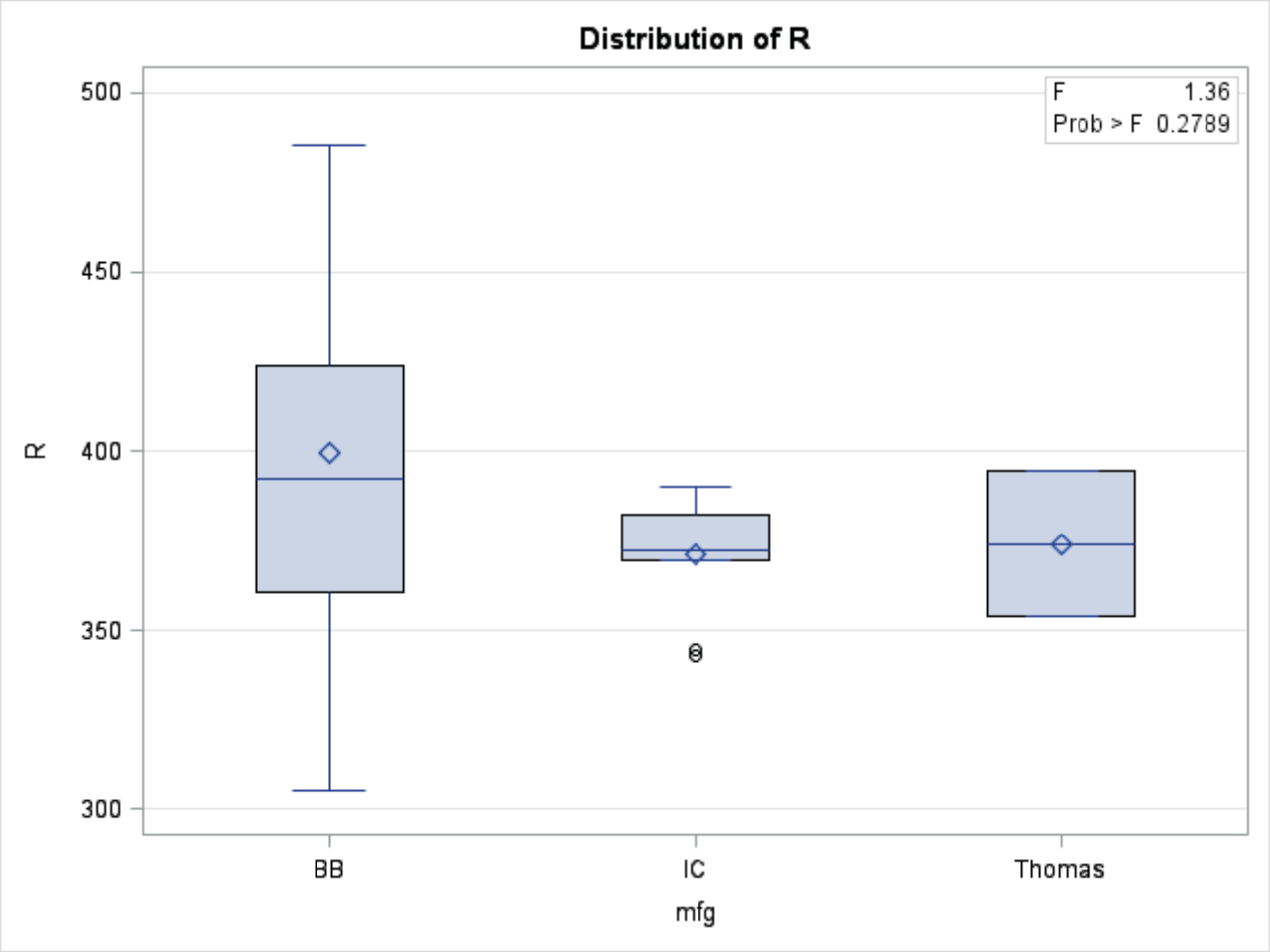
Comparisons significant at the 0.05 level were indicated by *.**

mfg Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Thomas - BB	19.881	14.238	25.523	***
Thomas - IC	27.794	21.987	33.602	***
BB - Thomas	-19.881	-25.523	-14.238	***
BB - IC	7.914	4.692	11.135	***
IC - Thomas	-27.794	-33.602	-21.987	***
IC - BB	-7.914	-11.135	-4.692	***

Dependent Variable: R

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	4706.71688	2353.35844	1.36	0.2789
Error	21	36402.93645	1733.47316		
Corrected Total	23	41109.65333			

R-Square	Coeff Var	Root MSE	R Mean
0.114492	10.76582	41.63500	386.7333



Scheffe's Test for R

Alpha	0.05
Error Degrees of Freedom	21
Error Mean Square	1733.473
Critical Value of F	3.46680

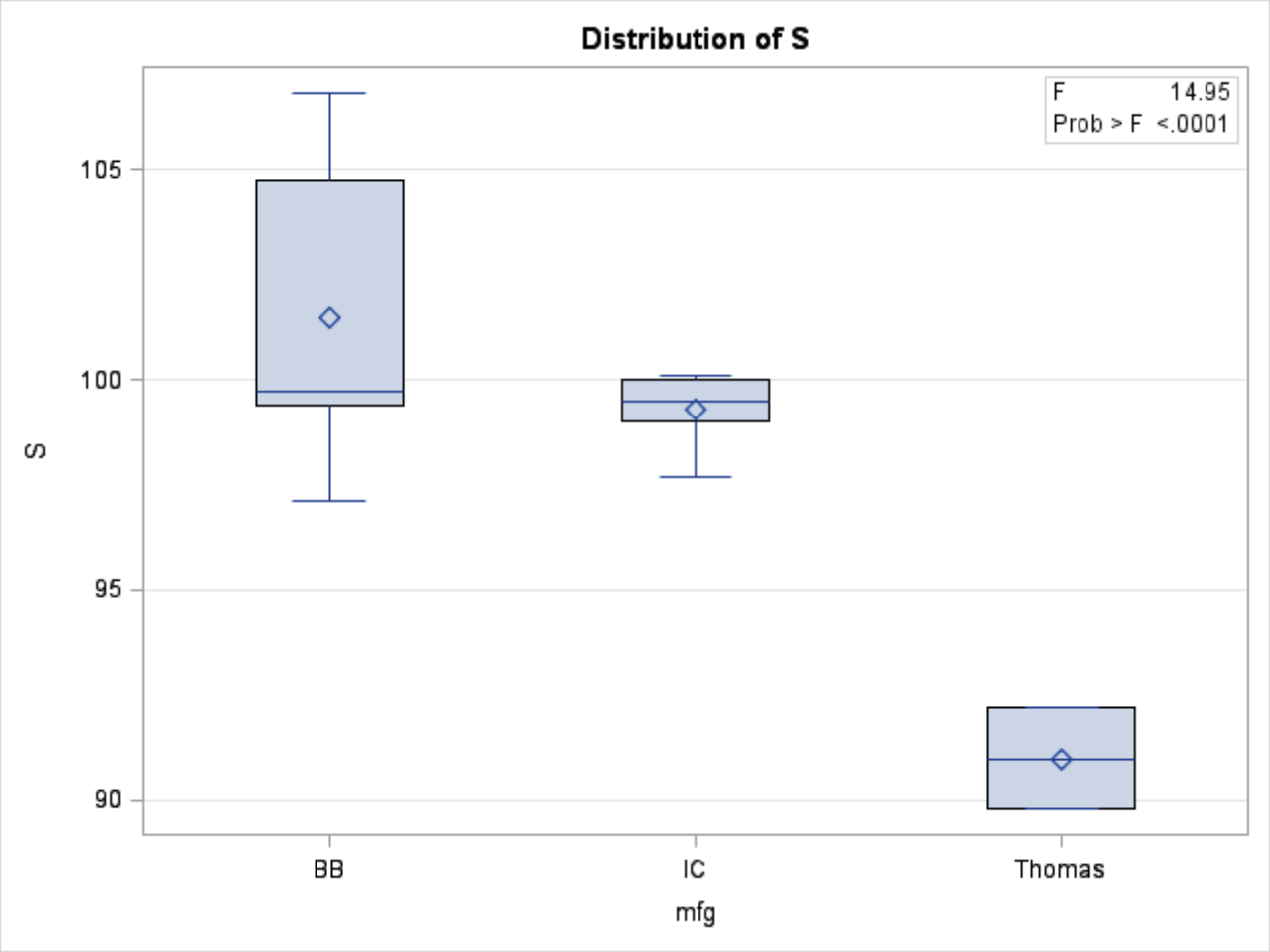
Comparisons significant at the 0.05 level were indicated by *.**

mfg Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
BB - Thomas	25.44	-57.83	108.71
BB - IC	28.64	-18.90	76.18
Thomas - BB	-25.44	-108.71	57.83
Thomas - IC	3.19	-82.51	88.90
IC - BB	-28.64	-76.18	18.90
IC - Thomas	-3.19	-88.90	82.51

Dependent Variable: S

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	193.9237714	96.9618857	14.95	<.0001
Error	21	136.2458120	6.4878958		
Corrected Total	23	330.1695833			

R-Square	Coeff Var	Root MSE	S Mean
0.587346	2.552346	2.547135	99.79583



Scheffe's Test for S

Alpha	0.05
Error Degrees of Freedom	21
Error Mean Square	6.487896
Critical Value of F	3.46680

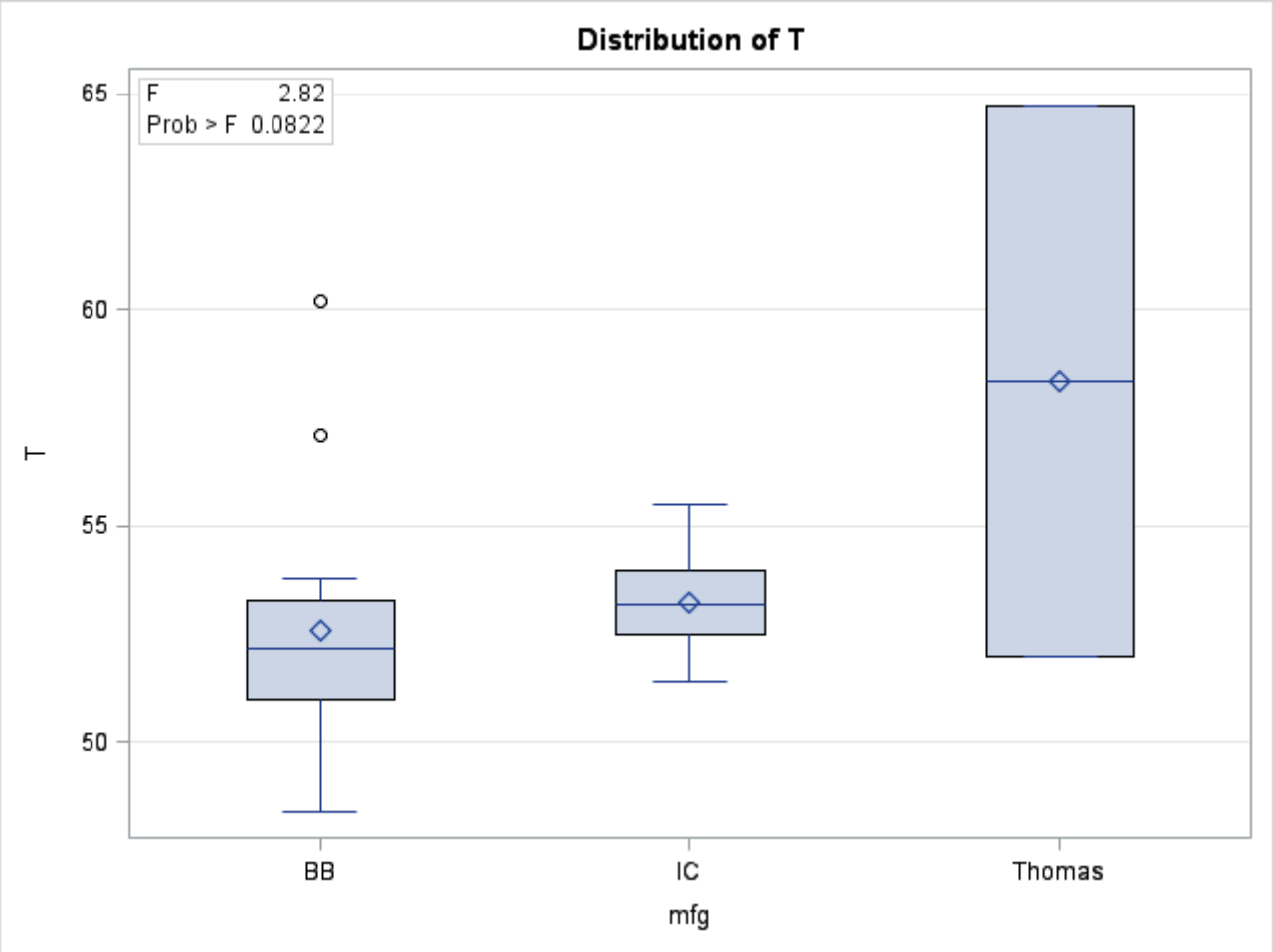
Comparisons significant at the 0.05 level were indicated by *.**

mfg Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
BB - IC	2.1735	-0.7349	5.0819	
BB - Thomas	10.4846	5.3902	15.5790	***
IC - BB	-2.1735	-5.0819	0.7349	
IC - Thomas	8.3111	3.0680	13.5543	***
Thomas - BB	-10.4846	-15.5790	-5.3902	***
Thomas - IC	-8.3111	-13.5543	-3.0680	***

Dependent Variable: T

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	57.3923611	28.6961806	2.82	0.0822
Error	21	213.6672222	10.1746296		
Corrected Total	23	271.0595833			

R-Square	Coeff Var	Root MSE	T Mean
0.211733	5.982220	3.189770	53.32083



Scheffe's Test for T

Alpha	0.05
Error Degrees of Freedom	21
Error Mean Square	10.17463
Critical Value of F	3.46680

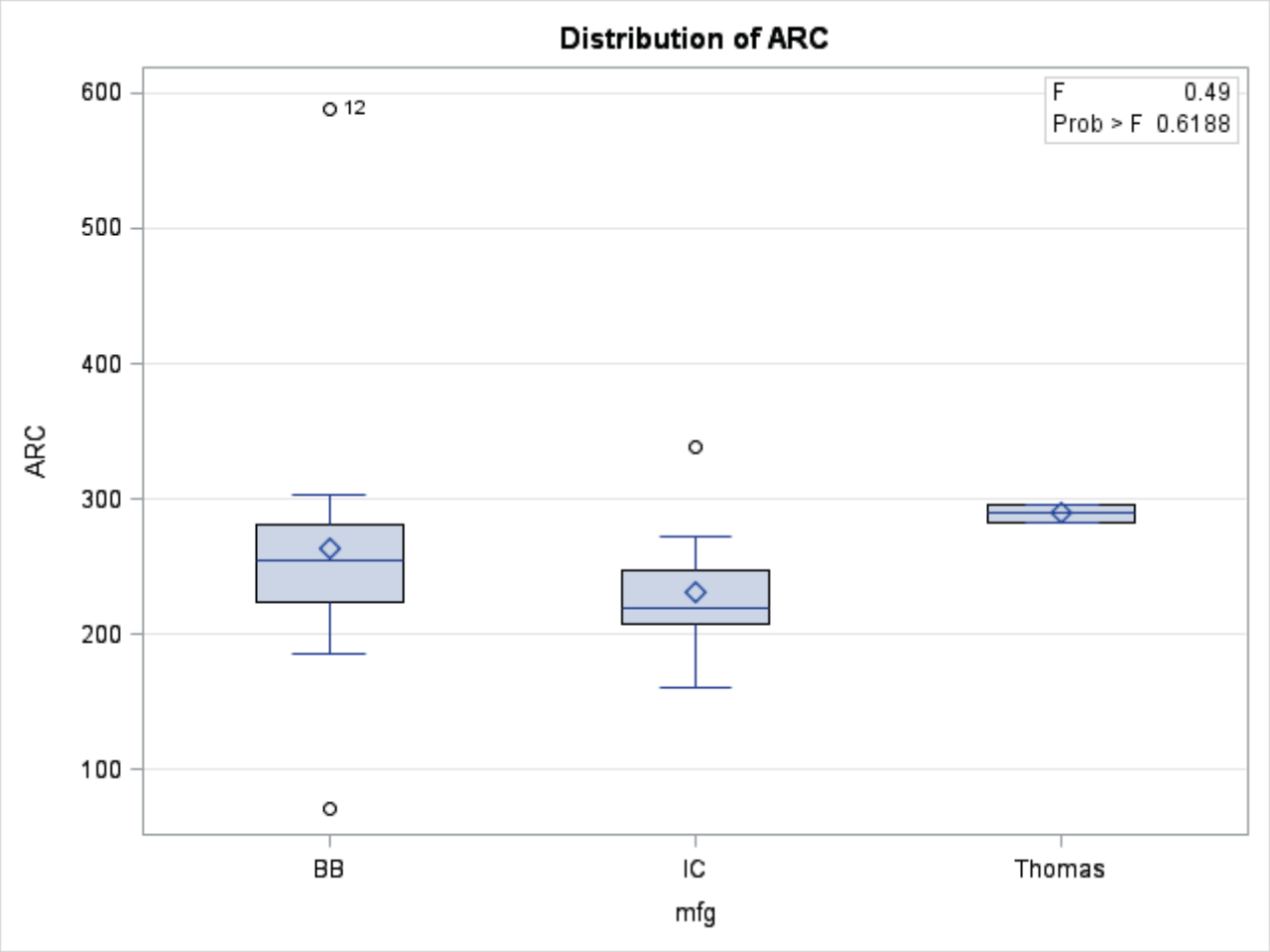
Comparisons significant at the 0.05 level were indicated by *.**

mfg Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
Thomas - IC	5.106	-1.460	11.672
Thomas - BB	5.750	-0.630	12.130
IC - Thomas	-5.106	-11.672	1.460
IC - BB	0.644	-2.998	4.287
BB - Thomas	-5.750	-12.130	0.630
BB - IC	-0.644	-4.287	2.998

Dependent Variable: ARC

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	8296.5655	4148.2827	0.49	0.6188
Error	21	177353.0329	8445.3825		
Corrected Total	23	185649.5983			

R-Square	Coeff Var	Root MSE	ARC Mean
0.044689	36.23649	91.89876	253.6083



Scheffe's Test for ARC

Alpha	0.05
Error Degrees of Freedom	21
Error Mean Square	8445.383
Critical Value of F	3.46680

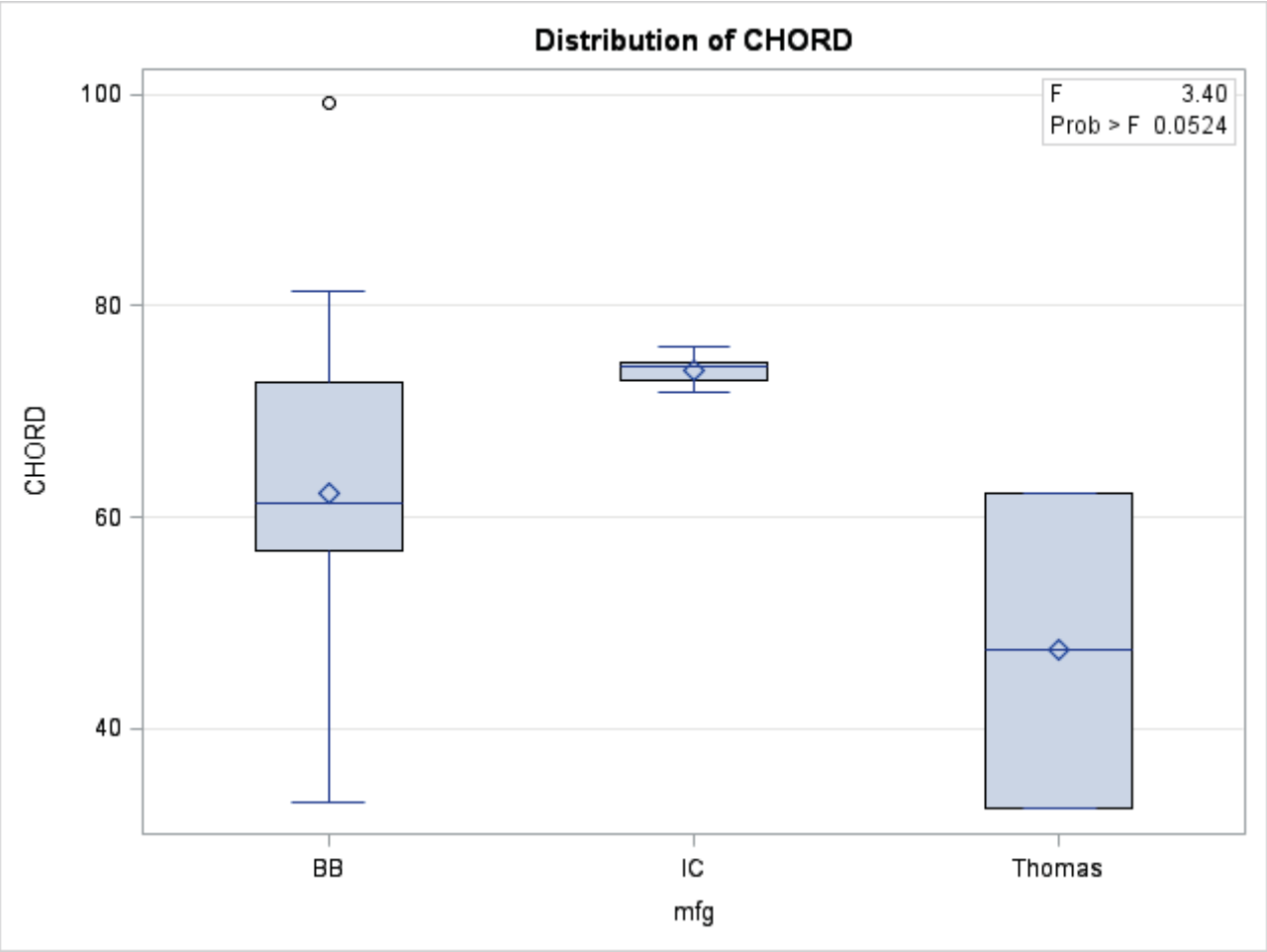
Comparisons significant at the 0.05 level were indicated by *.**

mfg Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
Thomas - BB	25.70	-158.10	209.50
Thomas - IC	57.93	-131.24	247.10
BB - Thomas	-25.70	-209.50	158.10
BB - IC	32.23	-72.70	137.16
IC - Thomas	-57.93	-247.10	131.24
IC - BB	-32.23	-137.16	72.70

Dependent Variable: CHORD

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	1439.513558	719.756779	3.40	0.0524
Error	21	4440.052692	211.431081		
Corrected Total	23	5879.566250			

R-Square	Coeff Var	Root MSE	CHORD Mean
0.244833	22.22919	14.54067	65.41250



Scheffe's Test for CHORD

Alpha	0.05
Error Degrees of Freedom	21
Error Mean Square	211.4311
Critical Value of F	3.46680

Comparisons significant at the 0.05 level were indicated by *.**

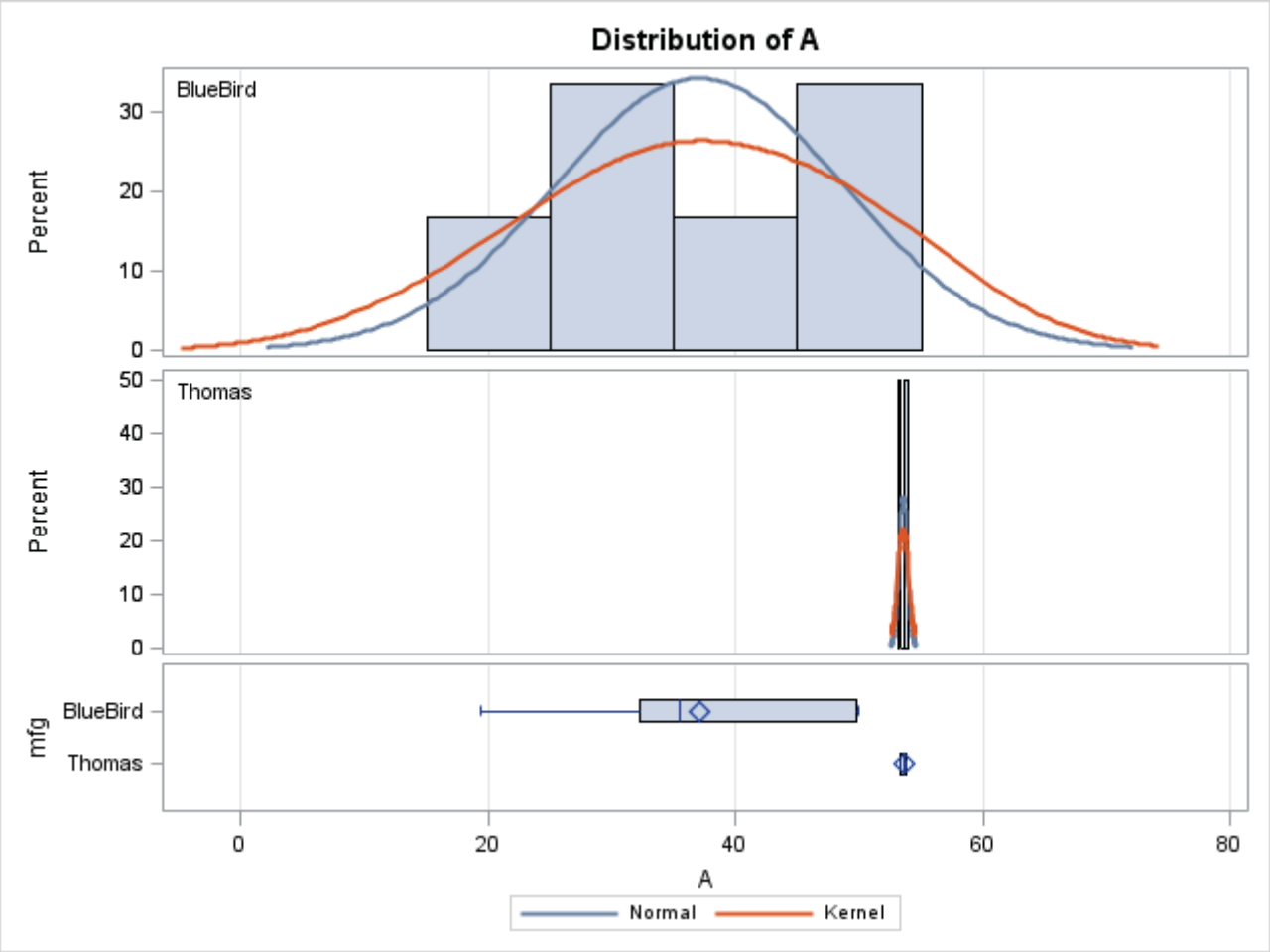
mfg Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
IC - BB	11.697	-4.905	28.300
IC - Thomas	26.617	-3.315	56.548
BB - IC	-11.697	-28.300	4.905
BB - Thomas	14.919	-14.163	44.001
Thomas - IC	-26.617	-56.548	3.315
Thomas - BB	-14.919	-44.001	14.163

9. Appendix D - *T* Test Comparison of Type D Buses by Manufacturer

Variable: A

mfg	N	Mean	Std Dev	Std Err	Minimum	Maximum
BlueBird	6	37.0333	11.6845	4.7702	19.3000	50.0000
Thomas	2	53.5500	0.3536	0.2500	53.3000	53.8000
Diff (1-2)		-16.5167	10.6674	8.7099		

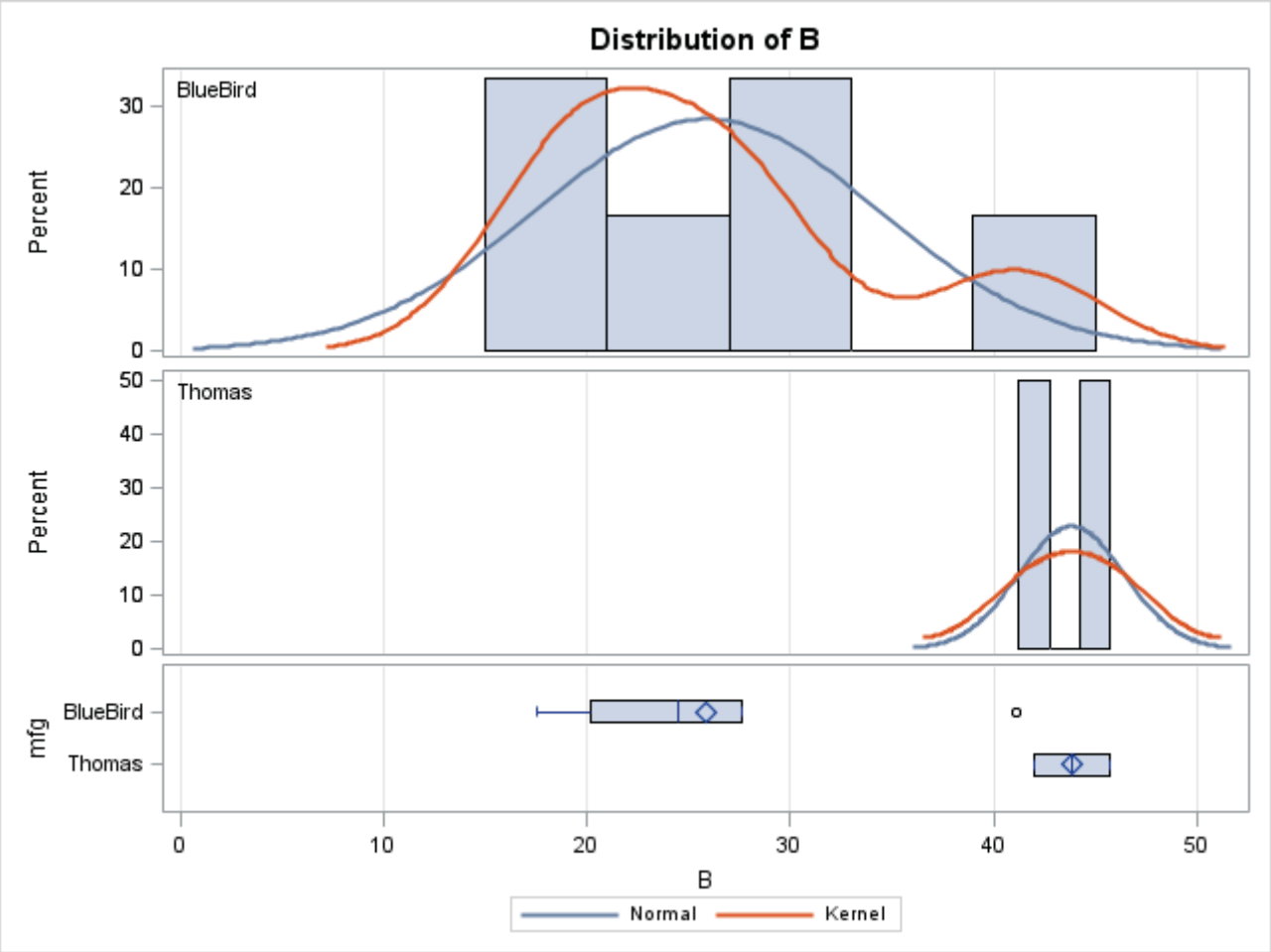
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	6	-1.90	0.1067
Satterthwaite	Unequal	5.0273	-3.46	0.0179



Variable: B

mfg	N	Mean	Std Dev	Std Err	Minimum	Maximum
BlueBird	6	25.9000	8.4318	3.4423	17.5000	41.1000
Thomas	2	43.8500	2.6163	1.8500	42.0000	45.7000
Diff (1-2)		-17.9500	7.7709	6.3449		

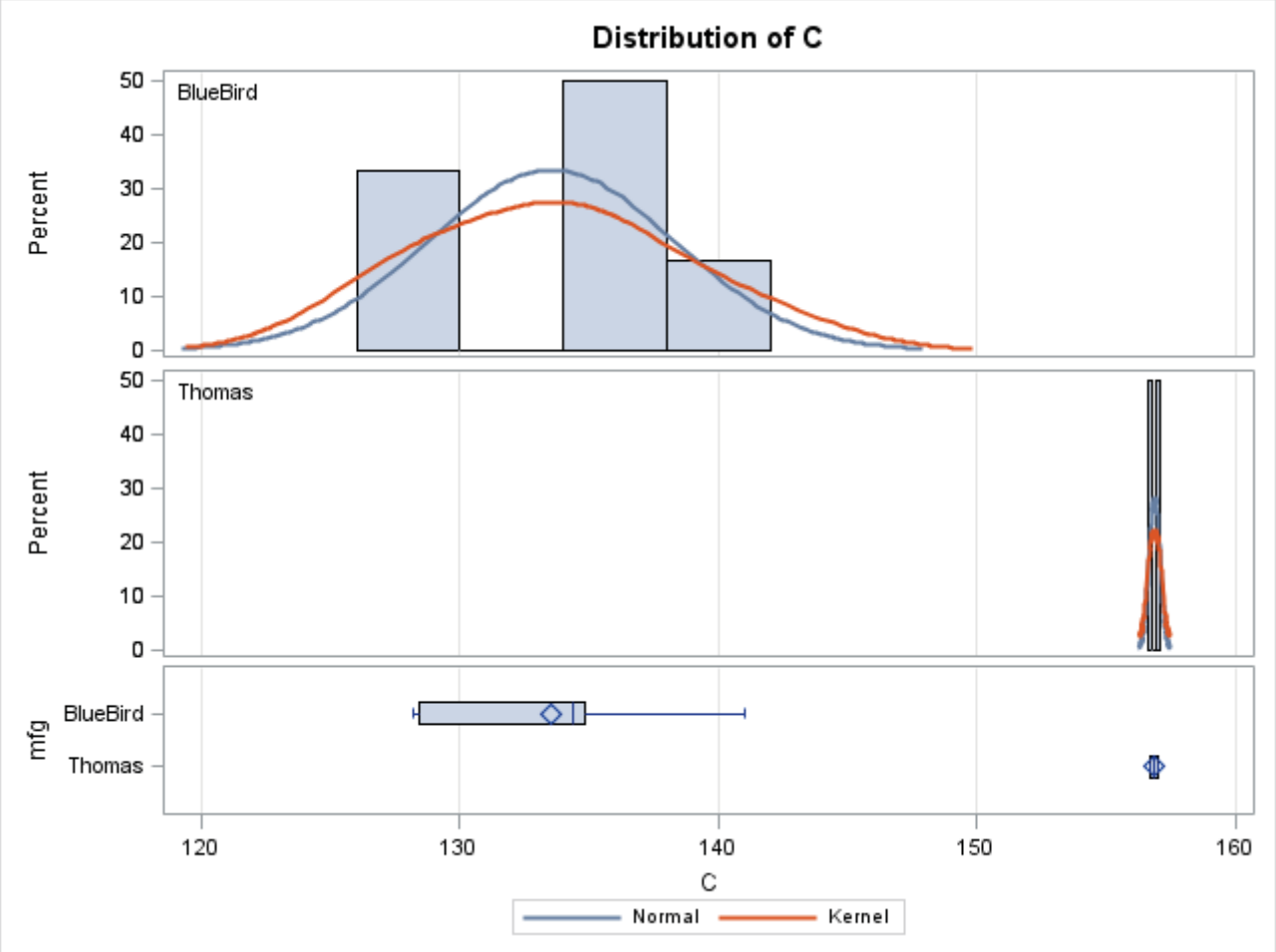
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	6	-2.83	0.0300
Satterthwaite	Unequal	5.8608	-4.59	0.0039



Variable: C

mfg	N	Mean	Std Dev	Std Err	Minimum	Maximum
BlueBird	6	133.5	4.7693	1.9471	128.2	141.0
Thomas	2	156.9	0.2121	0.1500	156.7	157.0
Diff (1-2)		-23.3167	4.3547	3.5556		

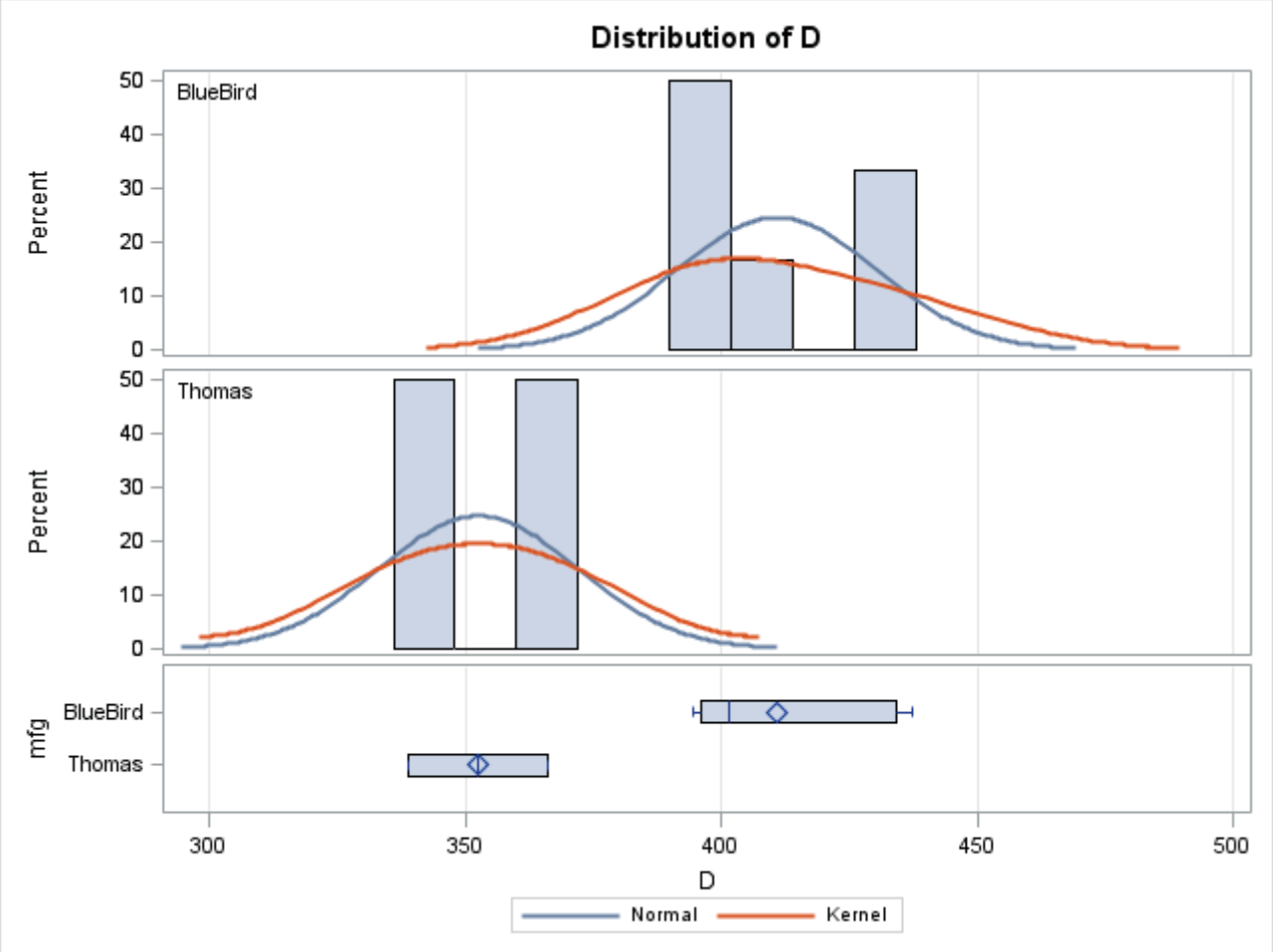
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	6	-6.56	0.0006
Satterthwaite	Unequal	5.0586	-11.94	<.0001



Variable: D

mfg	N	Mean	Std Dev	Std Err	Minimum	Maximum
BlueBird	6	410.9	19.5002	7.9609	394.5	437.3
Thomas	2	352.6	19.3747	13.7000	338.9	366.3
Diff (1-2)		58.2667	19.4794	15.9048		

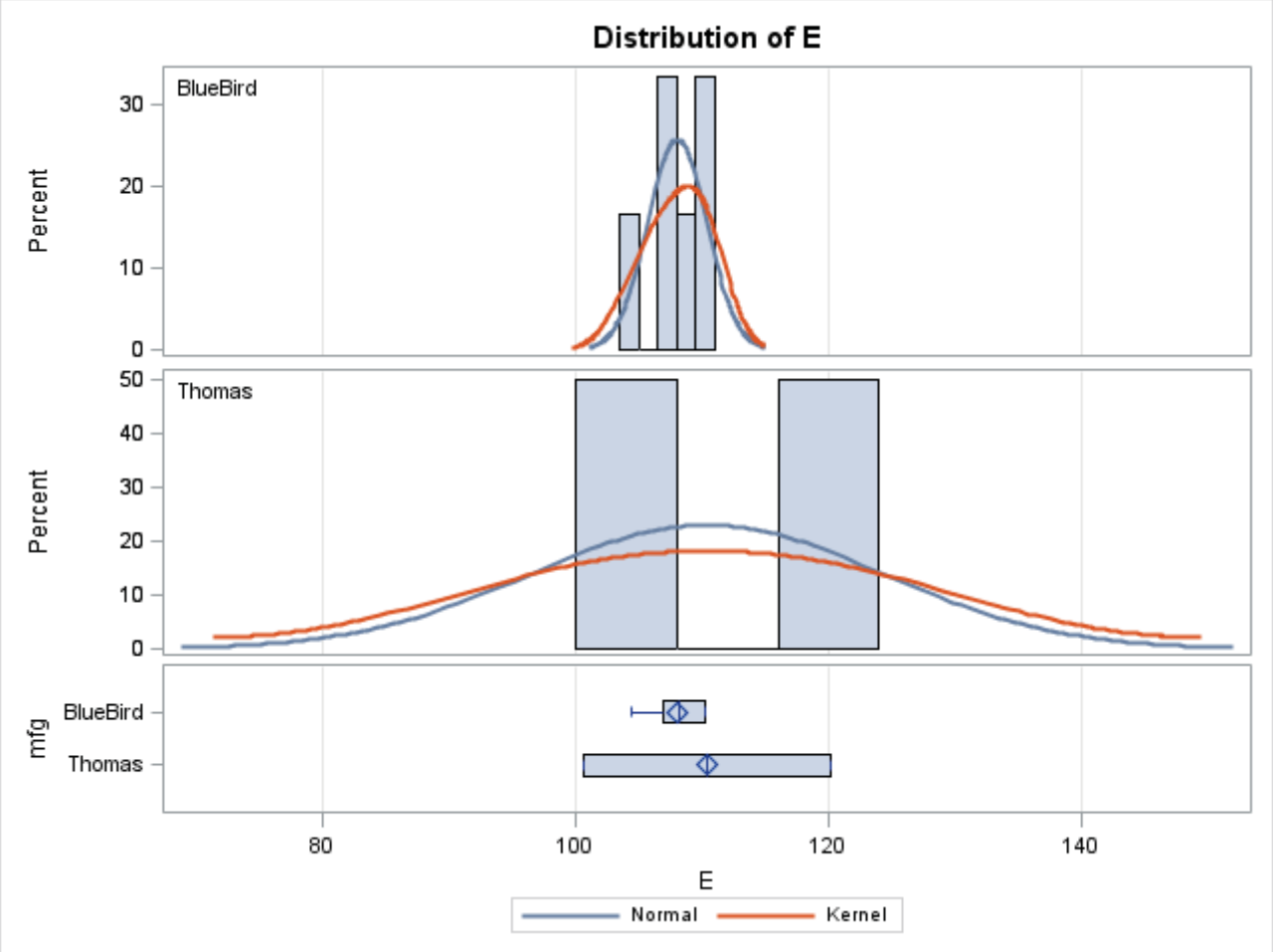
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	6	3.66	0.0105
Satterthwaite	Unequal	1.7495	3.68	0.0813



Variable: E

mfg	N	Mean	Std Dev	Std Err	Minimum	Maximum
BlueBird	6	108.1	2.3339	0.9528	104.4	110.3
Thomas	2	110.4	13.8593	9.8000	100.6	120.2
Diff (1-2)		-2.3500	6.0459	4.9364		

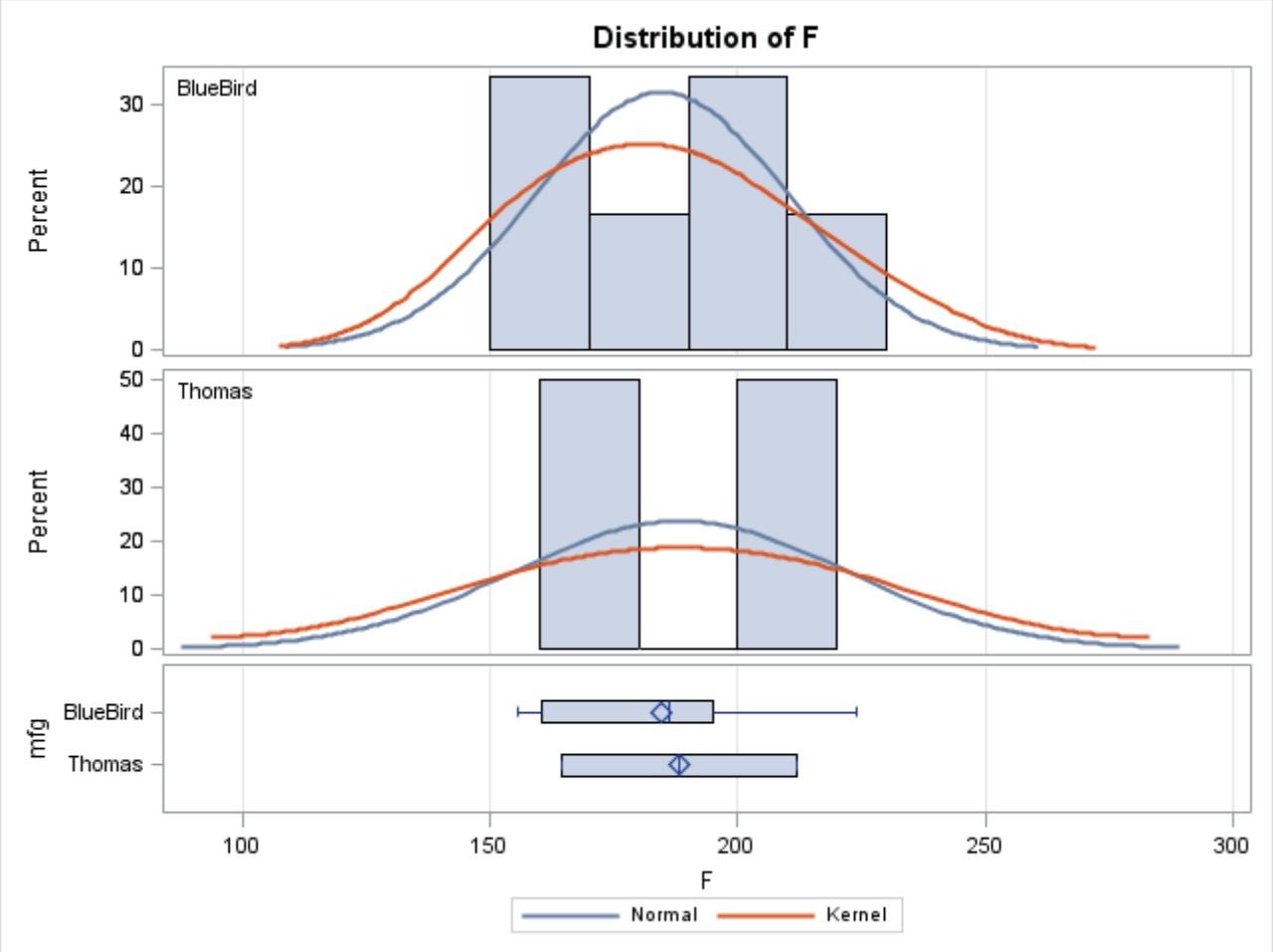
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	6	-0.48	0.6509
Satterthwaite	Unequal	1.019	-0.24	0.8503



Variable: F

mfg	N	Mean	Std Dev	Std Err	Minimum	Maximum
BlueBird	6	184.6	25.3822	10.3623	155.5	224.1
Thomas	2	188.4	33.5876	23.7500	164.6	212.1
Diff (1-2)		-3.7667	26.9240	21.9834		

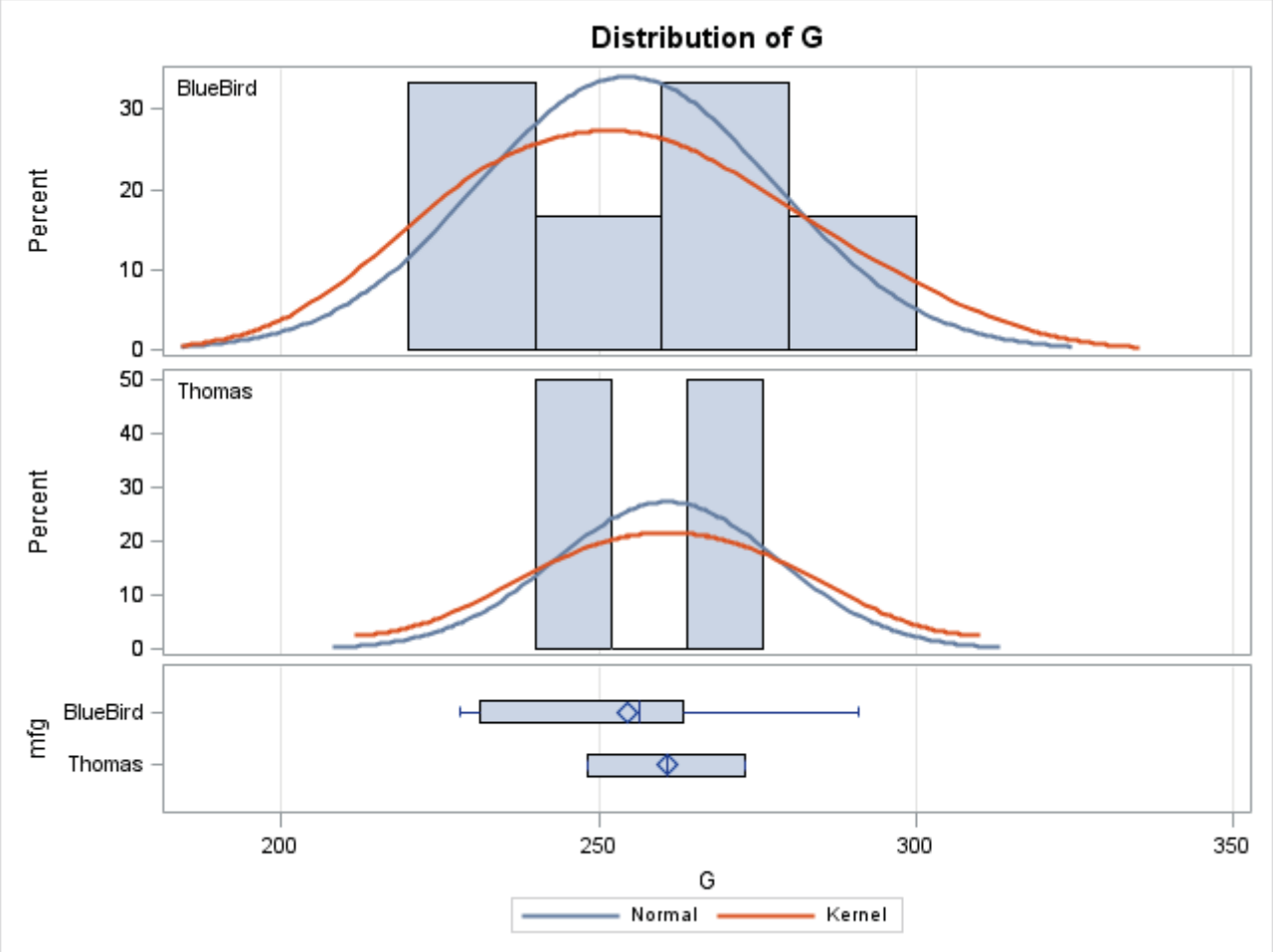
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	6	-0.17	0.8696
Satterthwaite	Unequal	1.4068	-0.15	0.9025



Variable: G

mfg	N	Mean	Std Dev	Std Err	Minimum	Maximum
BlueBird	6	254.4	23.4047	9.5549	228.3	291.1
Thomas	2	260.8	17.5362	12.4000	248.4	273.2
Diff (1-2)		-6.3667	22.5330	18.3981		

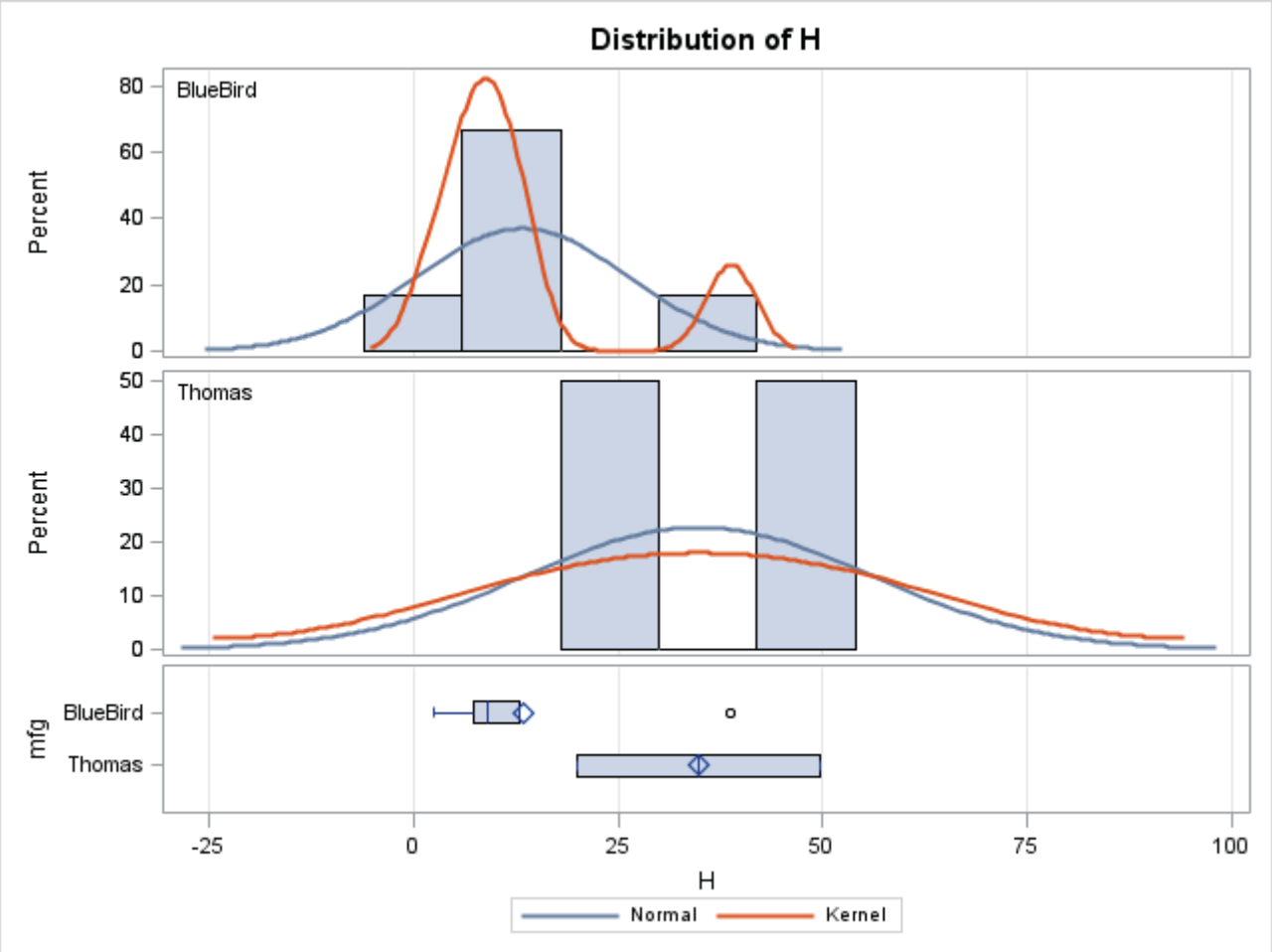
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	6	-0.35	0.7411
Satterthwaite	Unequal	2.3728	-0.41	0.7180



Variable: H

mfg	N	Mean	Std Dev	Std Err	Minimum	Maximum
BlueBird	6	13.3333	12.9617	5.2916	2.6000	38.8000
Thomas	2	34.8000	21.0718	14.9000	19.9000	49.7000
Diff (1-2)		-21.4667	14.6290	11.9446		

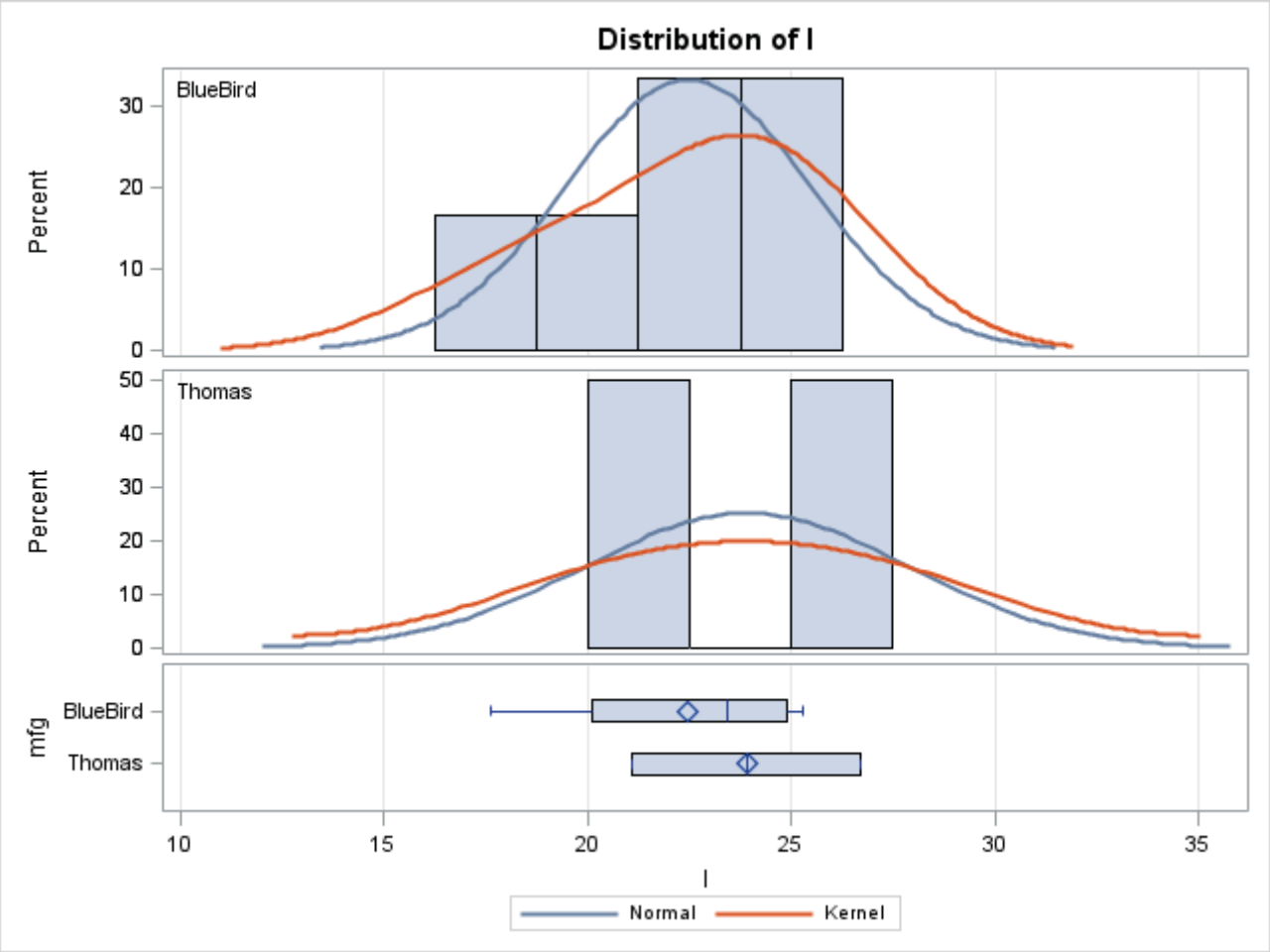
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	6	-1.80	0.1224
Satterthwaite	Unequal	1.2641	-1.36	0.3674



Variable: l

mfg	N	Mean	Std Dev	Std Err	Minimum	Maximum
BlueBird	6	22.4667	3.0071	1.2276	17.6000	25.3000
Thomas	2	23.9000	3.9598	2.8000	21.1000	26.7000
Diff (1-2)		-1.4333	3.1857	2.6011		

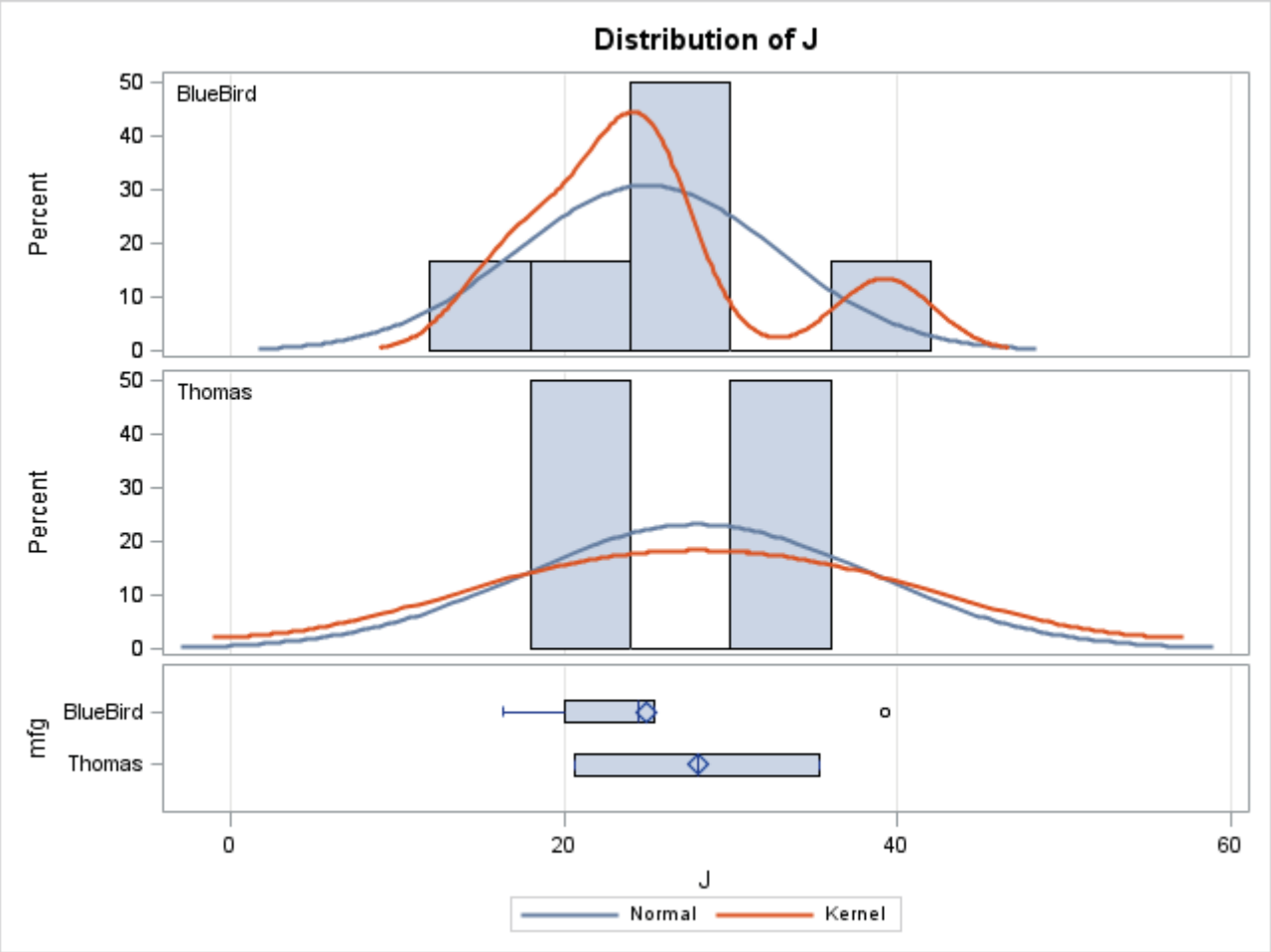
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	6	-0.55	0.6015
Satterthwaite	Unequal	1.411	-0.47	0.7014



Variable: J

mfg	N	Mean	Std Dev	Std Err	Minimum	Maximum
BlueBird	6	24.9833	7.7652	3.1701	16.4000	39.2000
Thomas	2	28.0000	10.3238	7.3000	20.7000	35.3000
Diff (1-2)		-3.0167	8.2469	6.7336		

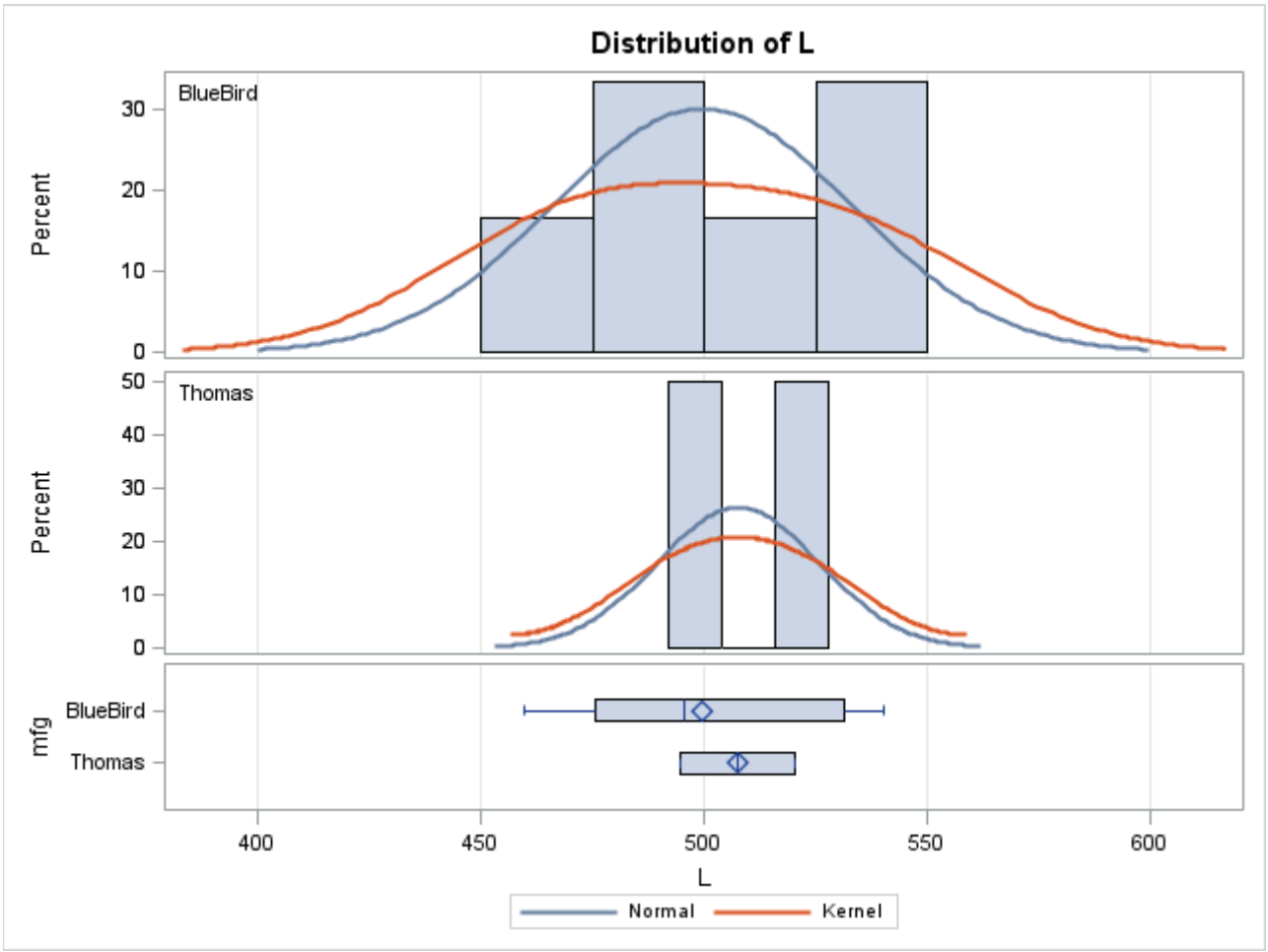
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	6	-0.45	0.6699
Satterthwaite	Unequal	1.4028	-0.38	0.7541



Variable: L

mfg	N	Mean	Std Dev	Std Err	Minimum	Maximum
BlueBird	6	499.7	33.2576	13.5774	459.5	540.4
Thomas	2	507.7	18.1726	12.8500	494.8	520.5
Diff (1-2)		-8.0000	31.2533	25.5182		

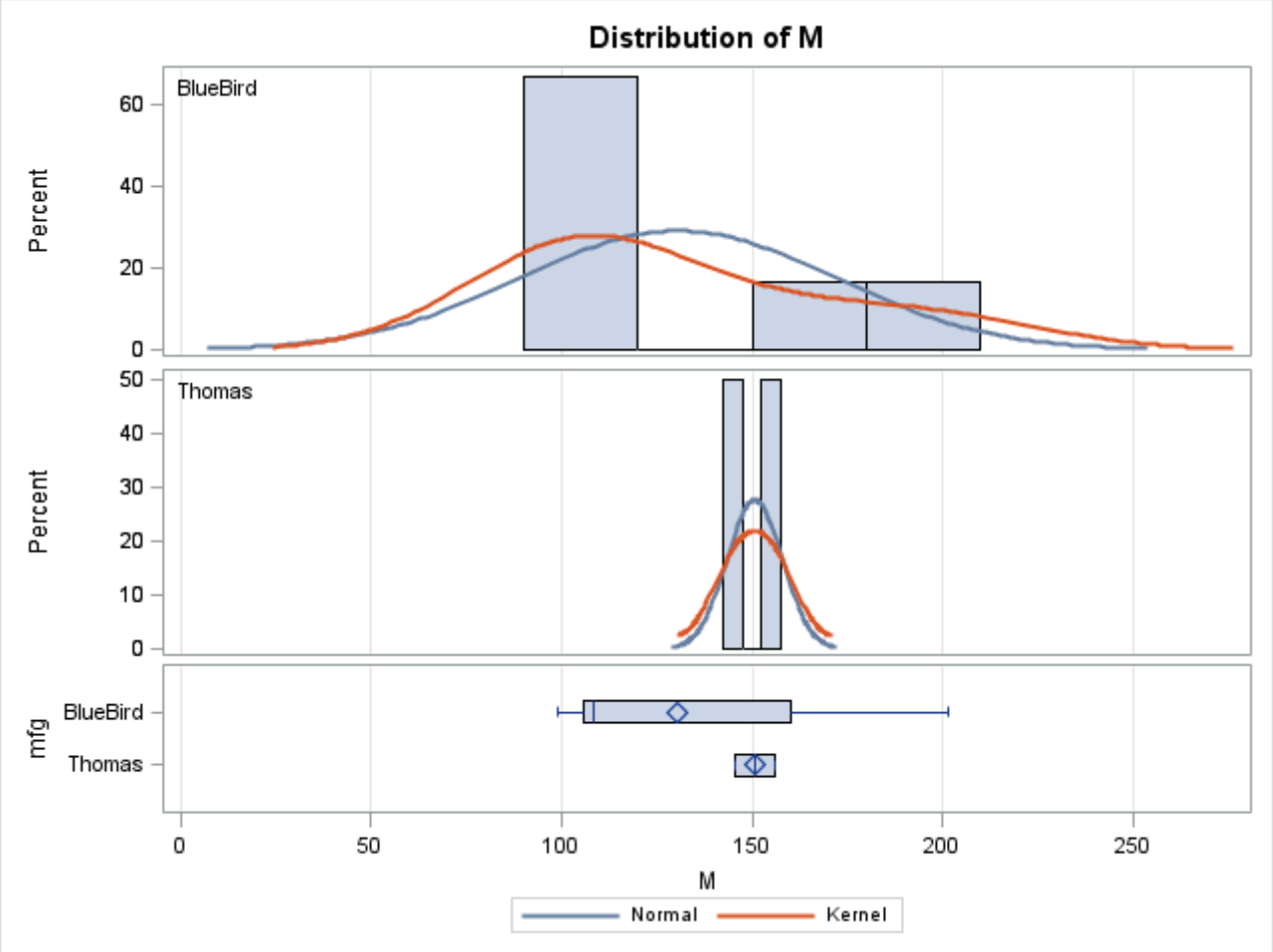
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	6	-0.31	0.7645
Satterthwaite	Unequal	3.5854	-0.43	0.6931



Variable: M

mfg	N	Mean	Std Dev	Std Err	Minimum	Maximum
BlueBird	6	130.4	41.1609	16.8039	99.0000	201.2
Thomas	2	150.6	7.2125	5.1000	145.5	155.7
Diff (1-2)		-20.2167	37.6898	30.7736		

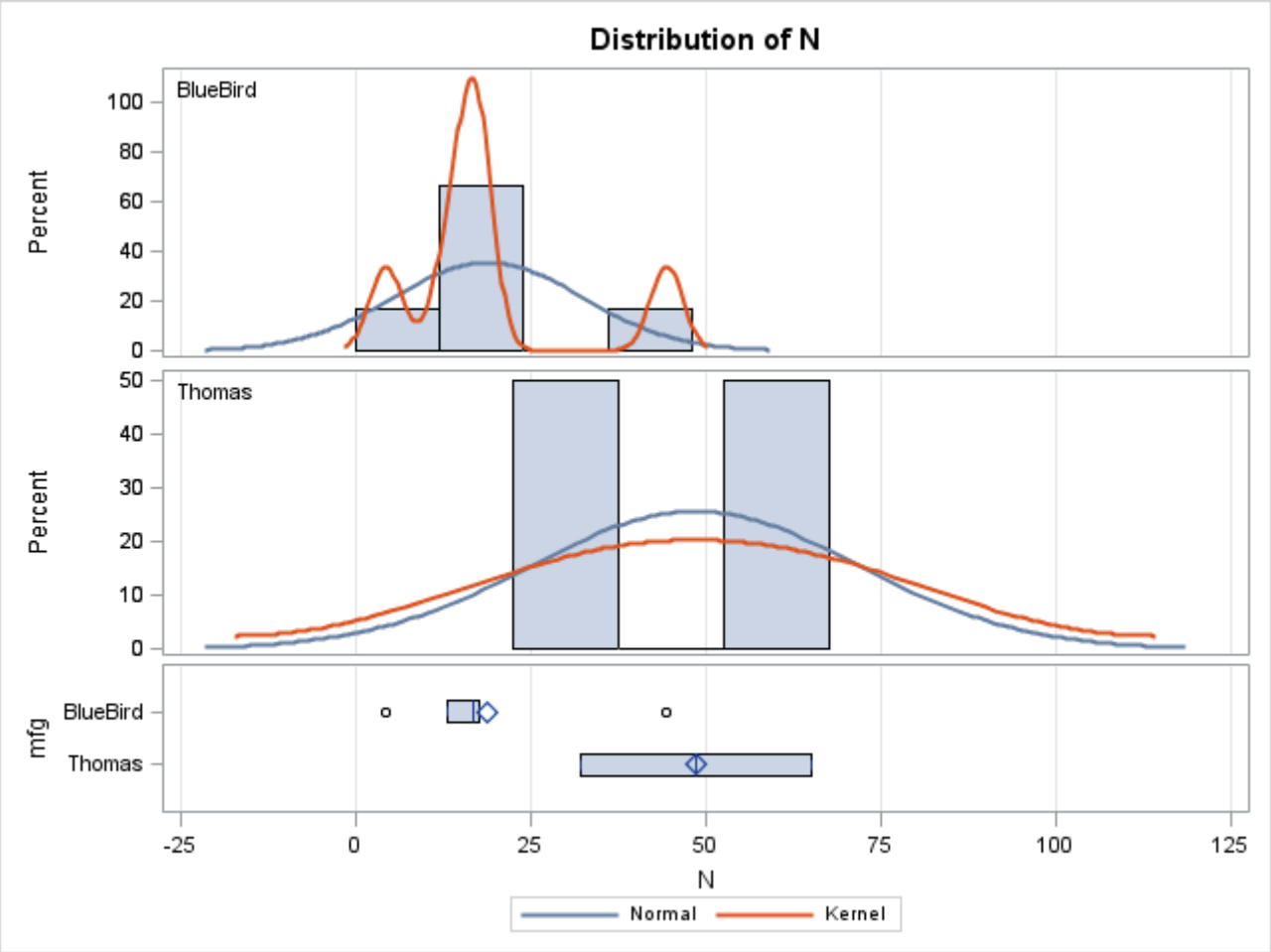
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	6	-0.66	0.5356
Satterthwaite	Unequal	5.7209	-1.15	0.2955



Variable: N

mfg	N	Mean	Std Dev	Std Err	Minimum	Maximum
BlueBird	6	18.8333	13.4683	5.4984	4.3000	44.4000
Thomas	2	48.5000	23.3345	16.5000	32.0000	65.0000
Diff (1-2)		-29.6667	15.5535	12.6994		

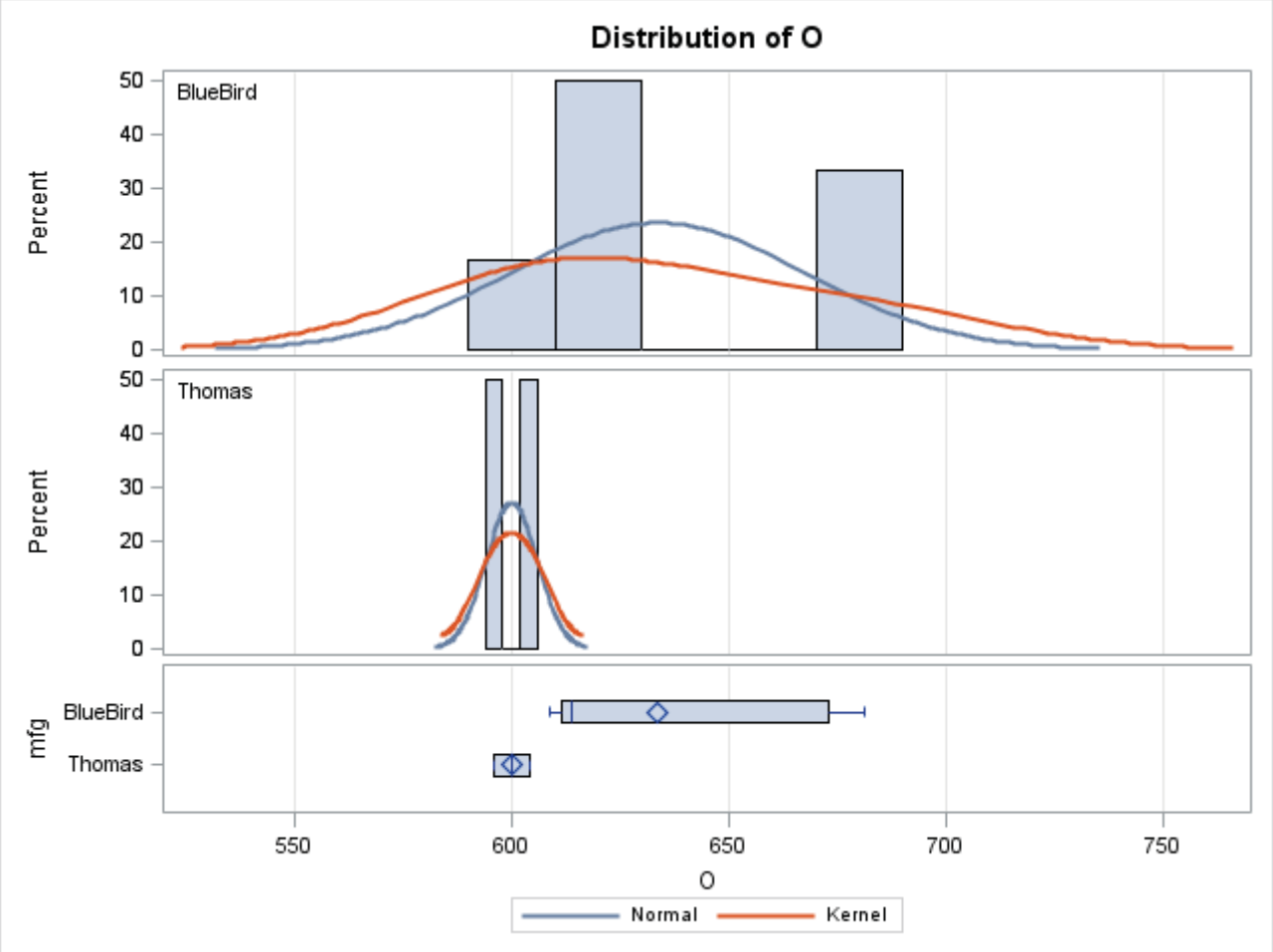
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	6	-2.34	0.0582
Satterthwaite	Unequal	1.2314	-1.71	0.3010



Variable: O

mfg	N	Mean	Std Dev	Std Err	Minimum	Maximum
BlueBird	6	633.6	33.8313	13.8116	608.8	681.1
Thomas	2	600.1	5.8690	4.1500	595.9	604.2
Diff (1-2)		33.5833	30.9764	25.2922		

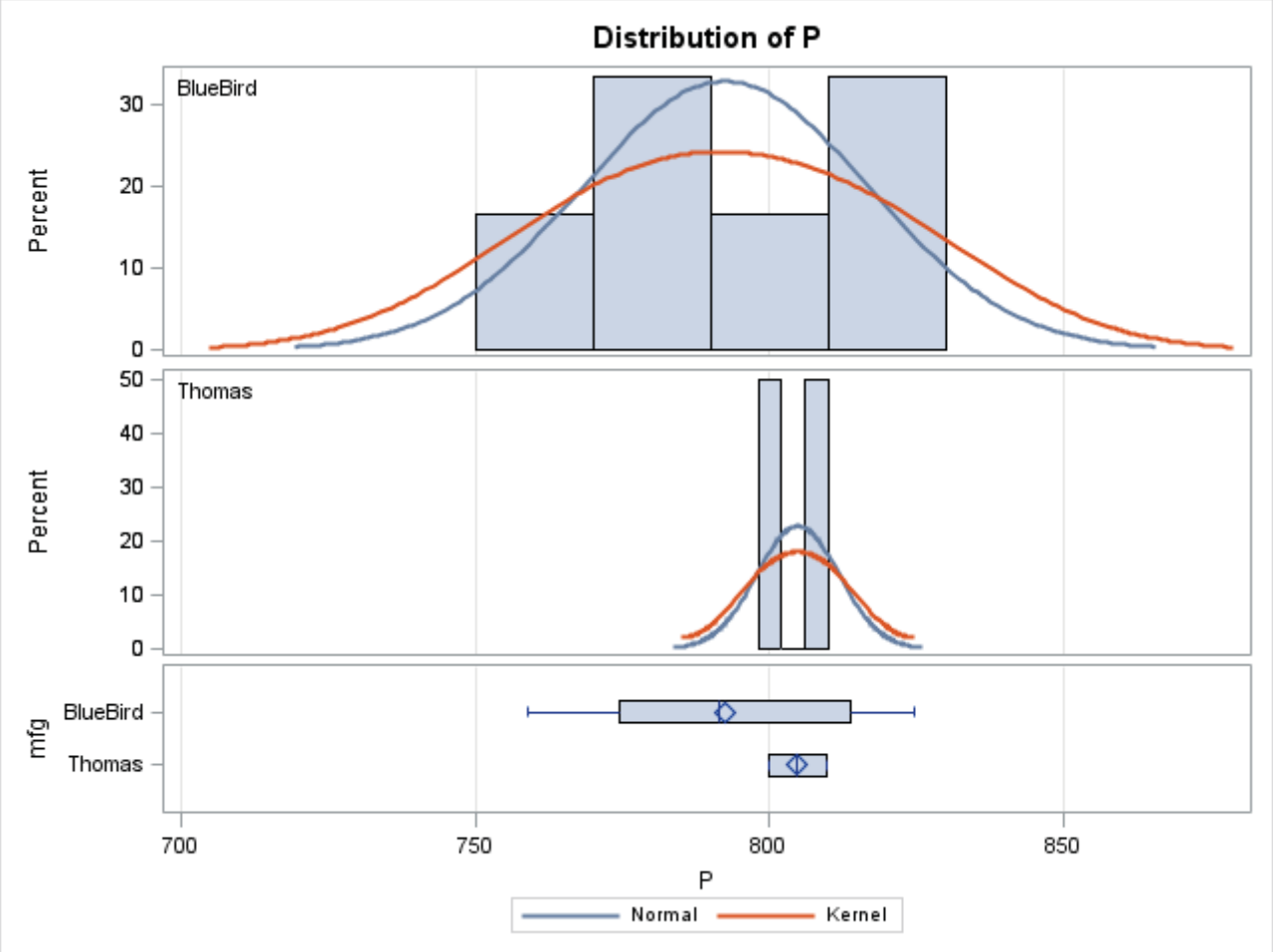
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	6	1.33	0.2325
Satterthwaite	Unequal	5.7108	2.33	0.0609



Variable: P

mfg	N	Mean	Std Dev	Std Err	Minimum	Maximum
BlueBird	6	792.4	24.3556	9.9432	758.9	824.7
Thomas	2	804.8	7.0004	4.9500	799.8	809.7
Diff (1-2)		-12.3333	22.4165	18.3030		

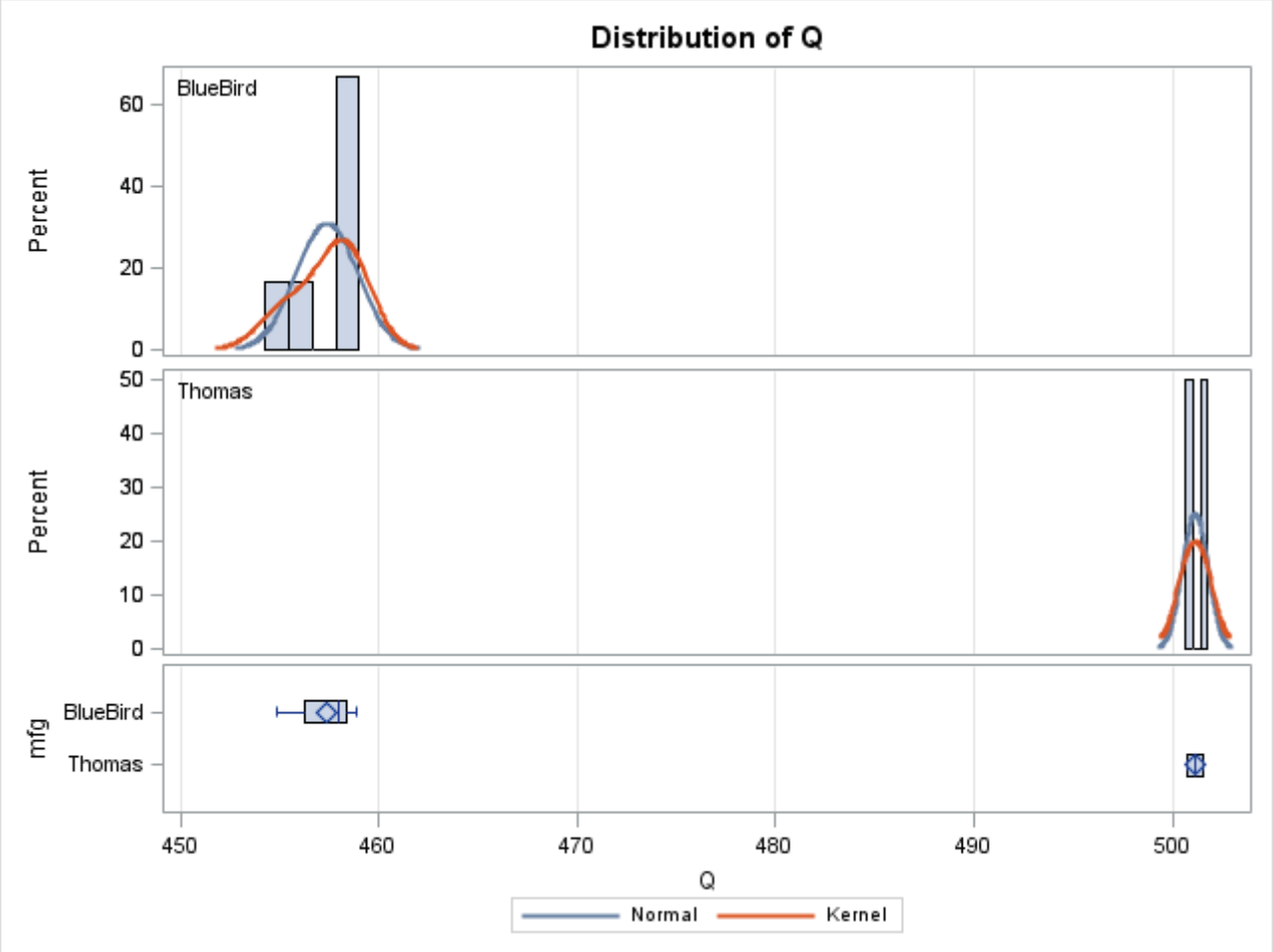
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	6	-0.67	0.5255
Satterthwaite	Unequal	5.9562	-1.11	0.3096



Variable: Q

mfg	N	Mean	Std Dev	Std Err	Minimum	Maximum
BlueBird	6	457.4	1.5526	0.6339	454.8	458.9
Thomas	2	501.2	0.6364	0.4500	500.7	501.6
Diff (1-2)		-43.7833	1.4410	1.1765		

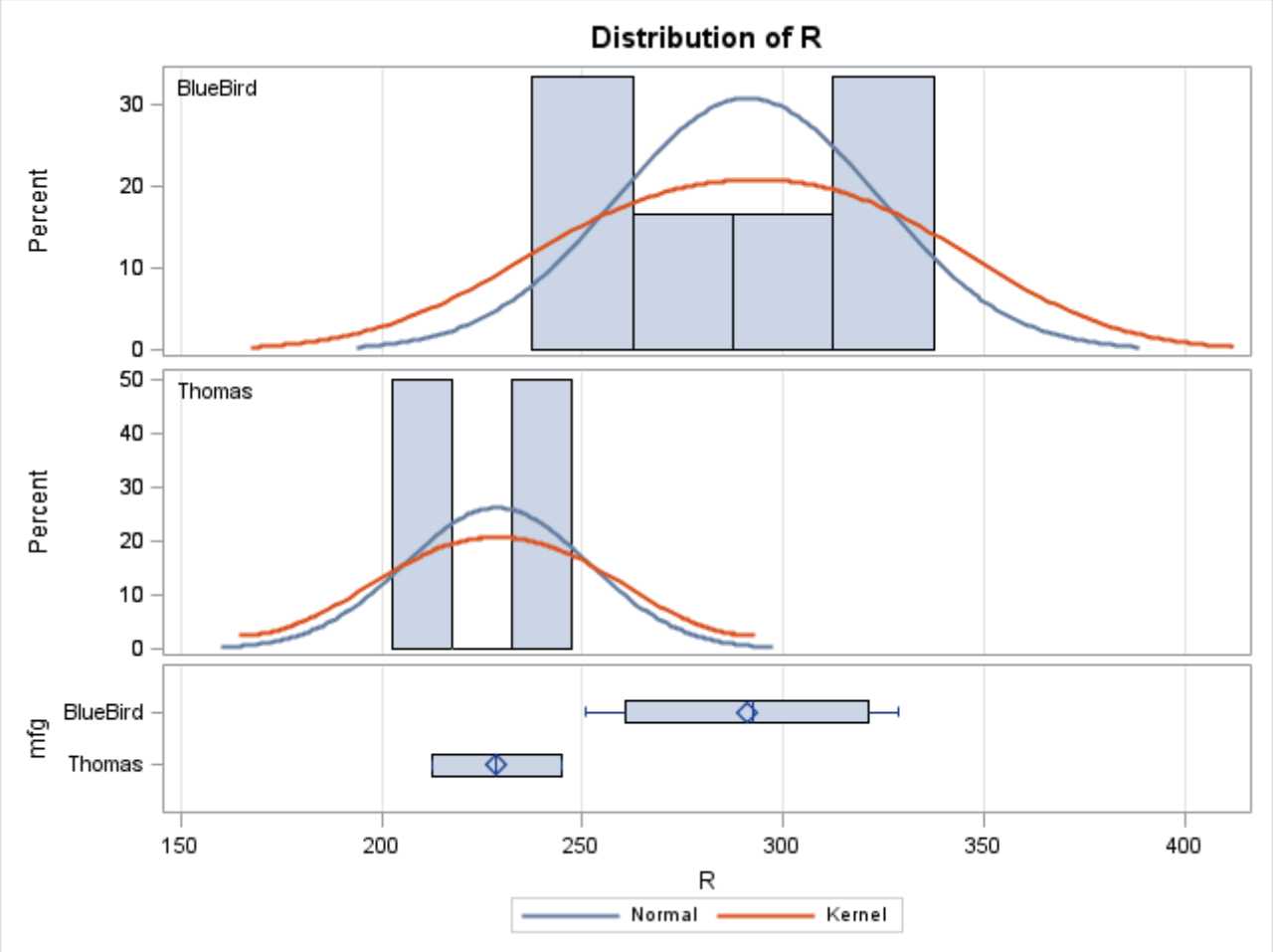
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	6	-37.21	<.0001
Satterthwaite	Unequal	4.9822	-56.32	<.0001



Variable: R

mfg	N	Mean	Std Dev	Std Err	Minimum	Maximum
BlueBird	6	291.1	32.4881	13.2632	250.9	328.4
Thomas	2	228.7	22.8395	16.1500	212.5	244.8
Diff (1-2)		62.4667	31.0887	25.3838		

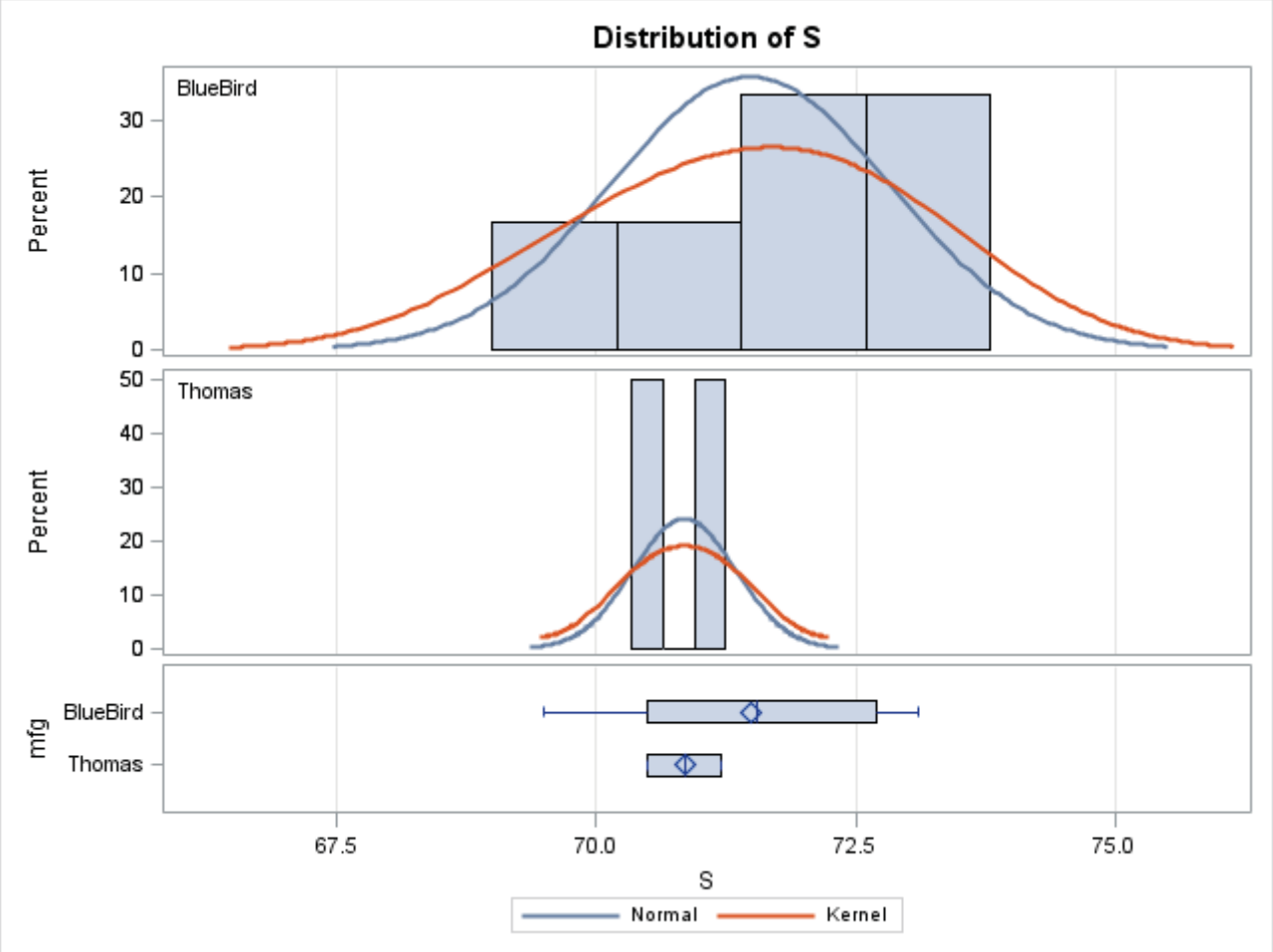
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	6	2.46	0.0491
Satterthwaite	Unequal	2.57	2.99	0.0707



Variable: S

mfg	N	Mean	Std Dev	Std Err	Minimum	Maximum
BlueBird	6	71.4833	1.3423	0.5480	69.5000	73.1000
Thomas	2	70.8500	0.4950	0.3500	70.5000	71.2000
Diff (1-2)		0.6333	1.2419	1.0140		

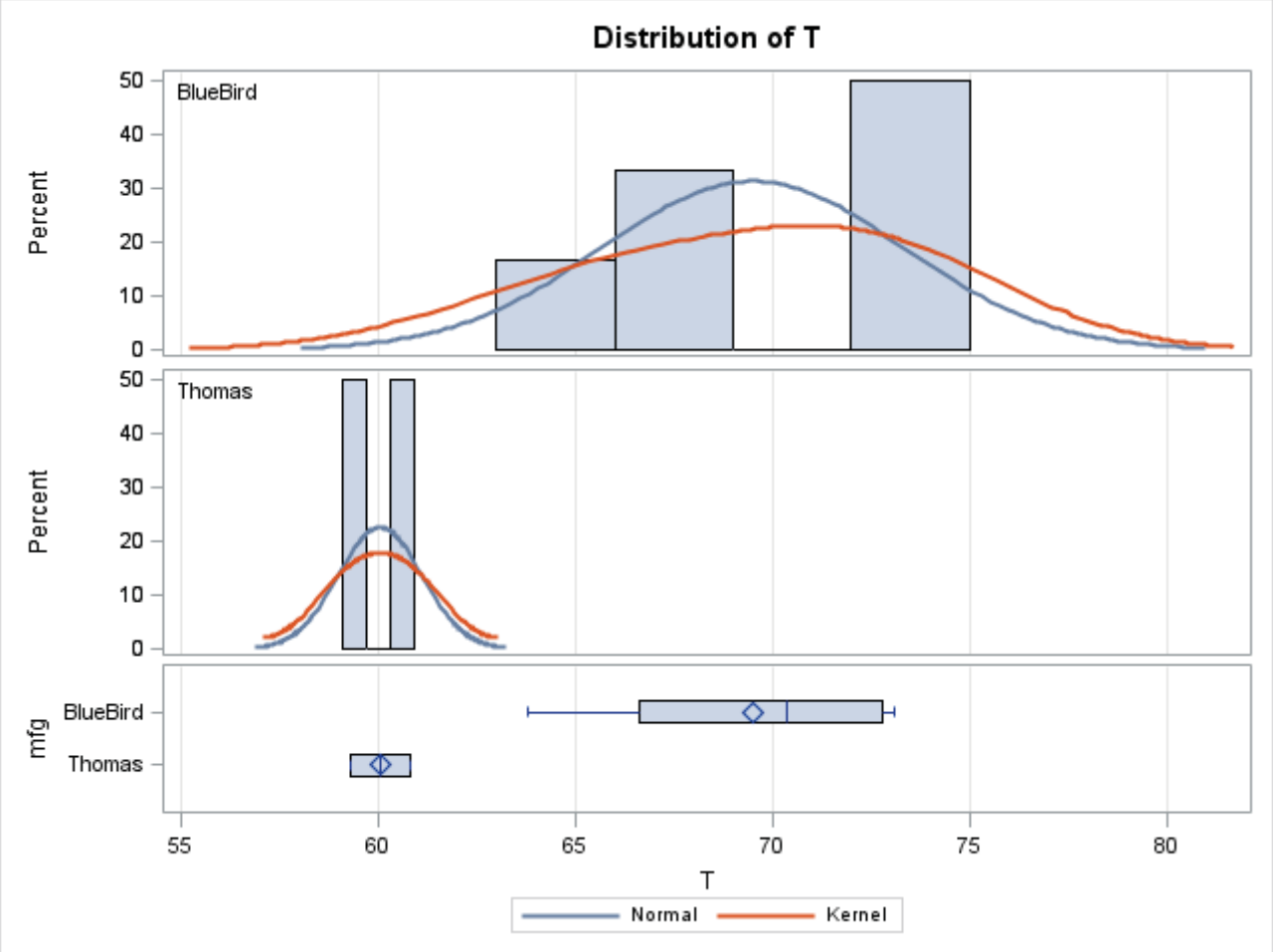
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	6	0.62	0.5552
Satterthwaite	Unequal	5.4099	0.97	0.3716



Variable: T

mfg	N	Mean	Std Dev	Std Err	Minimum	Maximum
BlueBird	6	69.5000	3.8220	1.5603	63.8000	73.1000
Thomas	2	60.0500	1.0607	0.7500	59.3000	60.8000
Diff (1-2)		9.4500	3.5158	2.8706		

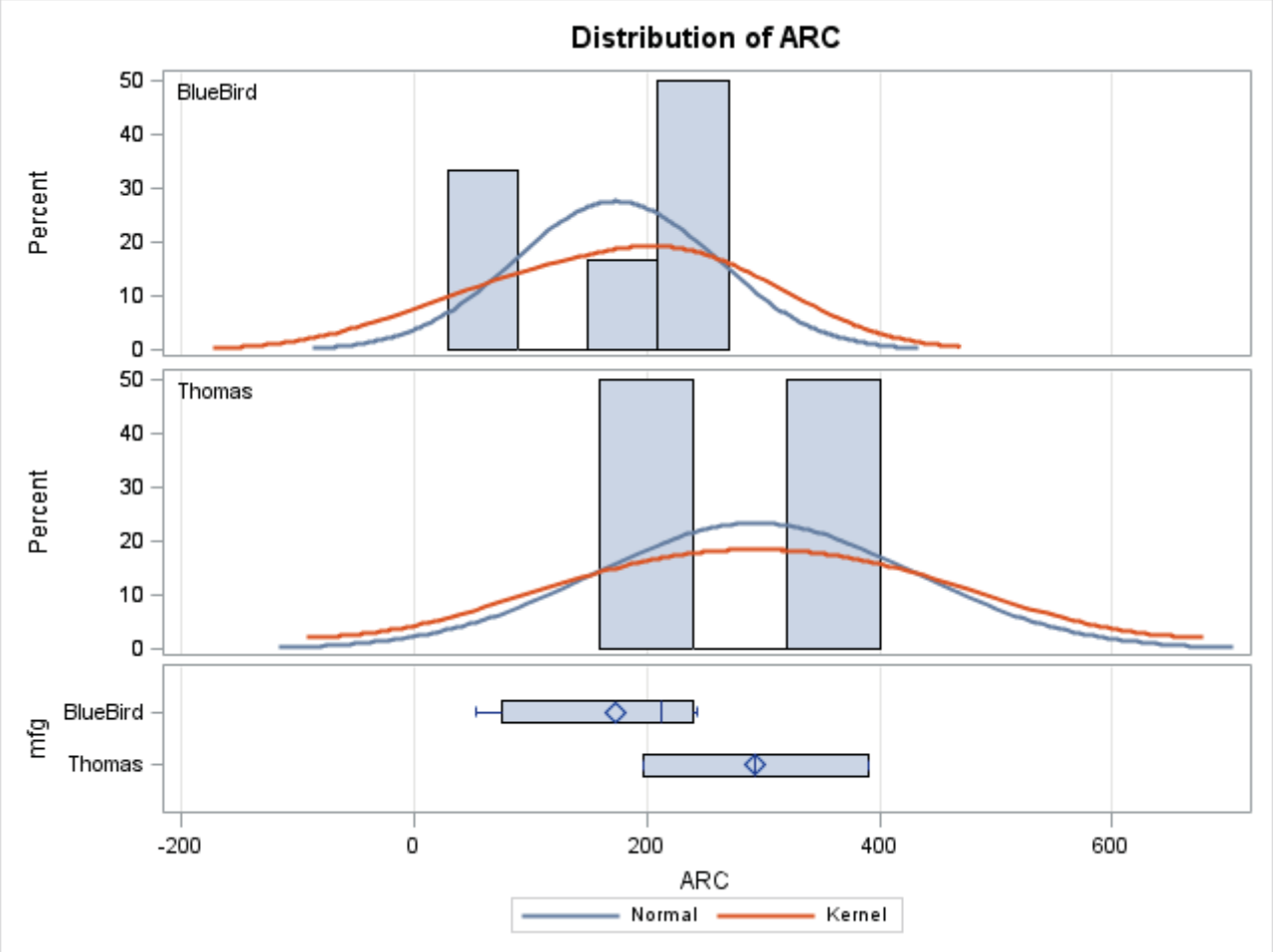
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	6	3.29	0.0166
Satterthwaite	Unequal	5.981	5.46	0.0016



Variable: ARC

mfg	N	Mean	Std Dev	Std Err	Minimum	Maximum
BlueBird	6	173.4	86.7393	35.4112	54.1000	243.3
Thomas	2	293.5	136.8	96.7000	196.8	390.2
Diff (1-2)		-120.1	96.8851	79.1064		

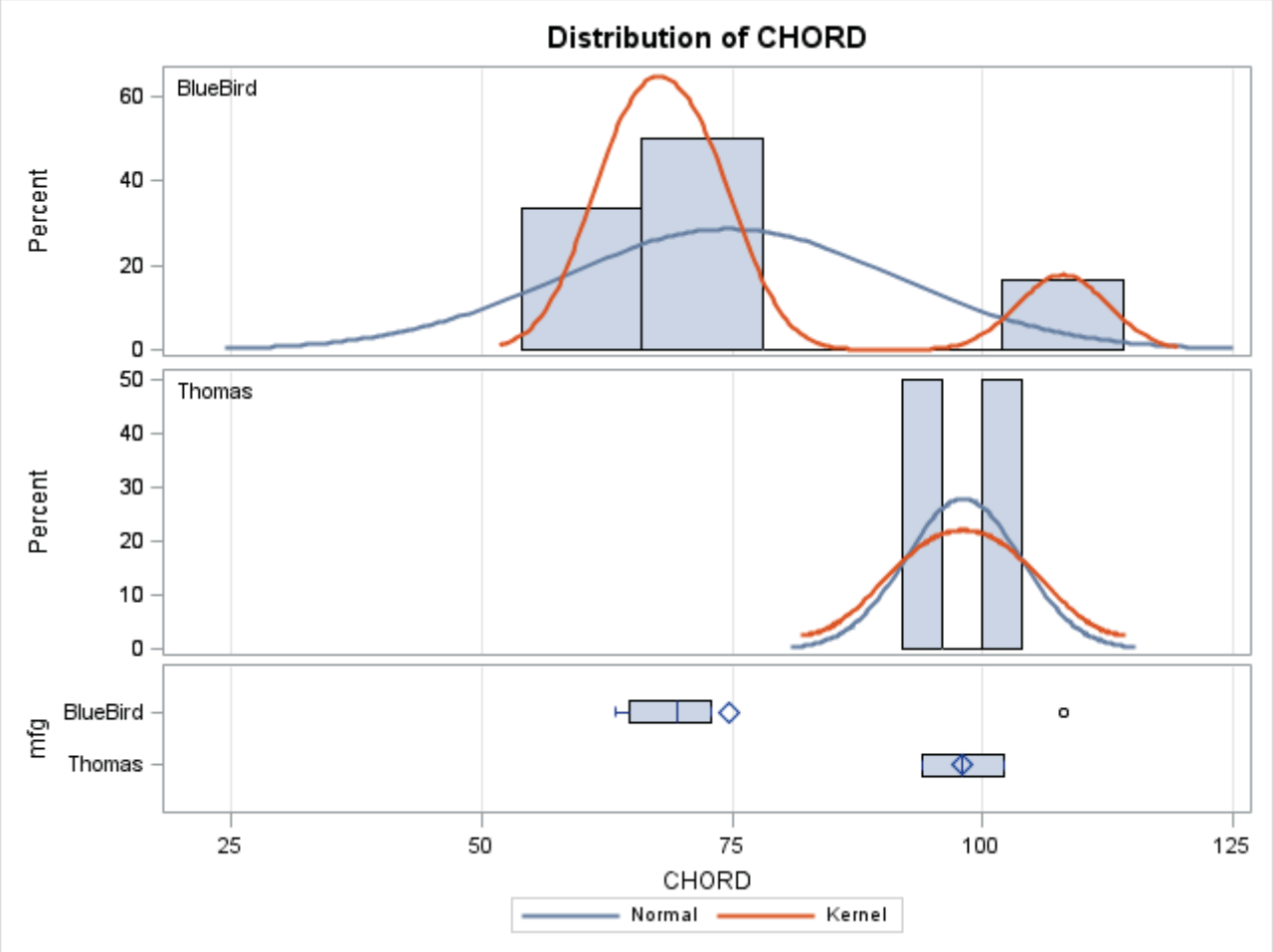
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	6	-1.52	0.1798
Satterthwaite	Unequal	1.2816	-1.17	0.4162



Variable: CHORD

mfg	N	Mean	Std Dev	Std Err	Minimum	Maximum
BlueBird	6	74.6500	16.7534	6.8395	63.3000	108.0
Thomas	2	98.0500	5.7276	4.0500	94.0000	102.1
Diff (1-2)		-23.4000	15.4714	12.6323		

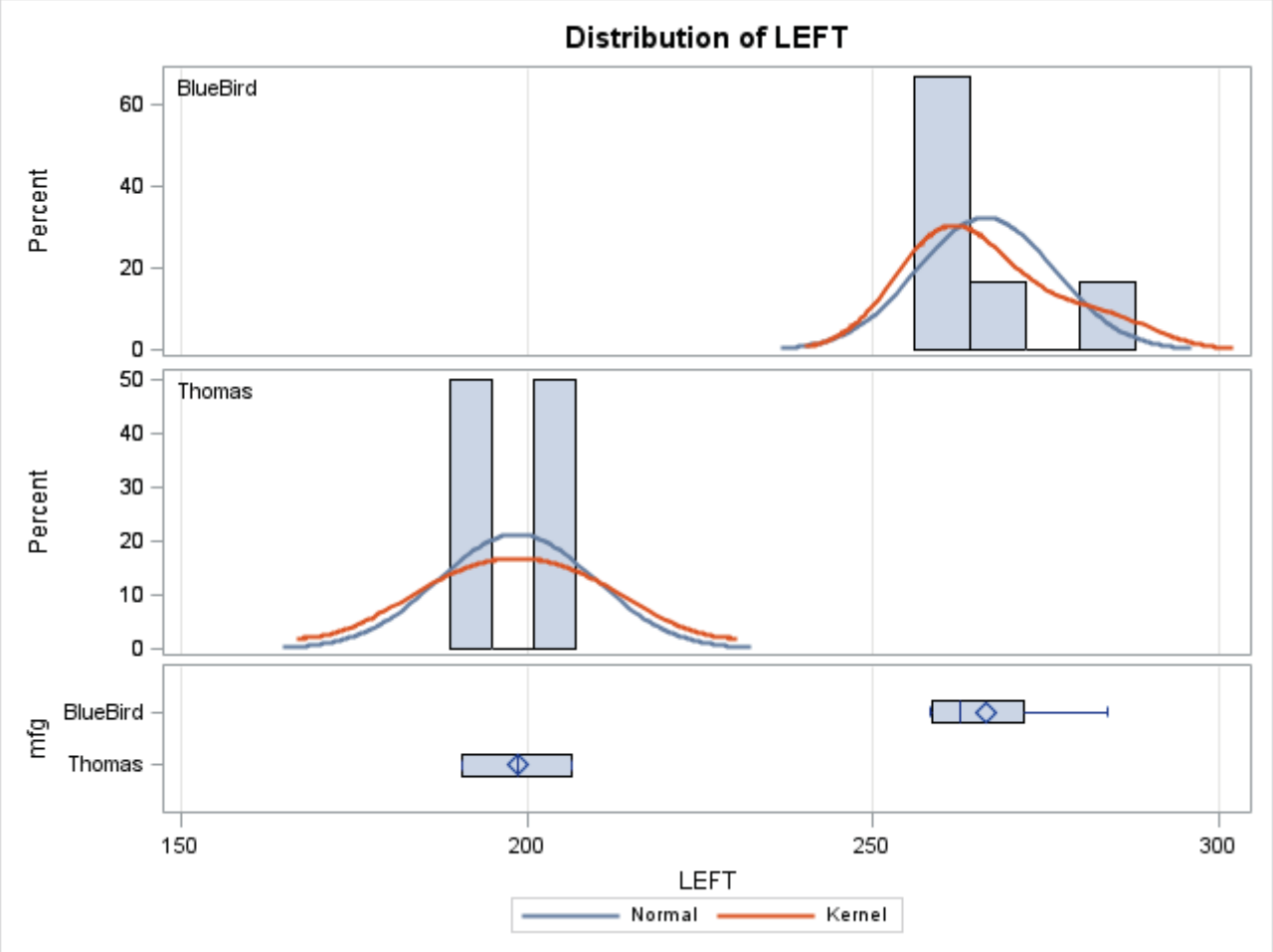
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	6	-1.85	0.1134
Satterthwaite	Unequal	5.6487	-2.94	0.0277



Variable: LEFT

mfg	N	Mean	Std Dev	Std Err	Minimum	Maximum
BlueBird	6	266.3	9.8813	4.0340	258.4	283.8
Thomas	2	198.6	11.2430	7.9500	190.6	206.5
Diff (1-2)		67.7500	10.1210	8.2637		

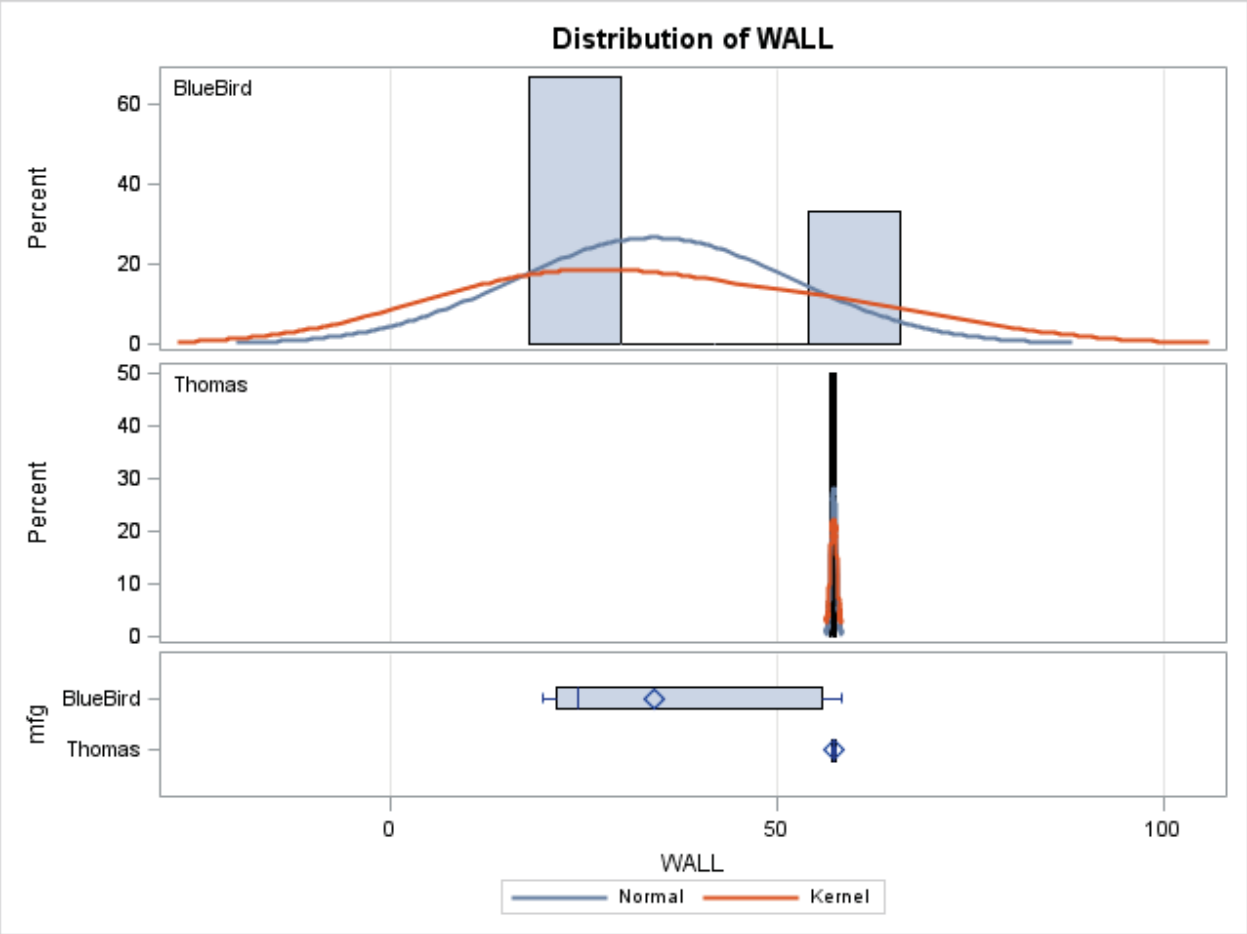
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	6	8.20	0.0002
Satterthwaite	Unequal	1.5606	7.60	0.0323



Variable: WALL

mfg	N	Mean	Std Dev	Std Err	Minimum	Maximum
BlueBird	6	34.1167	18.0149	7.3546	19.9000	58.5000
Thomas	2	57.3500	0.3536	0.2500	57.1000	57.6000
Diff (1-2)		-23.2333	16.4459	13.4281		

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	6	-1.73	0.1343
Satterthwaite	Unequal	5.0115	-3.16	0.0251

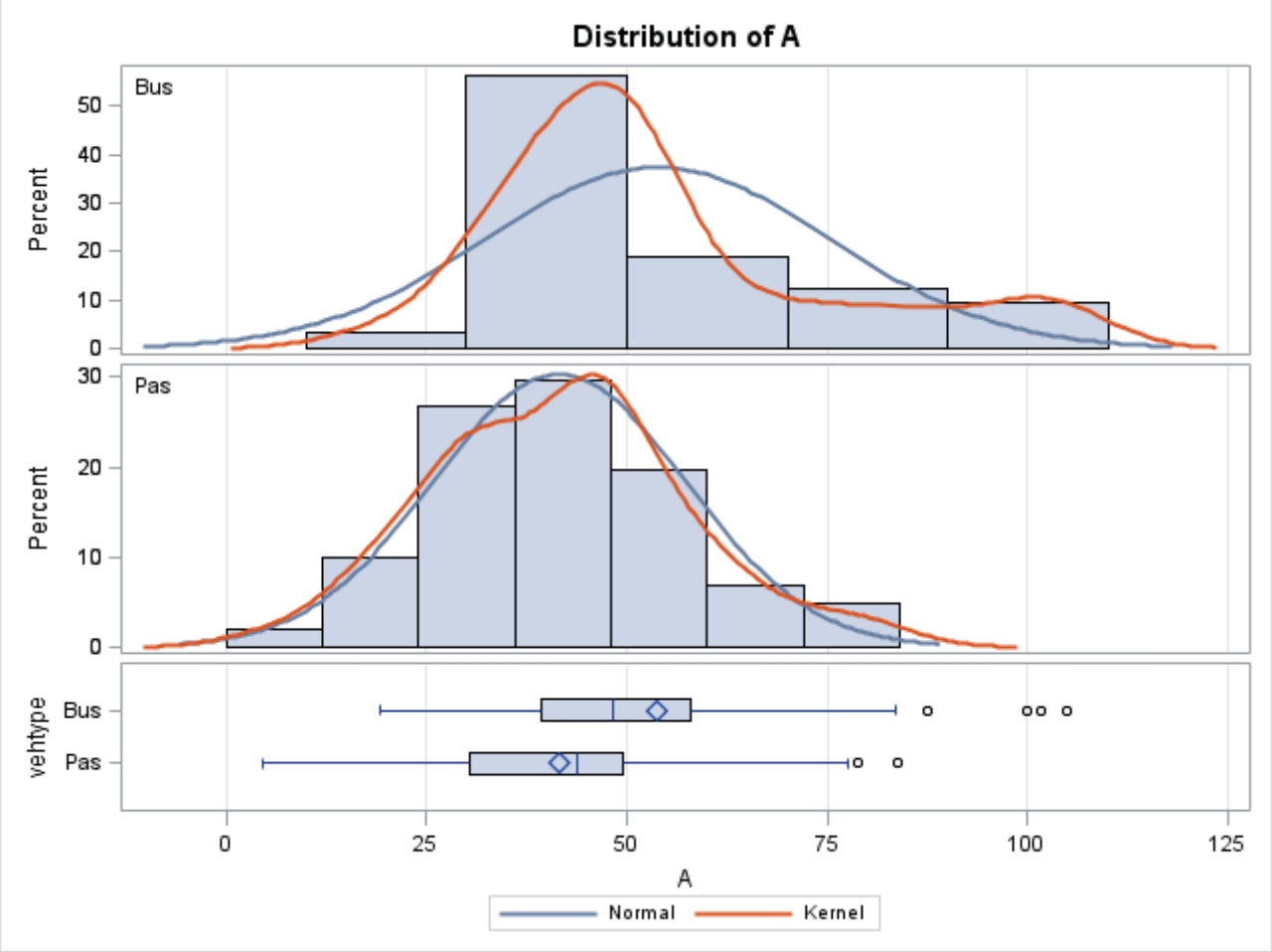


10. Appendix E - *T* Test Comparison of Passenger Car and Bus Dimensions

Variable: A

vehtype	N	Mean	Std Dev	Std Err	Minimum	Maximum
Bus	32	53.8281	21.3830	3.7800	19.3000	104.9
Pas	101	41.5327	15.7795	1.5701	4.5000	83.8000
Diff (1-2)		12.2955	17.2706	3.5035		

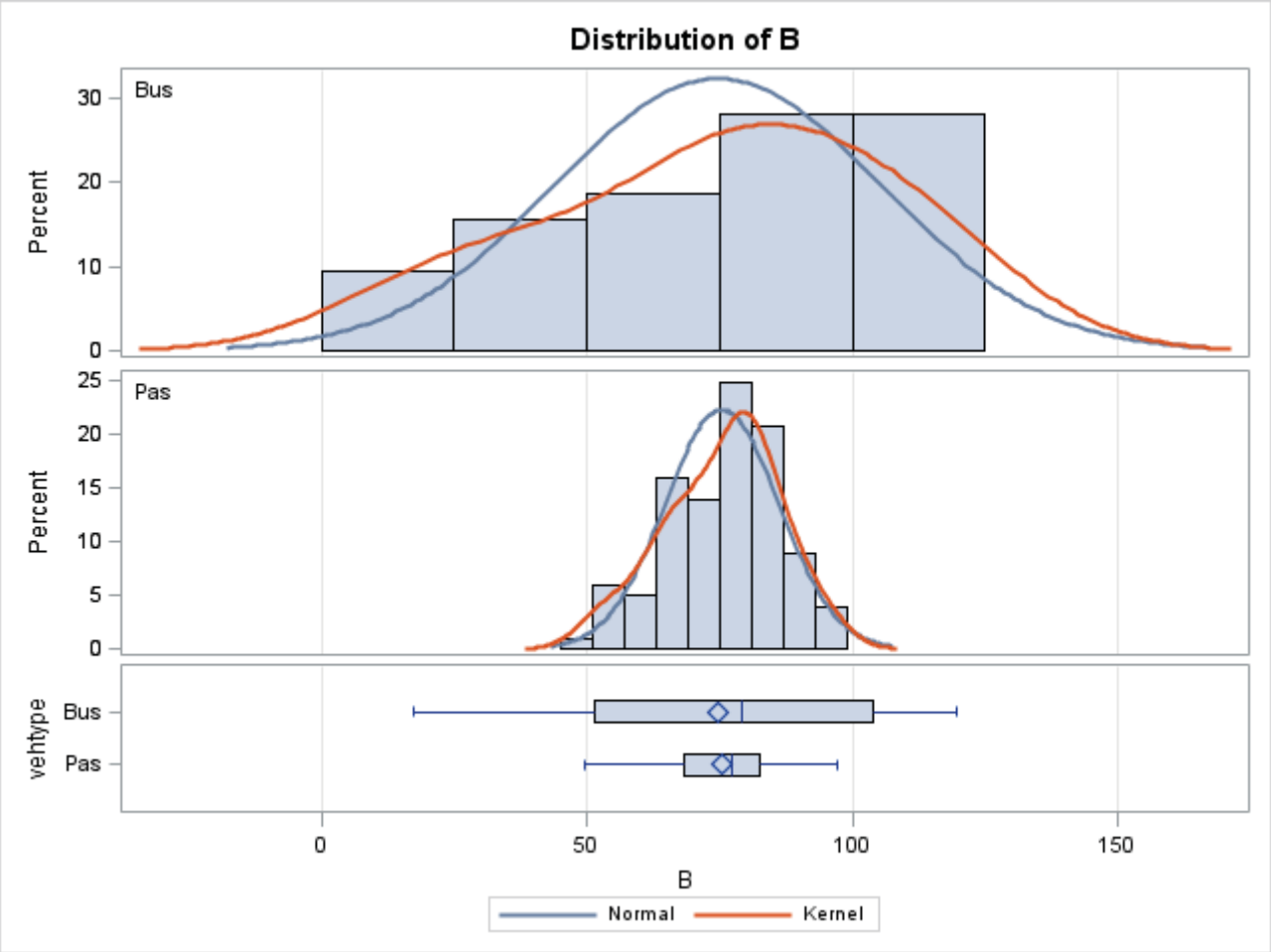
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	131	3.51	0.0006
Satterthwaite	Unequal	42.23	3.00	0.0045



Variable: B

vehtype	N	Mean	Std Dev	Std Err	Minimum	Maximum
Bus	32	74.6813	30.7707	5.4396	17.5000	119.5
Pas	101	75.4129	10.7408	1.0688	49.6000	97.1000
Diff (1-2)		-0.7316	17.6671	3.5839		

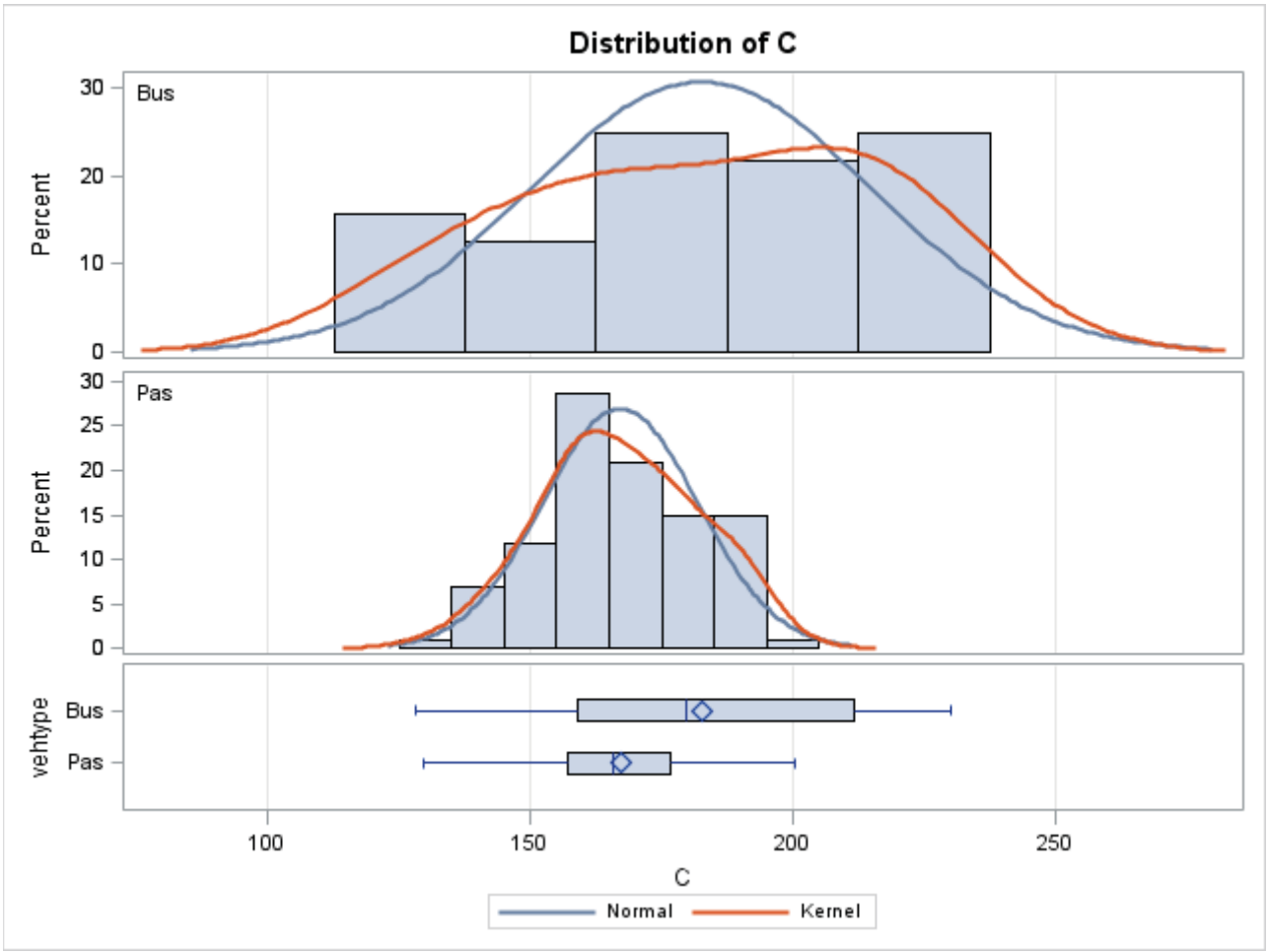
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	131	-0.20	0.8386
Satterthwaite	Unequal	33.424	-0.13	0.8958



Variable: C

vehtype	N	Mean	Std Dev	Std Err	Minimum	Maximum
Bus	32	182.6	32.4337	5.7335	128.2	230.0
Pas	101	167.1	14.8079	1.4734	129.7	200.4
Diff (1-2)		15.4810	20.4039	4.1391		

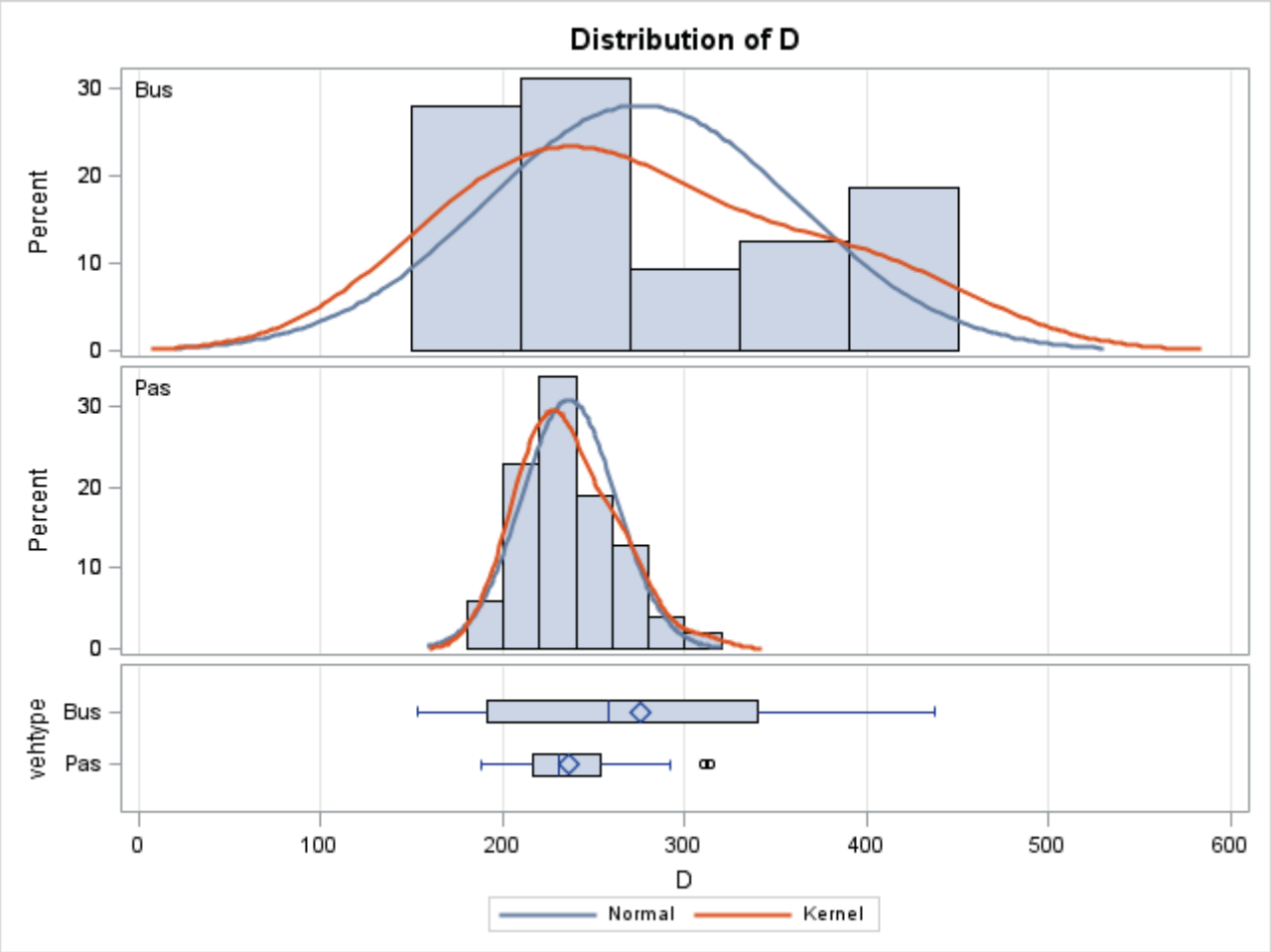
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	131	3.74	0.0003
Satterthwaite	Unequal	35.182	2.62	0.0130



Variable: D

vehtype	N	Mean	Std Dev	Std Err	Minimum	Maximum
Bus	32	275.2	85.0104	15.0279	153.0	437.3
Pas	101	236.1	25.9236	2.5795	188.5	313.2
Diff (1-2)		39.1181	47.1504	9.5648		

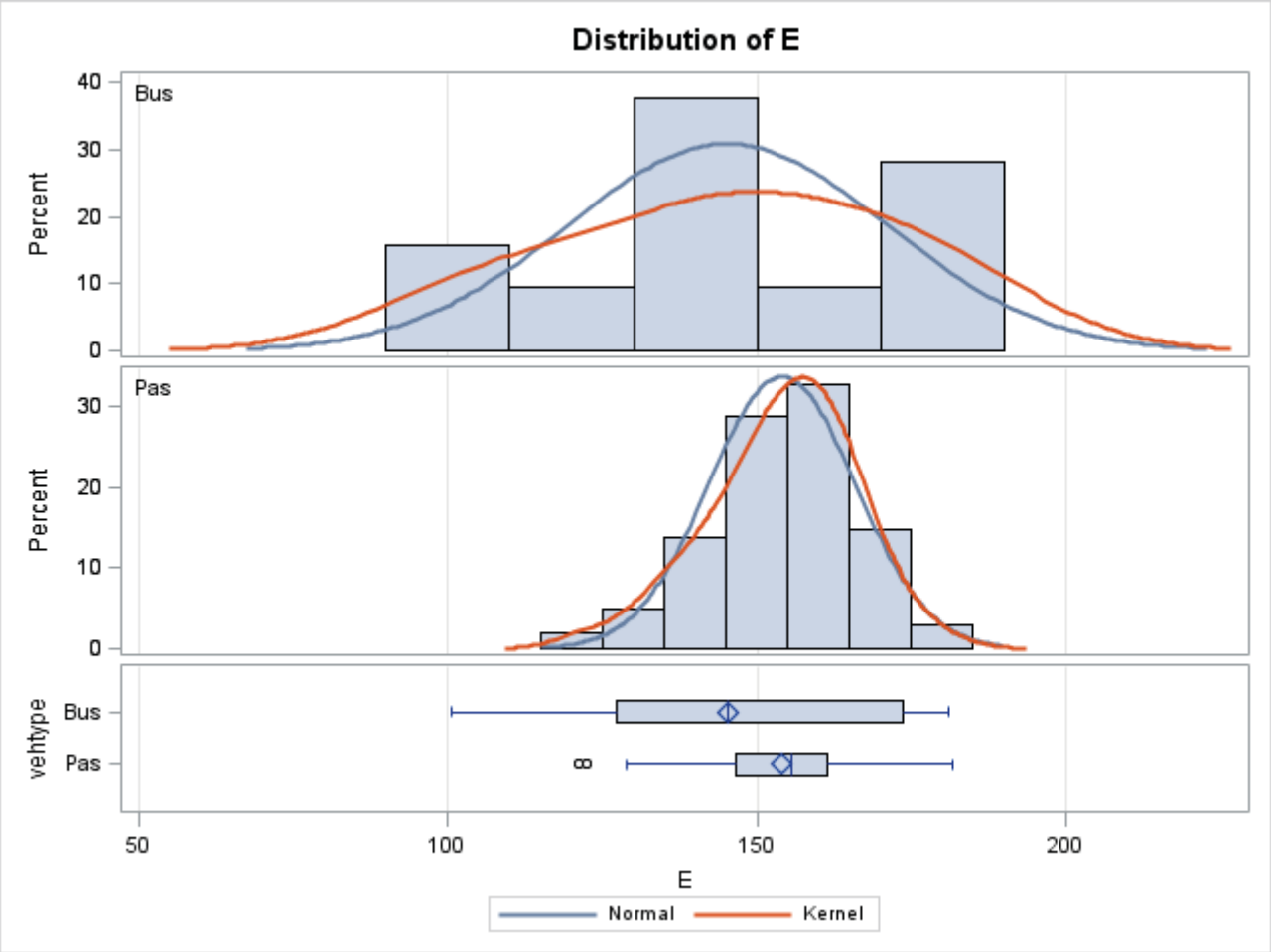
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	131	4.09	<.0001
Satterthwaite	Unequal	32.845	2.57	0.0151



Variable: E

vehtype	N	Mean	Std Dev	Std Err	Minimum	Maximum
Bus	32	145.1	25.8894	4.5766	100.6	180.9
Pas	101	154.1	11.8187	1.1760	121.2	181.8
Diff (1-2)		-8.9315	16.2862	3.3038		

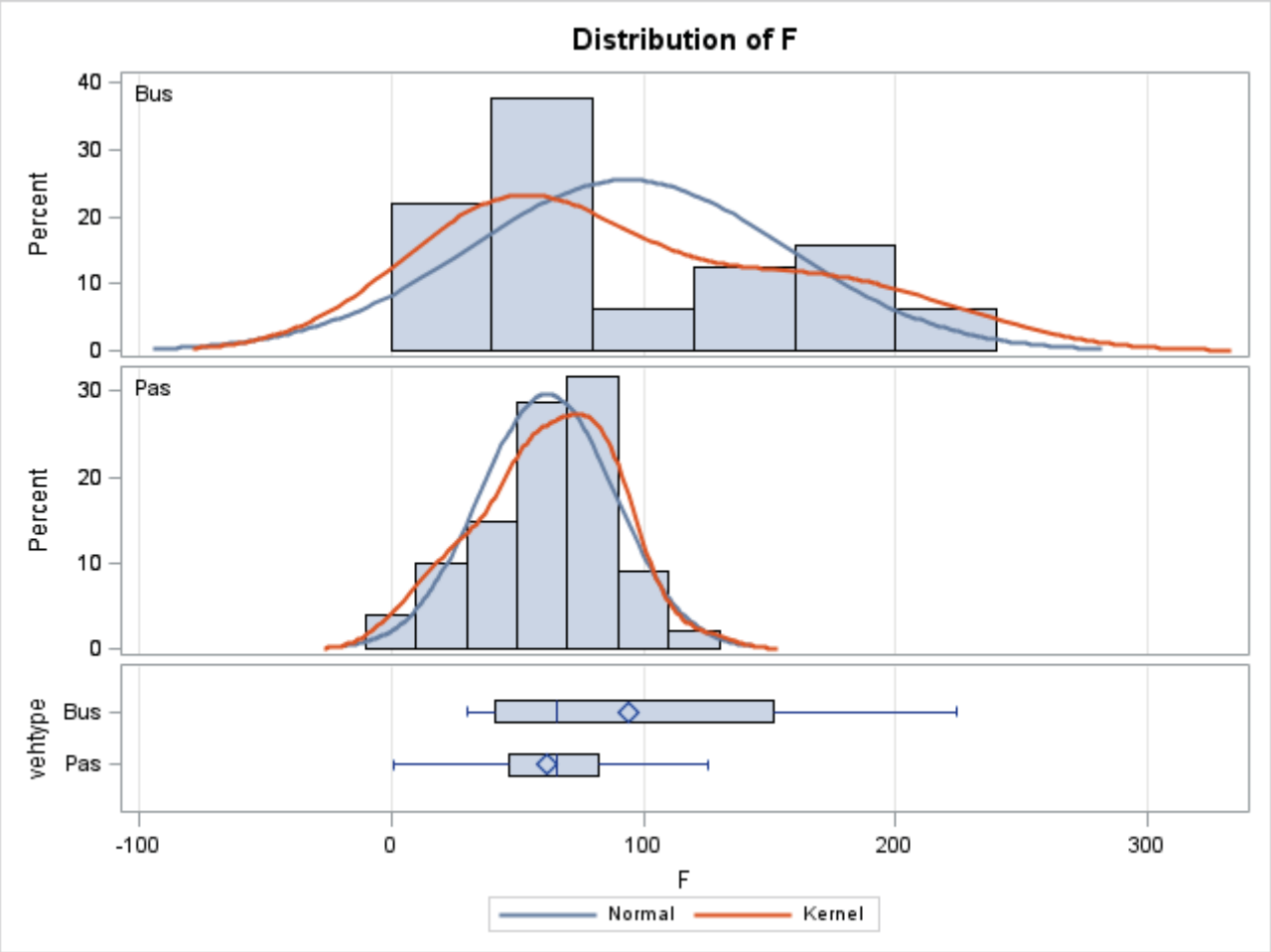
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	131	-2.70	0.0078
Satterthwaite	Unequal	35.181	-1.89	0.0670



Variable: F

vehtype	N	Mean	Std Dev	Std Err	Minimum	Maximum
Bus	32	93.8000	62.7297	11.0891	30.4000	224.1
Pas	101	61.9356	26.9239	2.6790	0.8000	126.0
Diff (1-2)		31.8644	38.5298	7.8160		

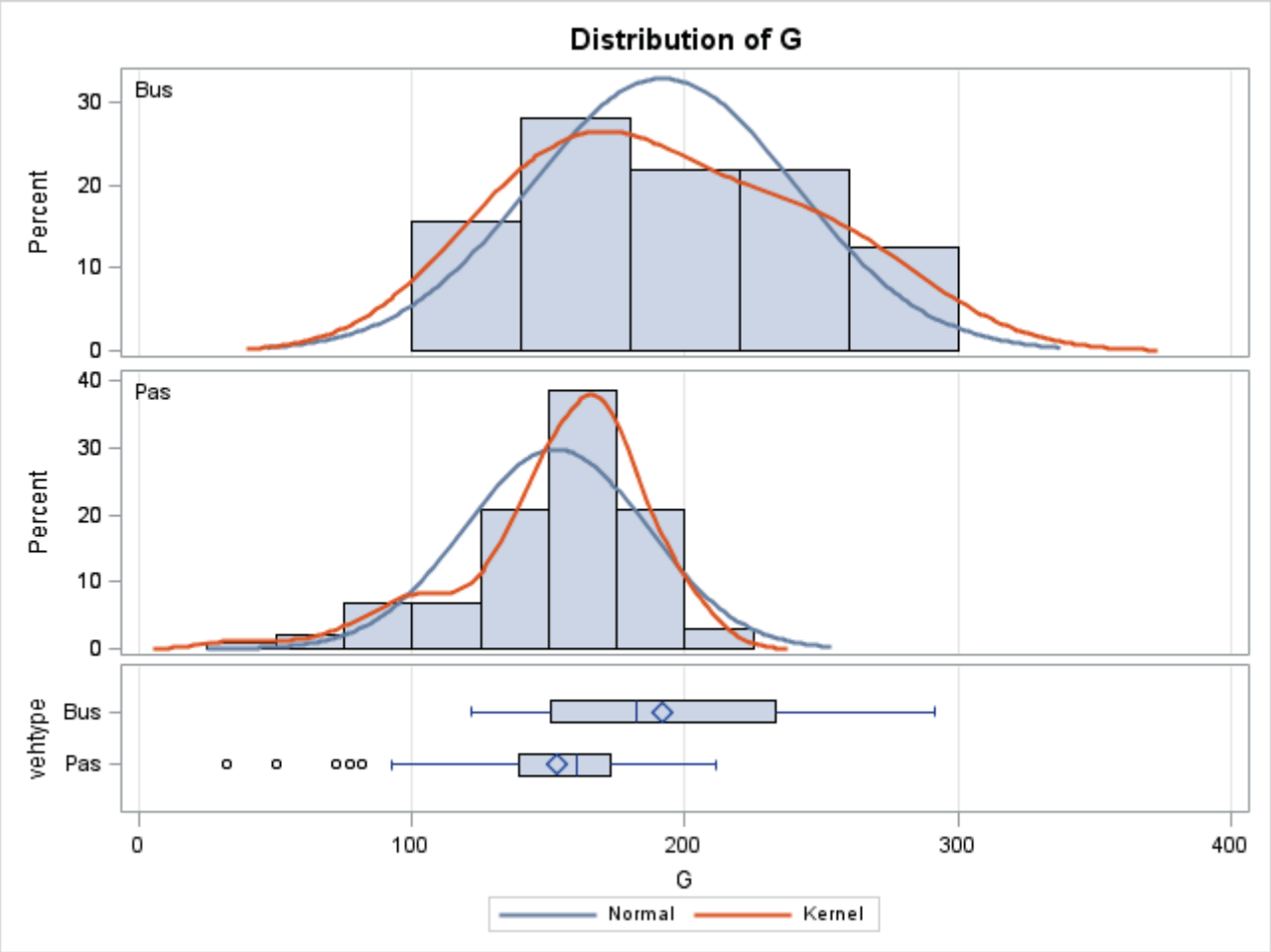
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	131	4.08	<.0001
Satterthwaite	Unequal	34.688	2.79	0.0084



Variable: G

vehtype	N	Mean	Std Dev	Std Err	Minimum	Maximum
Bus	32	191.9	48.4997	8.5736	121.5	291.1
Pas	101	152.7	33.5422	3.3376	32.0000	211.1
Diff (1-2)		39.1798	37.6228	7.6320		

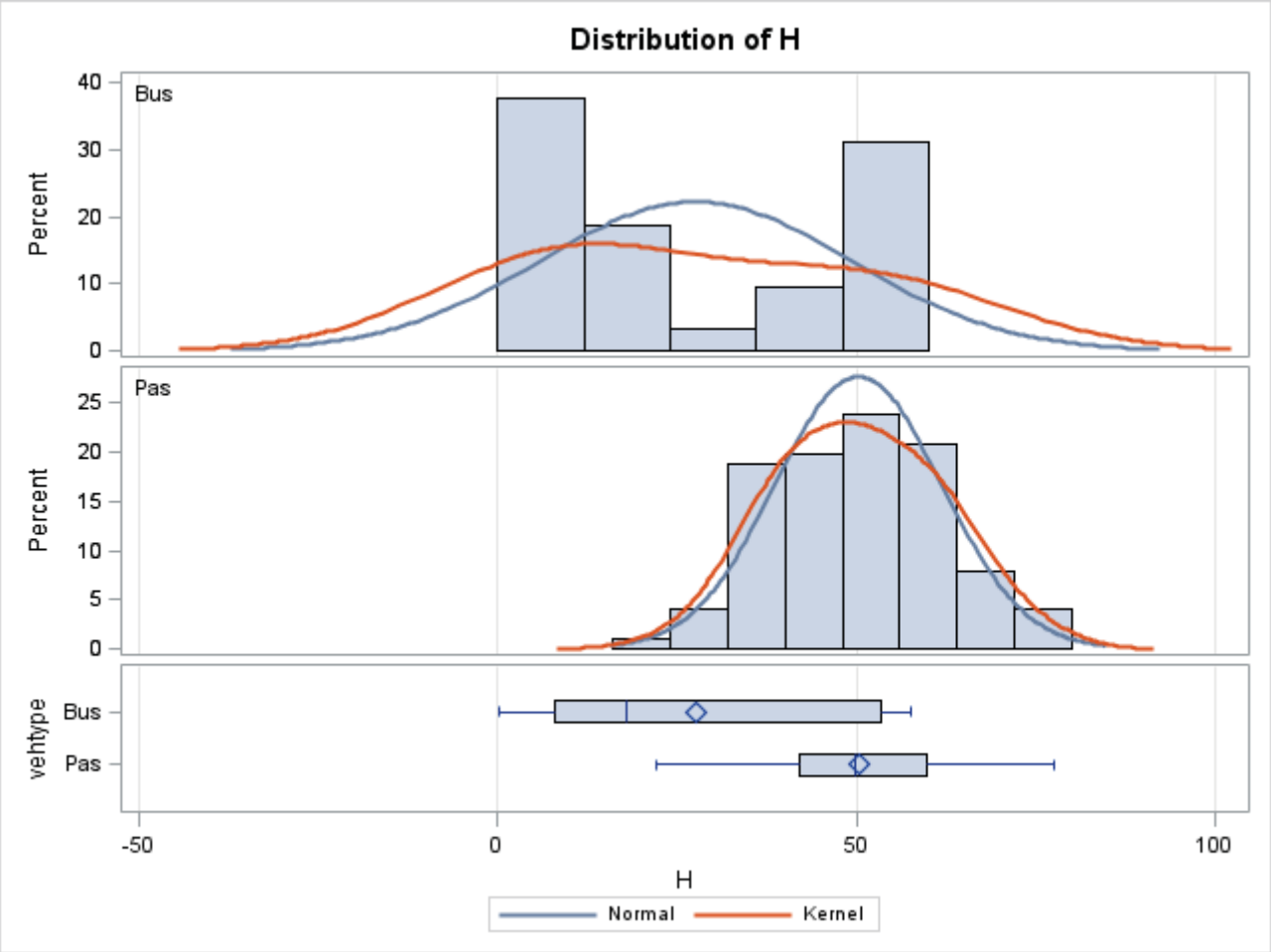
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	131	5.13	<.0001
Satterthwaite	Unequal	40.817	4.26	0.0001



Variable: H

vehtype	N	Mean	Std Dev	Std Err	Minimum	Maximum
Bus	32	27.5563	21.5652	3.8122	0.3000	57.5000
Pas	101	50.2495	11.5284	1.1471	22.0000	77.6000
Diff (1-2)		-22.6933	14.5432	2.9502		

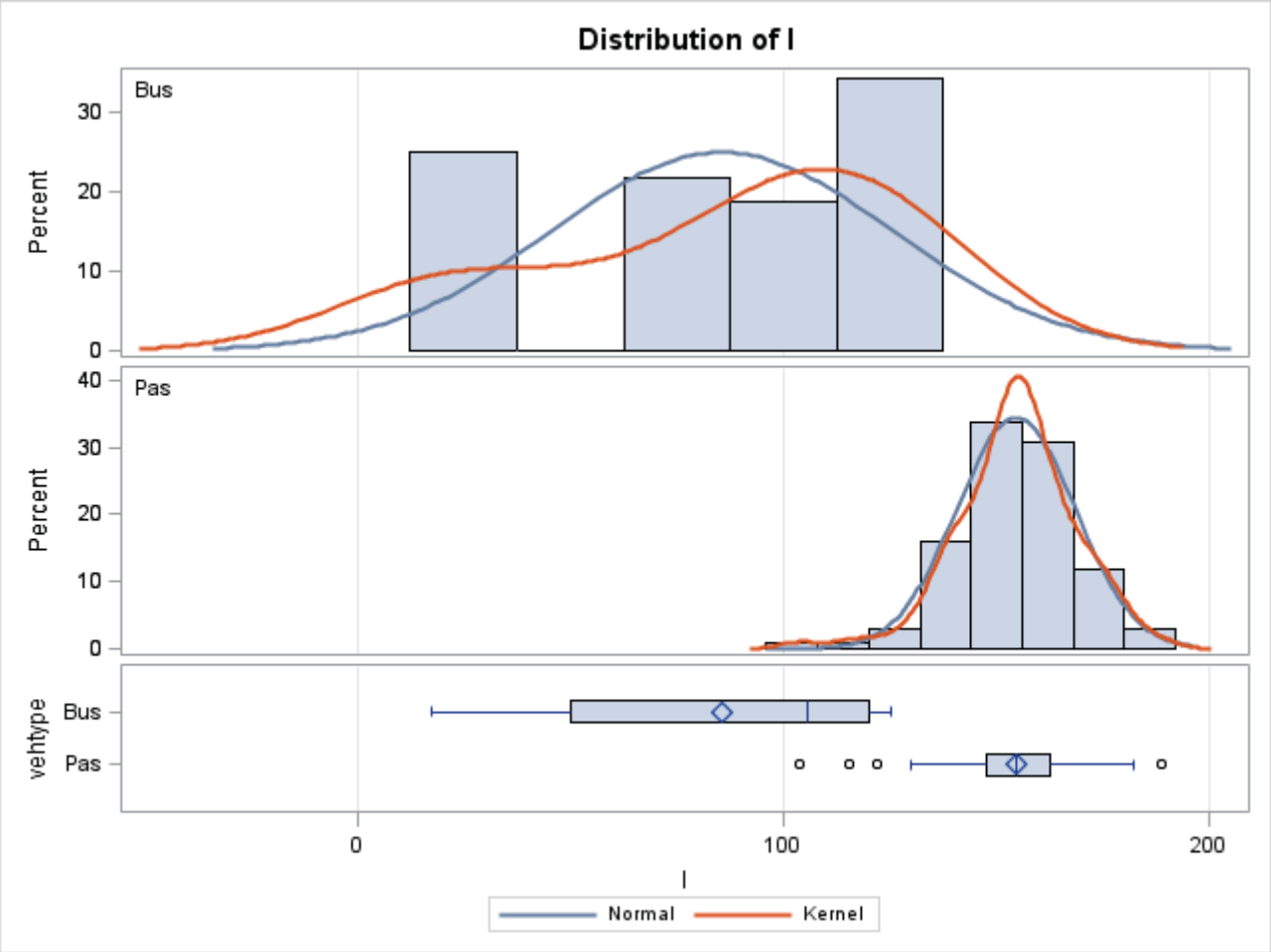
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	131	-7.69	<.0001
Satterthwaite	Unequal	36.774	-5.70	<.0001



Variable: I

vehtype	N	Mean	Std Dev	Std Err	Minimum	Maximum
Bus	32	85.4938	39.8386	7.0425	17.6000	125.0
Pas	101	154.5	13.9274	1.3858	103.8	188.5
Diff (1-2)		-68.9944	22.8833	4.6420		

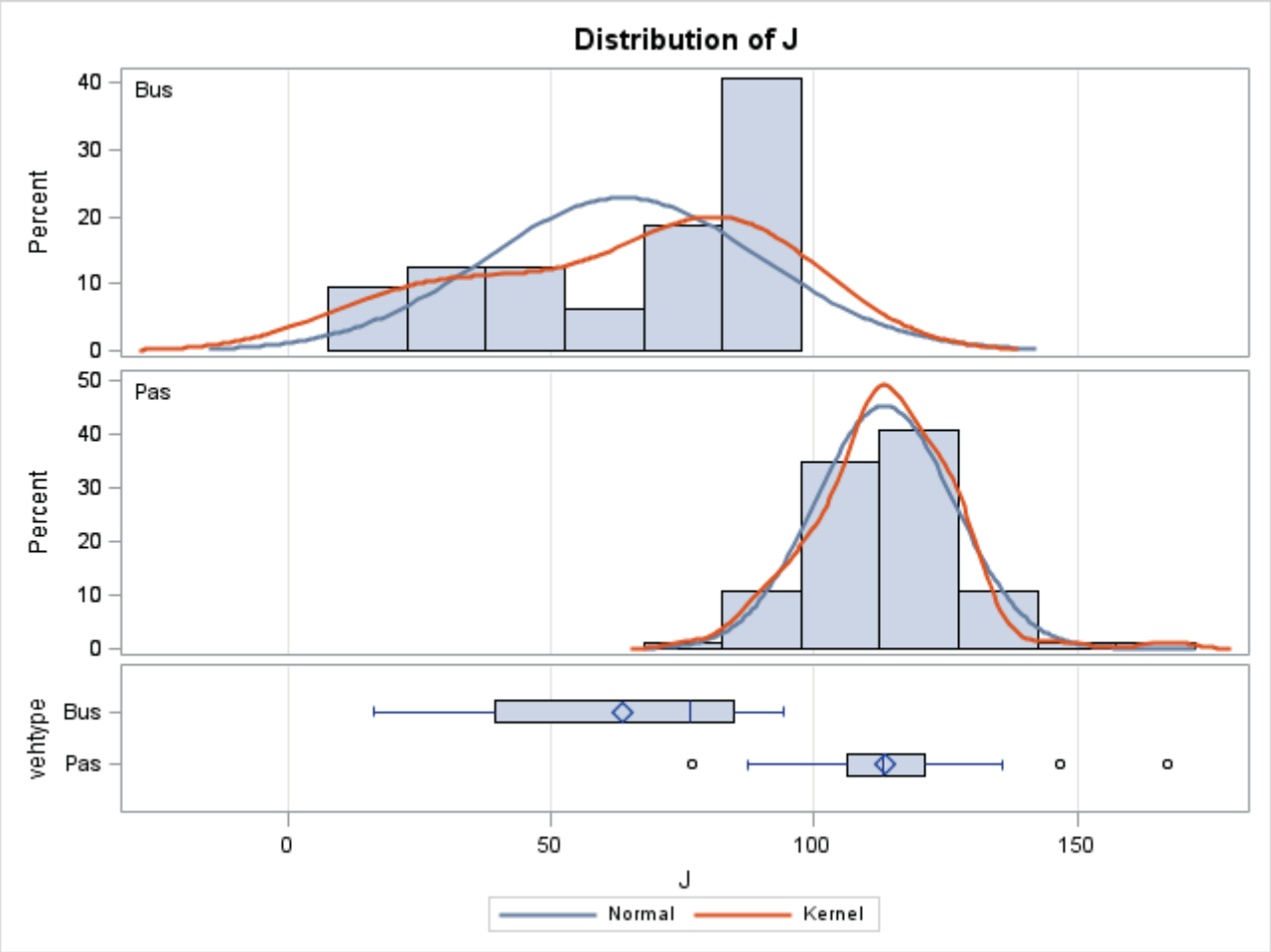
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	131	-14.86	<.0001
Satterthwaite	Unequal	33.432	-9.61	<.0001



Variable: J

vehtype	N	Mean	Std Dev	Std Err	Minimum	Maximum
Bus	32	63.6531	26.2287	4.6366	16.4000	94.0000
Pas	101	113.4	13.2135	1.3148	76.9000	167.3
Diff (1-2)		-49.7192	17.2068	3.4905		

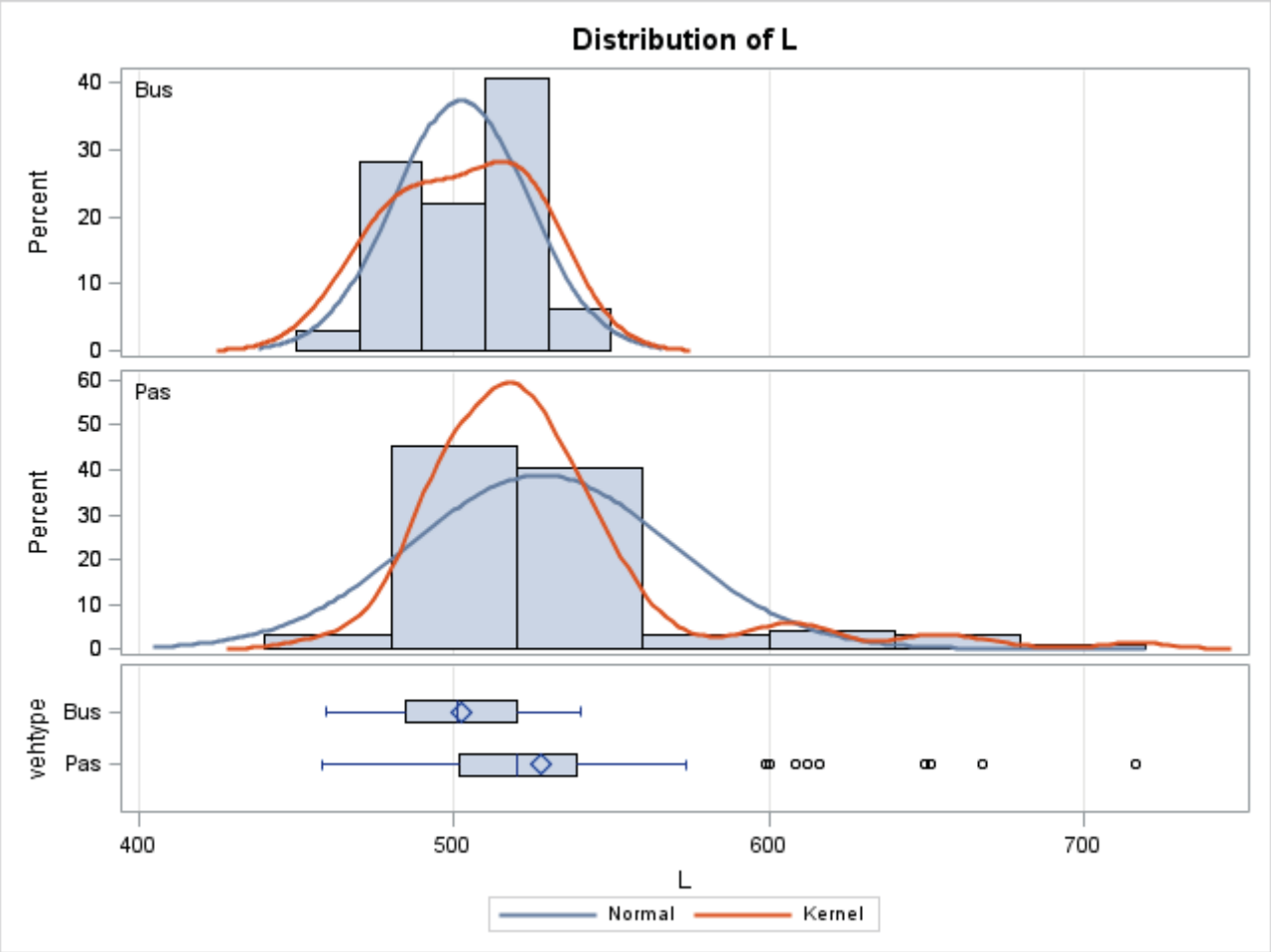
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	131	-14.24	<.0001
Satterthwaite	Unequal	36.113	-10.32	<.0001



Variable: L

vehtype	N	Mean	Std Dev	Std Err	Minimum	Maximum
Bus	32	502.3	21.3798	3.7794	459.5	540.4
Pas	101	527.8	41.1022	4.0898	458.3	716.6
Diff (1-2)		-25.4525	37.3868	7.5842		

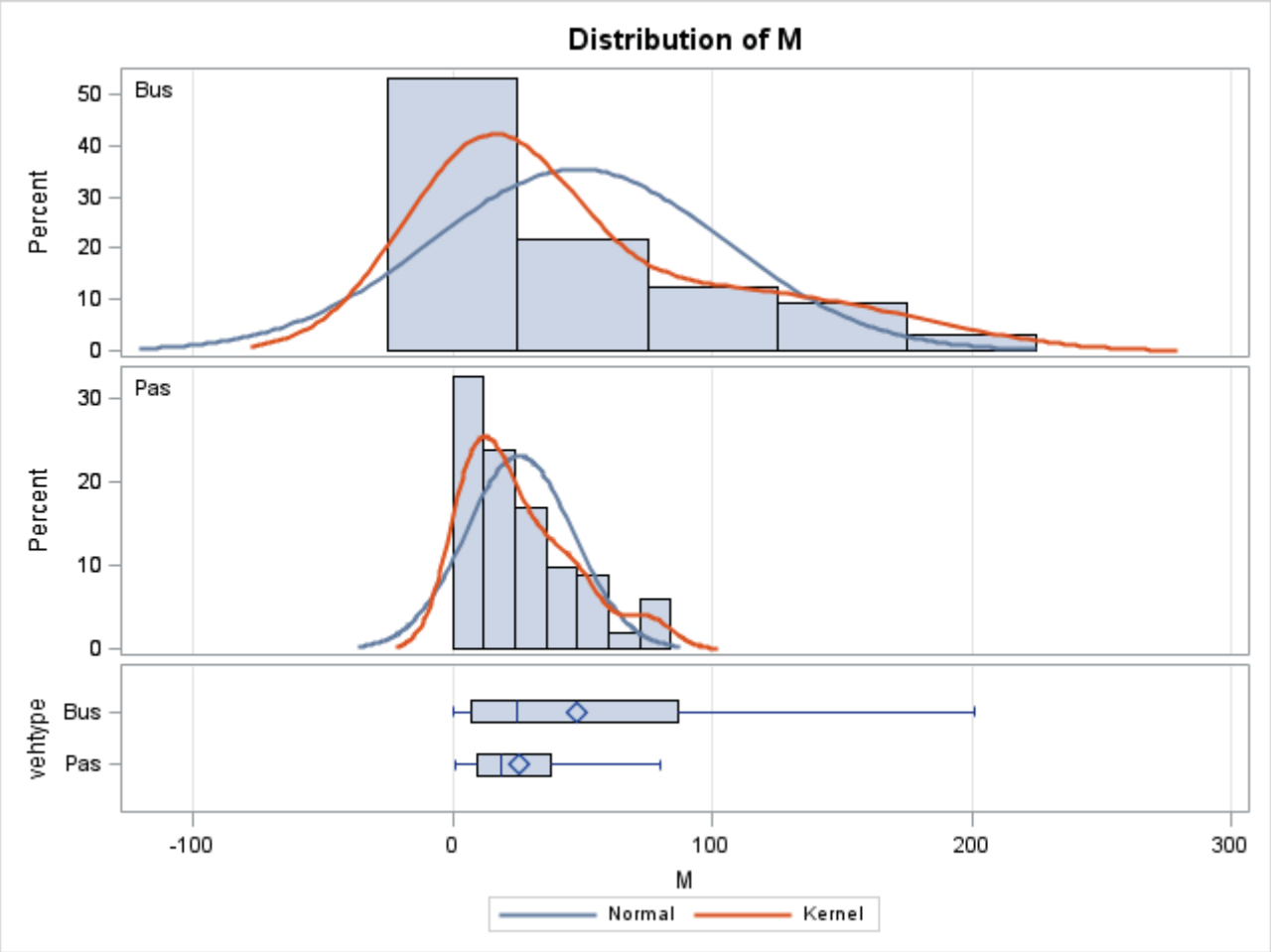
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	131	-3.36	0.0010
Satterthwaite	Unequal	102.53	-4.57	<.0001



Variable: M

vehtype	N	Mean	Std Dev	Std Err	Minimum	Maximum
Bus	32	48.0906	56.3456	9.9606	0.4000	201.2
Pas	101	25.5970	20.7130	2.0610	0.7000	79.6000
Diff (1-2)		22.4936	32.8451	6.6629		

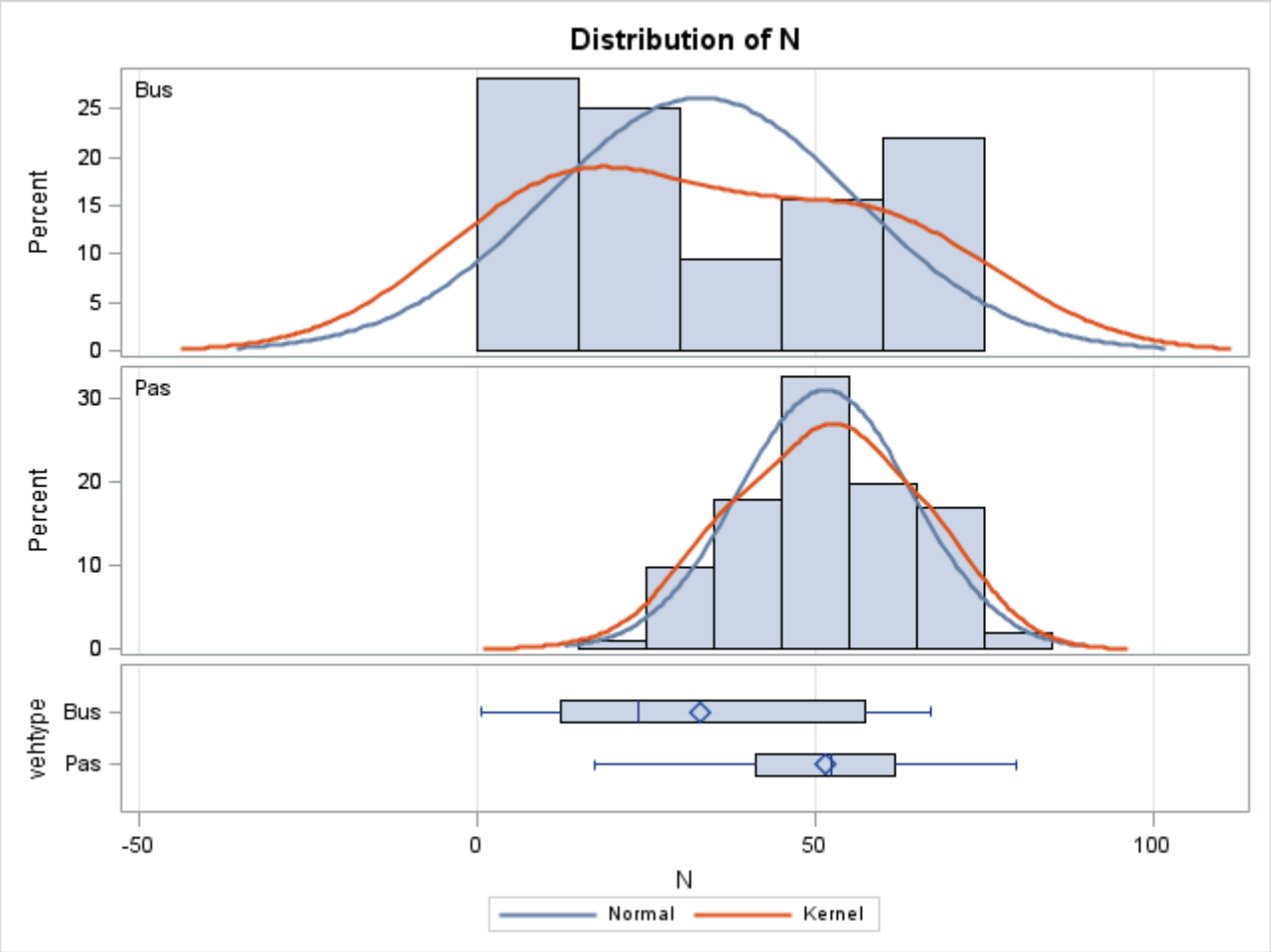
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	131	3.38	0.0010
Satterthwaite	Unequal	33.692	2.21	0.0339



Variable: N

vehtype	N	Mean	Std Dev	Std Err	Minimum	Maximum
Bus	32	33.0938	22.9139	4.0506	0.5000	67.2000
Pas	101	51.4941	12.8654	1.2802	17.4000	79.6000
Diff (1-2)		-18.4003	15.8303	3.2113		

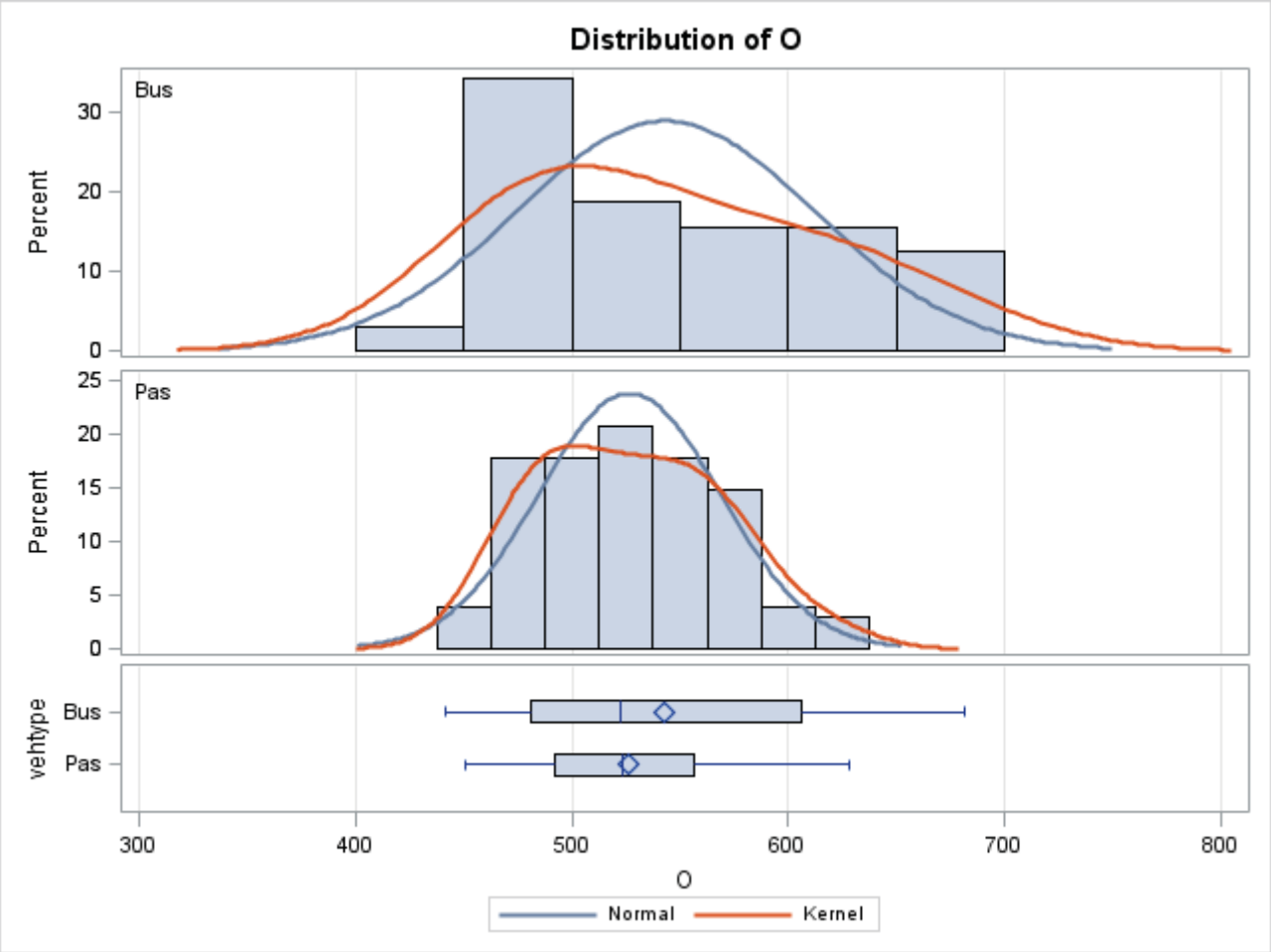
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	131	-5.73	<.0001
Satterthwaite	Unequal	37.386	-4.33	0.0001



Variable: O

vehtype	N	Mean	Std Dev	Std Err	Minimum	Maximum
Bus	32	543.1	68.7606	12.1553	441.4	681.1
Pas	101	526.6	41.9284	4.1720	451.2	627.9
Diff (1-2)		16.4787	49.6067	10.0631		

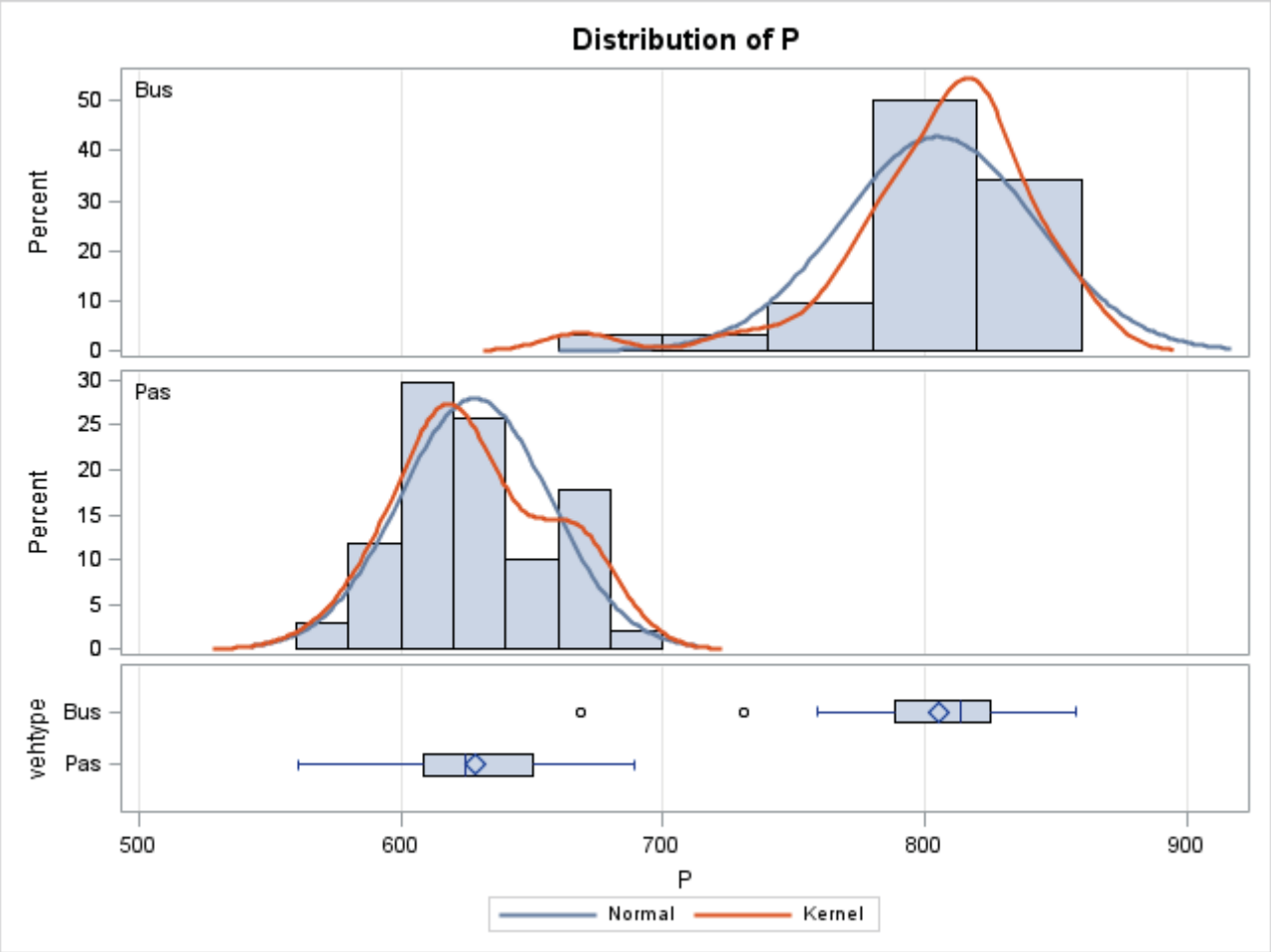
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	131	1.64	0.1039
Satterthwaite	Unequal	38.568	1.28	0.2074



Variable: P

vehtype	N	Mean	Std Dev	Std Err	Minimum	Maximum
Bus	32	804.9	37.3201	6.5973	668.6	858.0
Pas	101	628.2	28.5108	2.8369	561.1	689.2
Diff (1-2)		176.7	30.8237	6.2528		

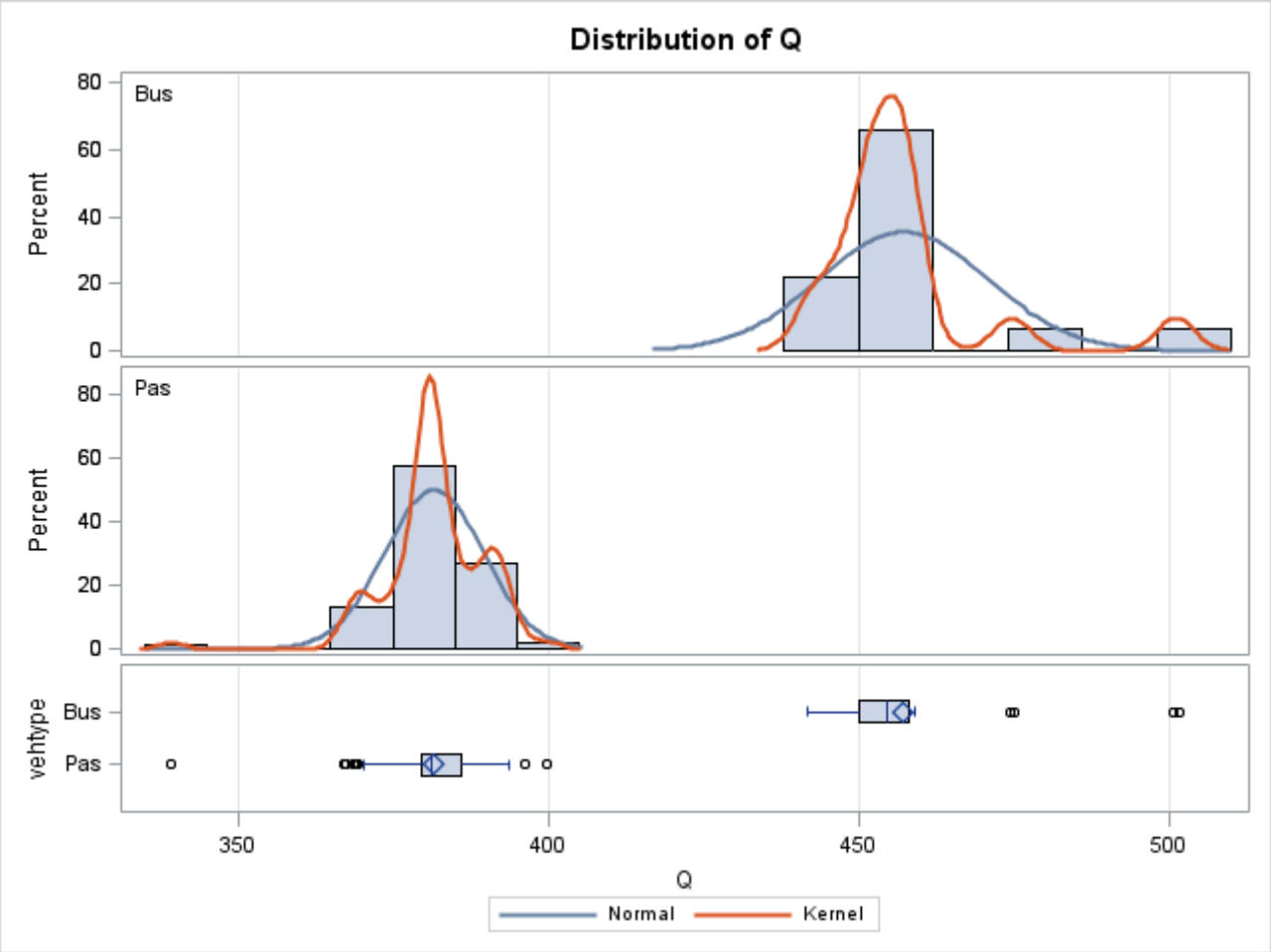
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	131	28.26	<.0001
Satterthwaite	Unequal	43.068	24.61	<.0001



Variable: Q

vehtype	N	Mean	Std Dev	Std Err	Minimum	Maximum
Bus	32	457.2	13.5290	2.3916	441.7	501.6
Pas	101	381.6	8.0037	0.7964	339.3	399.9
Diff (1-2)		75.6320	9.6028	1.9480		

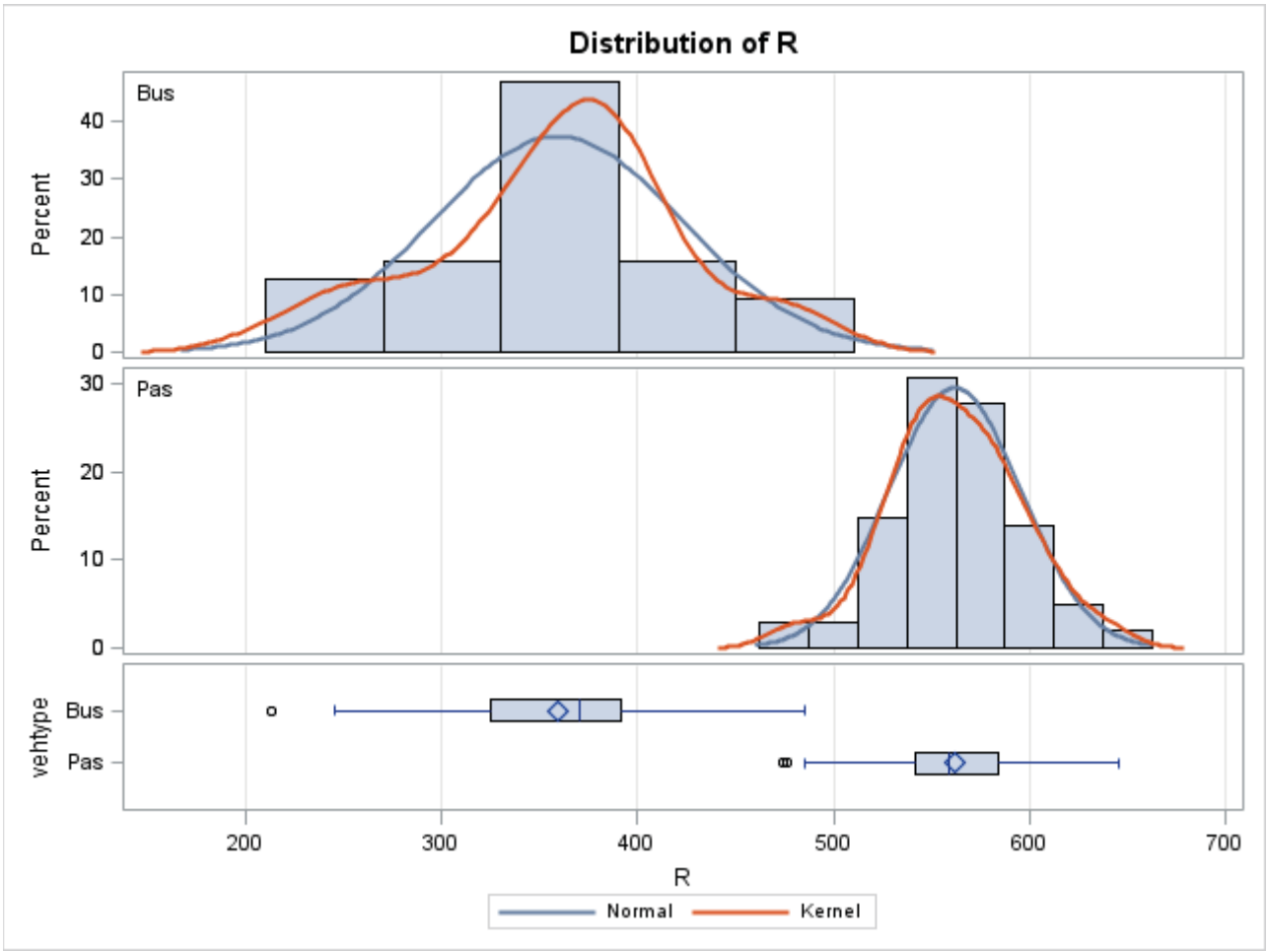
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	131	38.83	<.0001
Satterthwaite	Unequal	38.111	30.00	<.0001



Variable: R

vehtype	N	Mean	Std Dev	Std Err	Minimum	Maximum
Bus	32	358.9	64.0058	11.3147	212.5	485.7
Pas	101	561.8	33.7973	3.3630	474.3	645.6
Diff (1-2)		-202.8	42.9117	8.7049		

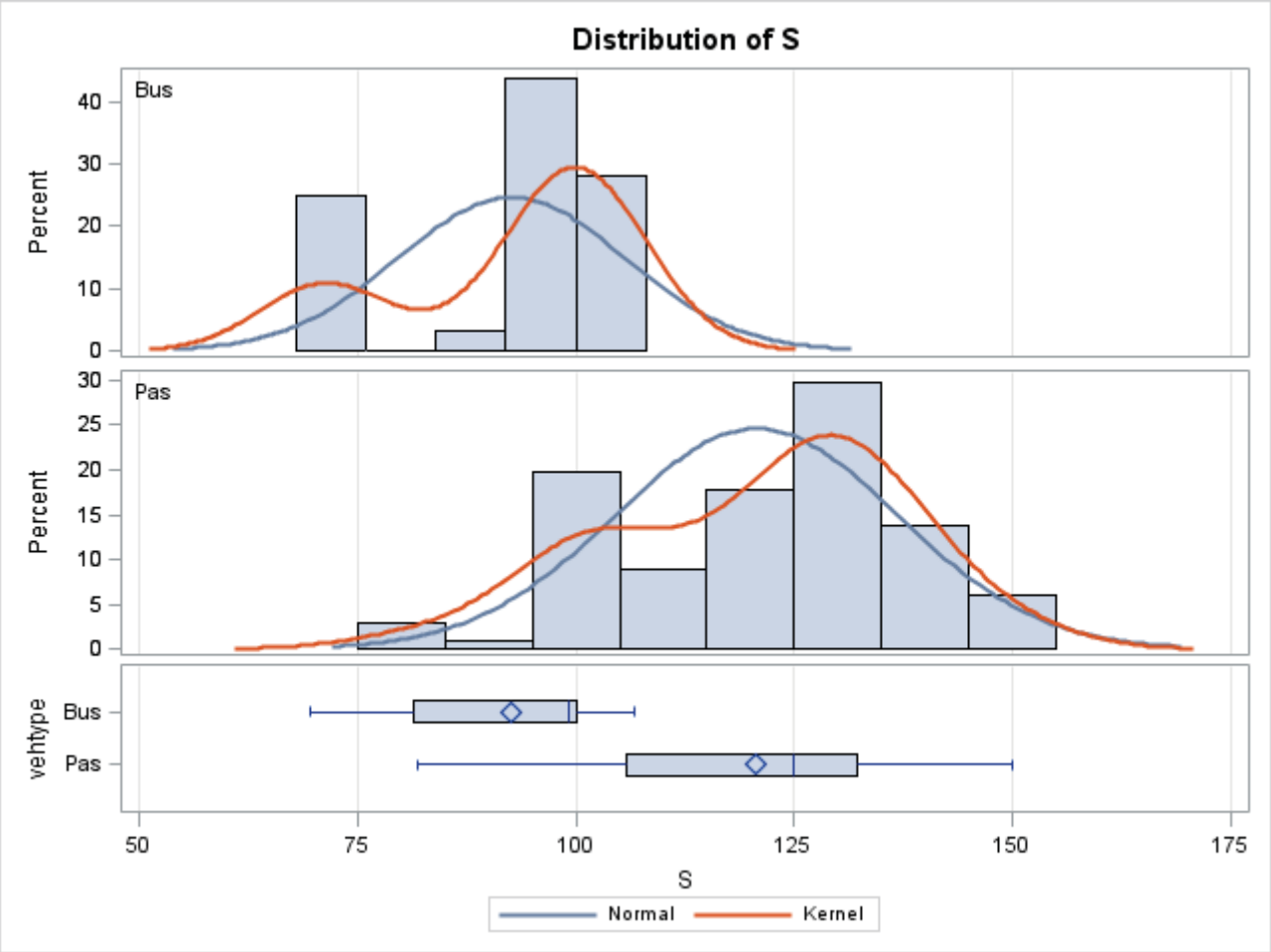
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	131	-23.30	<.0001
Satterthwaite	Unequal	36.63	-17.18	<.0001



Variable: S

vehtype	N	Mean	Std Dev	Std Err	Minimum	Maximum
Bus	32	92.6781	12.9559	2.2903	69.5000	106.8
Pas	101	120.7	16.2191	1.6139	81.8000	150.0
Diff (1-2)		-27.9981	15.5090	3.1461		

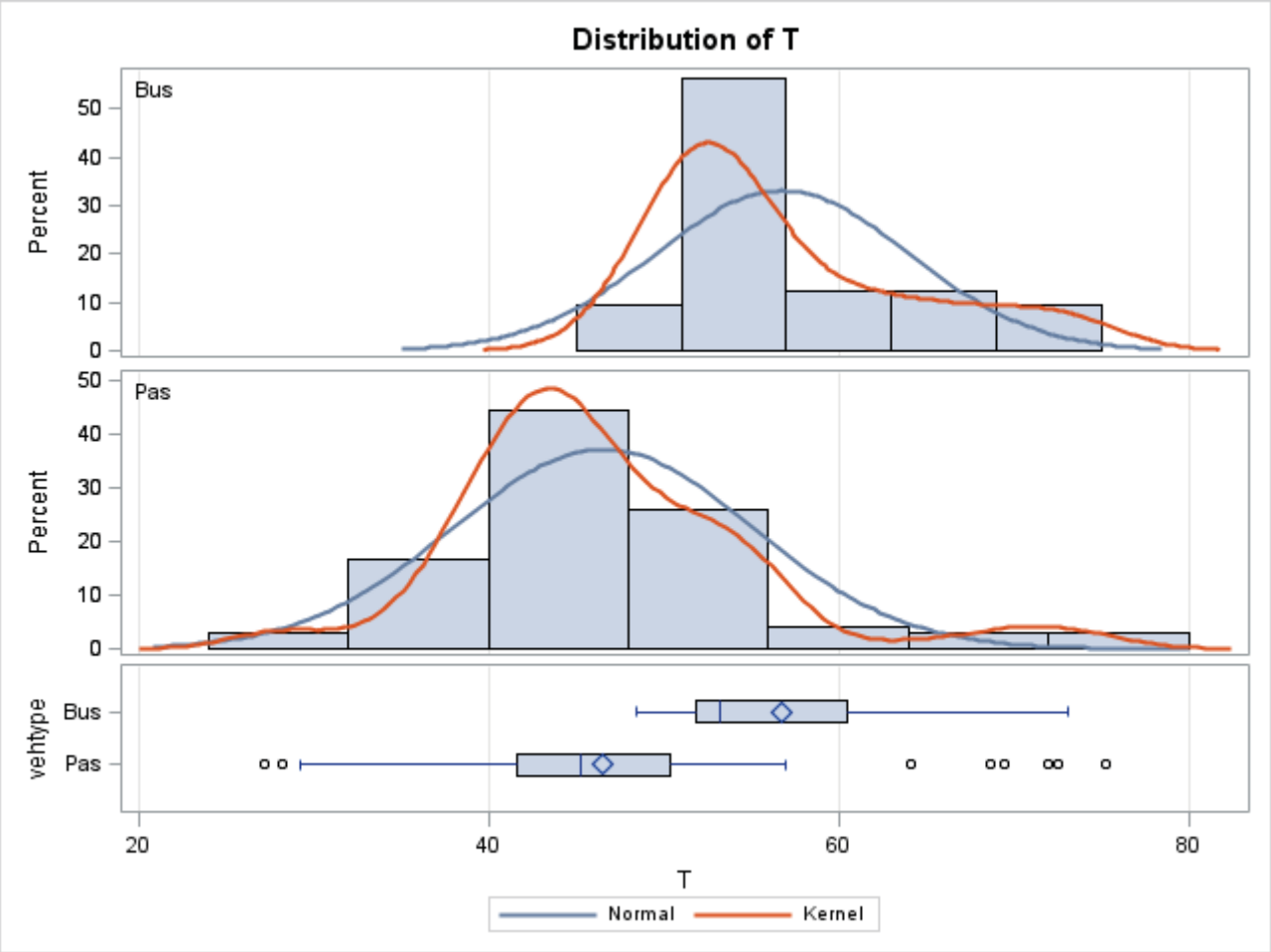
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	131	-8.90	<.0001
Satterthwaite	Unequal	64.498	-9.99	<.0001



Variable: T

vehtype	N	Mean	Std Dev	Std Err	Minimum	Maximum
Bus	32	56.7750	7.2392	1.2797	48.4000	73.1000
Pas	101	46.5198	8.5872	0.8545	27.2000	75.3000
Diff (1-2)		10.2552	8.2881	1.6813		

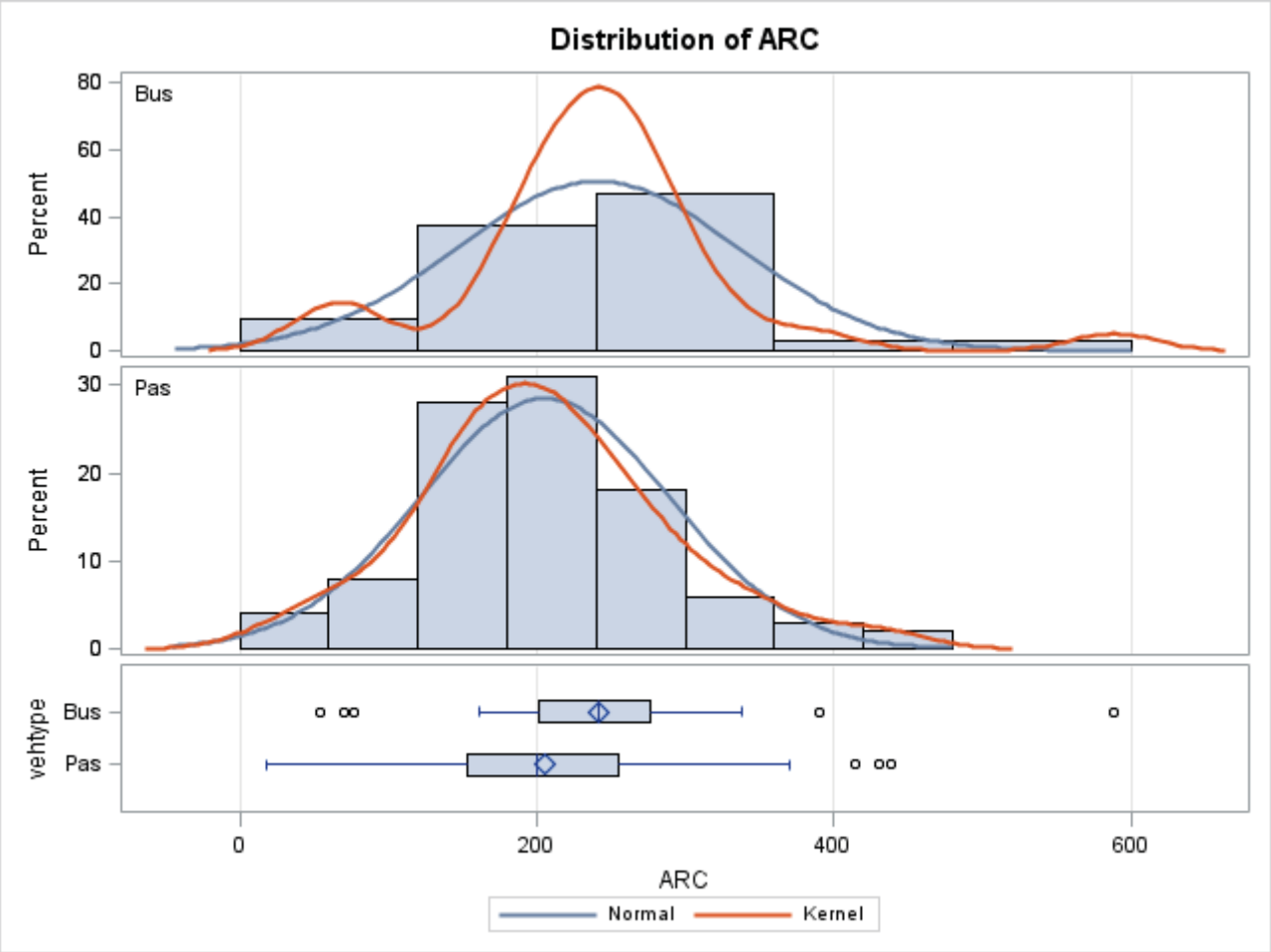
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	131	6.10	<.0001
Satterthwaite	Unequal	61.041	6.66	<.0001



Variable: ARC

vehtype	N	Mean	Std Dev	Std Err	Minimum	Maximum
Bus	32	241.1	94.8178	16.7616	54.1000	588.3
Pas	100	205.1	83.9152	8.3915	18.1000	438.0
Diff (1-2)		36.0146	86.6397	17.5966		

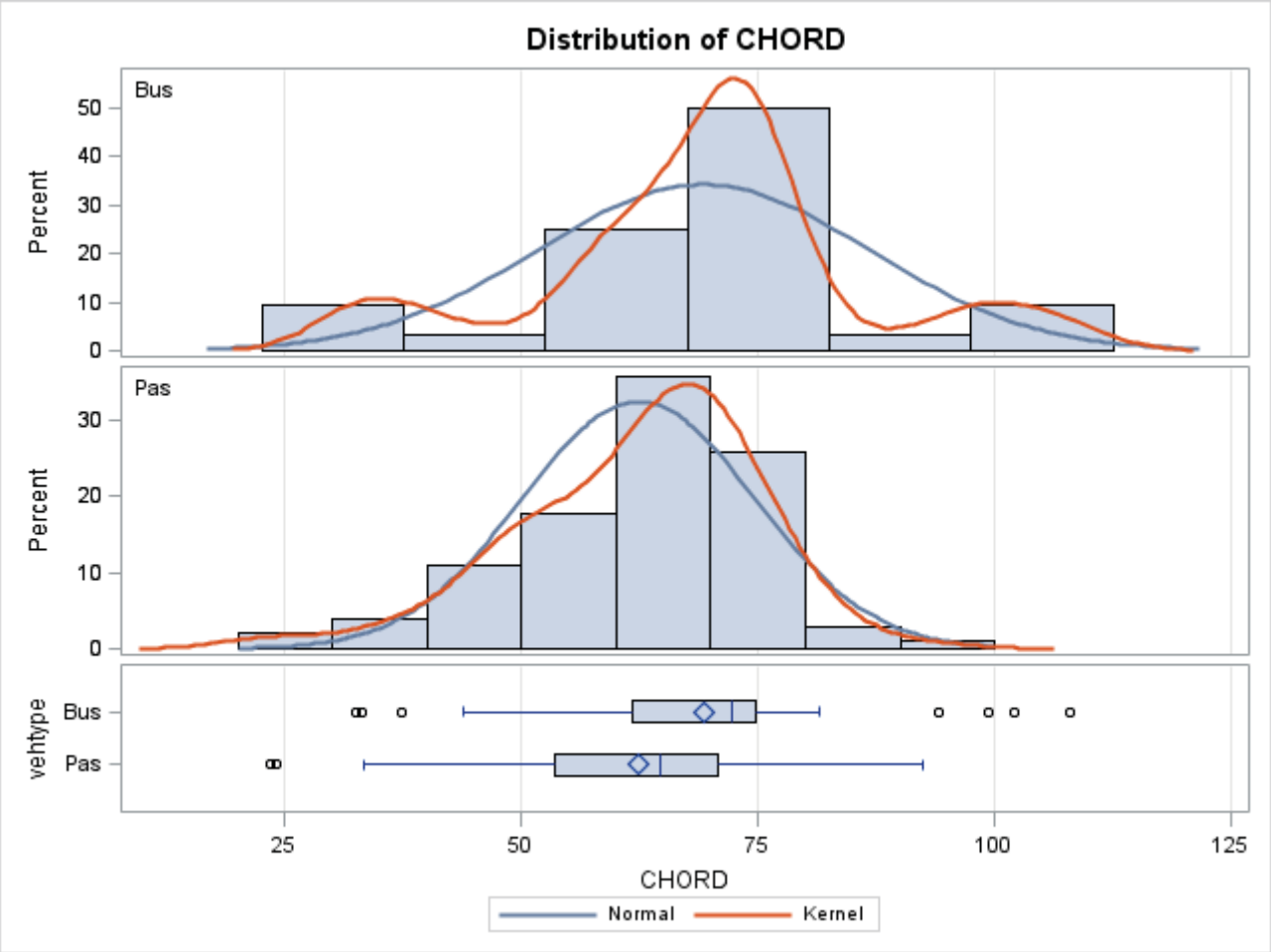
Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	130	2.05	0.0427
Satterthwaite	Unequal	47.552	1.92	0.0607



Variable: CHORD

vehtype	N	Mean	Std Dev	Std Err	Minimum	Maximum
Bus	32	69.1844	17.5084	3.0951	32.4000	108.0
Pas	101	62.3535	12.3307	1.2269	23.5000	92.3000
Diff (1-2)		6.8309	13.7334	2.7859		

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	131	2.45	0.0155
Satterthwaite	Unequal	41.193	2.05	0.0466

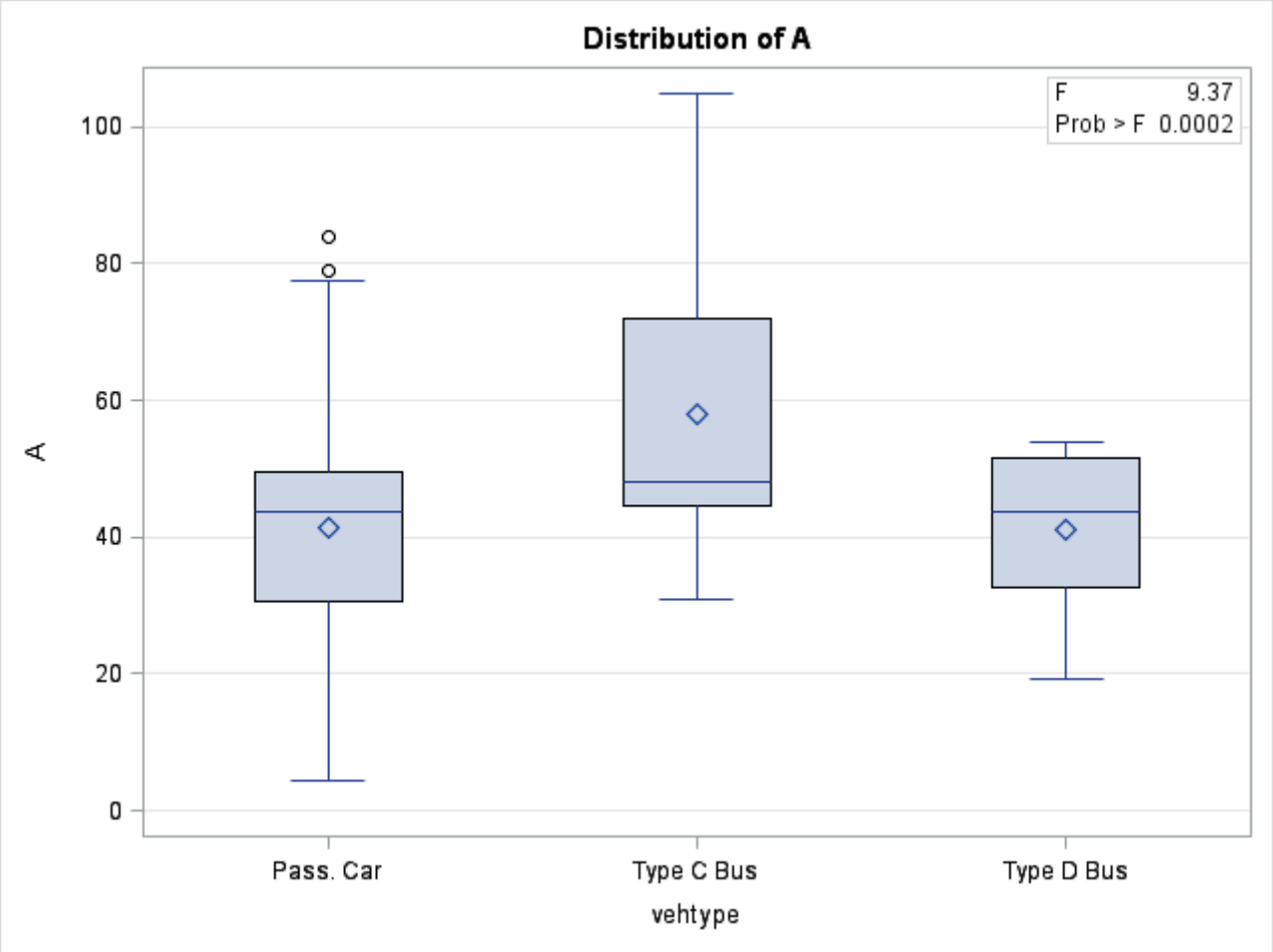


11. Appendix F - Comparison of Passenger Car Dimensions to Type C and D Buses

Dependent Variable: A

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	268651.3291	89550.4430	311.58	<.0001
Error	130	37362.5009	287.4039		
Uncorrected Total	133	306013.8300			

R-Square	Coeff Var	Root MSE	A Mean
0.125970	38.10433	16.95299	44.49098



Scheffe's Test for A

Alpha	0.05
Error Degrees of Freedom	130
Error Mean Square	287.4039
Critical Value of F	3.06584

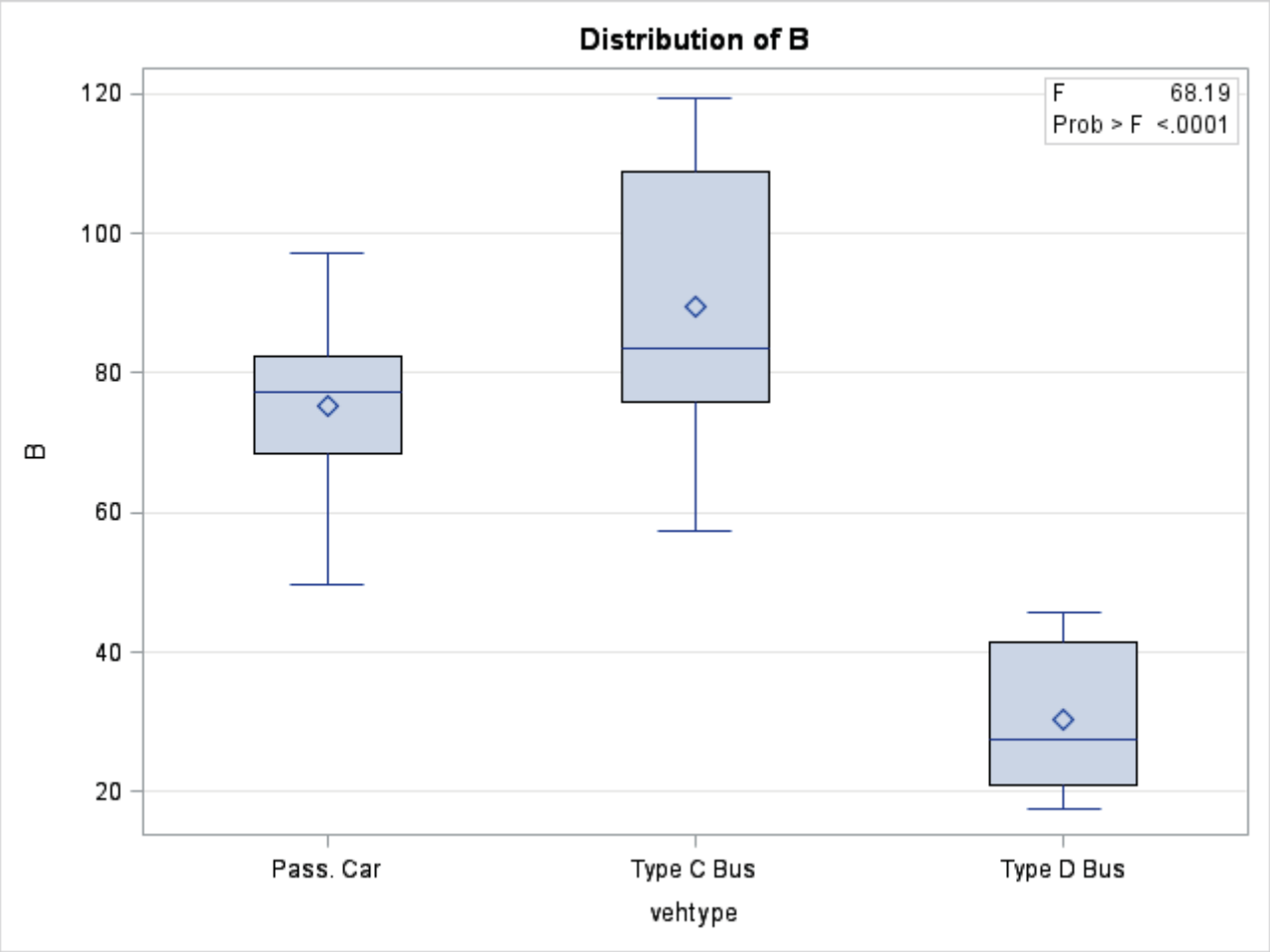
Comparisons significant at the 0.05 level were indicated by *.**

vehtype Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Type C Bus - Pass. Car	16.517	6.984	26.050	***
Type C Bus - Type D Bus	16.887	-0.251	34.026	
Pass. Car - Type C Bus	-16.517	-26.050	-6.984	***
Pass. Car - Type D Bus	0.370	-15.048	15.789	
Type D Bus - Type C Bus	-16.887	-34.026	0.251	
Type D Bus - Pass. Car	-0.370	-15.789	15.048	

Dependent Variable: B

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	773797.7884	257932.5961	1679.82	<.0001
Error	130	19961.2416	153.5480		
Uncorrected Total	133	793759.0300			

R-Square	Coeff Var	Root MSE	B Mean
0.511969	16.46992	12.39145	75.23684



Scheffe's Test for B

Alpha	0.05
Error Degrees of Freedom	130
Error Mean Square	153.548
Critical Value of F	3.06584

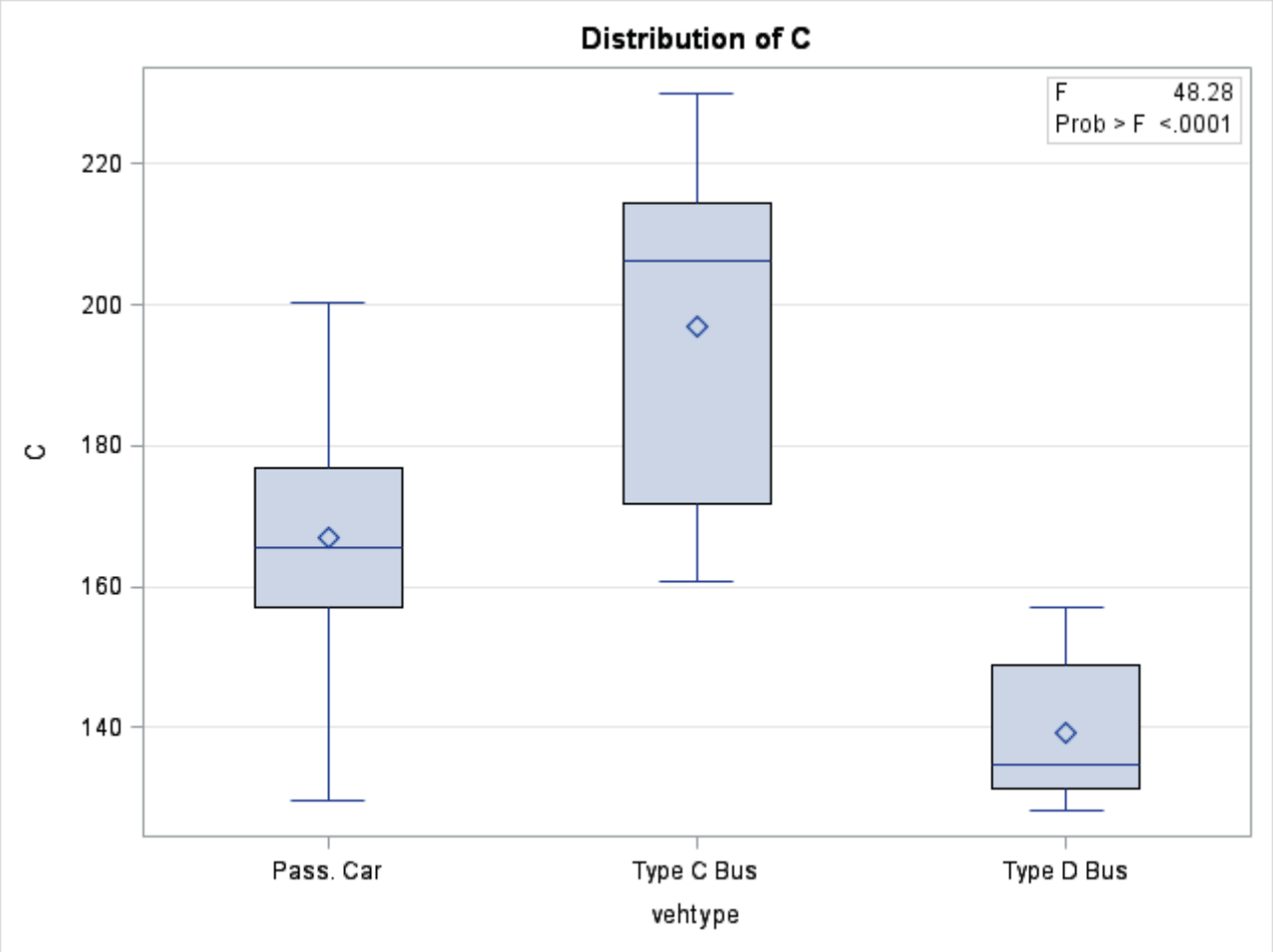
Comparisons significant at the 0.05 level were indicated by *.**

vehtype Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Type C Bus - Pass. Car	14.033	7.065	21.001	***
Type C Bus - Type D Bus	59.058	46.532	71.585	***
Pass. Car - Type C Bus	-14.033	-21.001	-7.065	***
Pass. Car - Type D Bus	45.025	33.755	56.295	***
Type D Bus - Type C Bus	-59.058	-71.585	-46.532	***
Type D Bus - Pass. Car	-45.025	-56.295	-33.755	***

Dependent Variable: C

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	3905685.874	1301895.291	4886.30	<.0001
Error	130	34636.906	266.438		
Uncorrected Total	133	3940322.780			

R-Square	Coeff V	Root MSE	C Mean
0.426177	9.556745	16.32292	170.8000



Scheffe's Test for C

Alpha	0.05
Error Degrees of Freedom	130
Error Mean Square	266.4377
Critical Value of F	3.06584

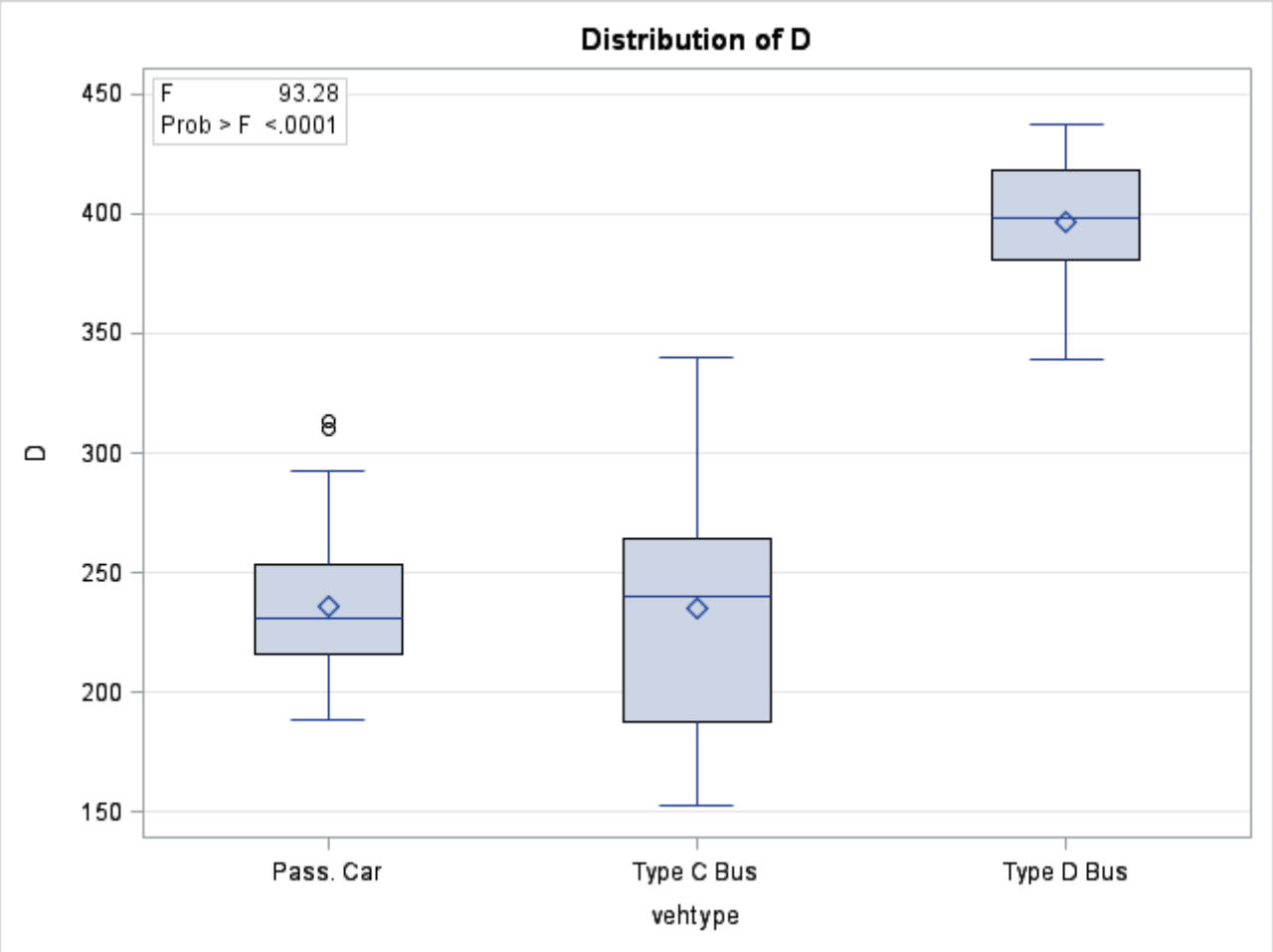
Comparisons significant at the 0.05 level were indicated by *.**

vehtype Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Type C Bus - Pass. Car	29.879	20.700	39.058	***
Type C Bus - Type D Bus	57.592	41.091	74.093	***
Pass. Car - Type C Bus	-29.879	-39.058	-20.700	***
Pass. Car - Type D Bus	27.713	12.867	42.558	***
Type D Bus - Type C Bus	-57.592	-74.093	-41.091	***
Type D Bus - Pass. Car	-27.713	-42.558	-12.867	***

Dependent Variable: D

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	8210720.702	2736906.901	2638.10	<.0001
Error	130	134869.158	1037.455		
Uncorrected Total	133	8345589.860			

R-Square	Coeff Var	Root MSE	D Mean
0.589338	13.11897	32.20955	245.5188



Scheffe's Test for D

Alpha	0.05
Error Degrees of Freedom	130
Error Mean Square	1037.455
Critical Value of F	3.06584

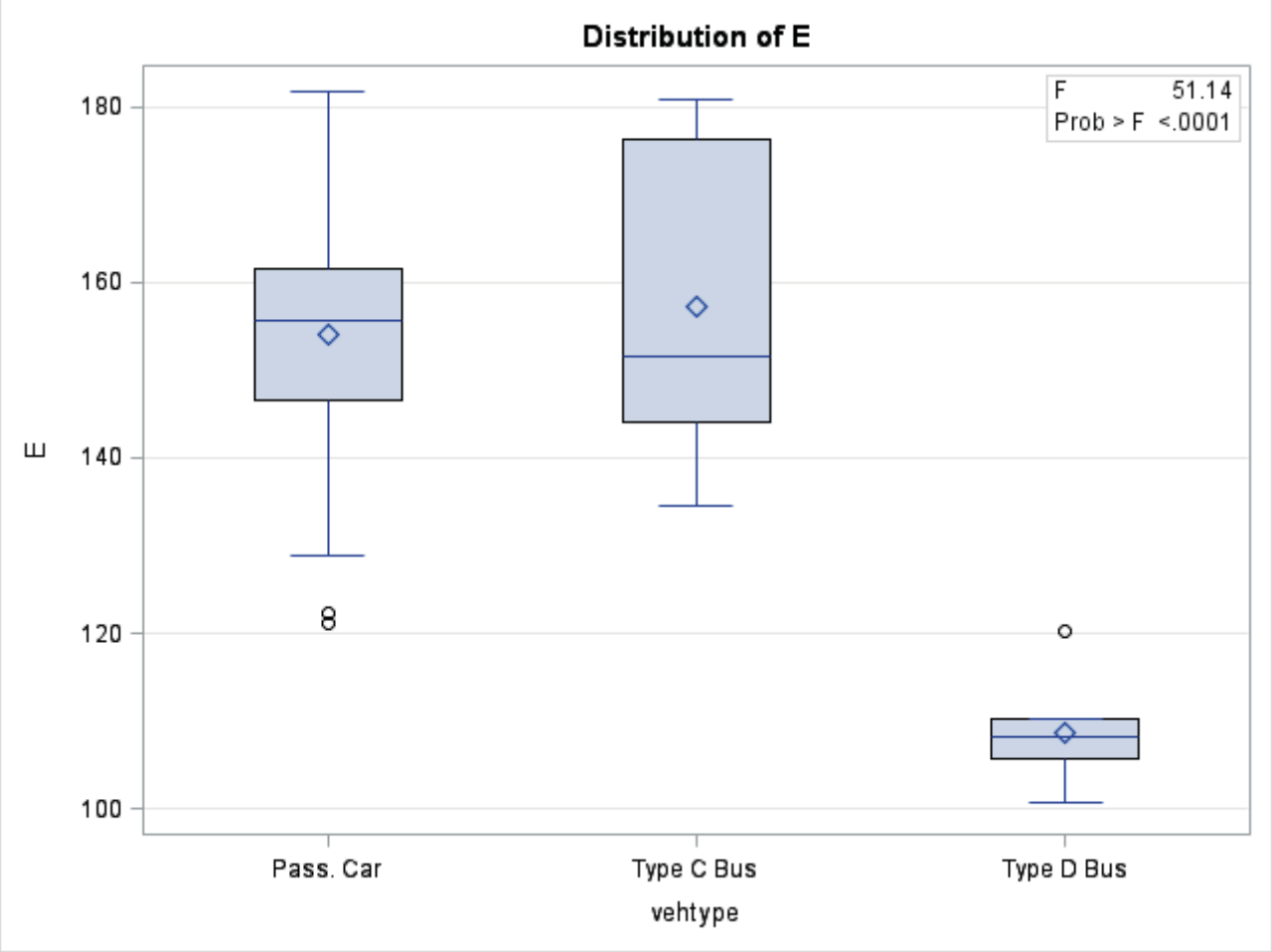
Comparisons significant at the 0.05 level were indicated by *.**

vehtype Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Type D Bus - Pass. Car	160.193	130.899	189.487	***
Type D Bus - Type C Bus	161.433	128.872	193.994	***
Pass. Car - Type D Bus	-160.193	-189.487	-130.899	***
Pass. Car - Type C Bus	1.240	-16.872	19.352	
Type C Bus - Type D Bus	-161.433	-193.994	-128.872	***
Type C Bus - Pass. Car	-1.240	-19.352	16.872	

Dependent Variable: E

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	3086007.567	1028669.189	6513.50	<.0001
Error	130	20530.753	157.929		
Uncorrected Total	133	3106538.320			

R-Square	Coeff Var	Root MSE	E Mean
0.440347	8.271757	12.56698	151.9263



Scheffe's Test for E

Alpha	0.05
Error Degrees of Freedom	130
Error Mean Square	157.9289
Critical Value of F	3.06584

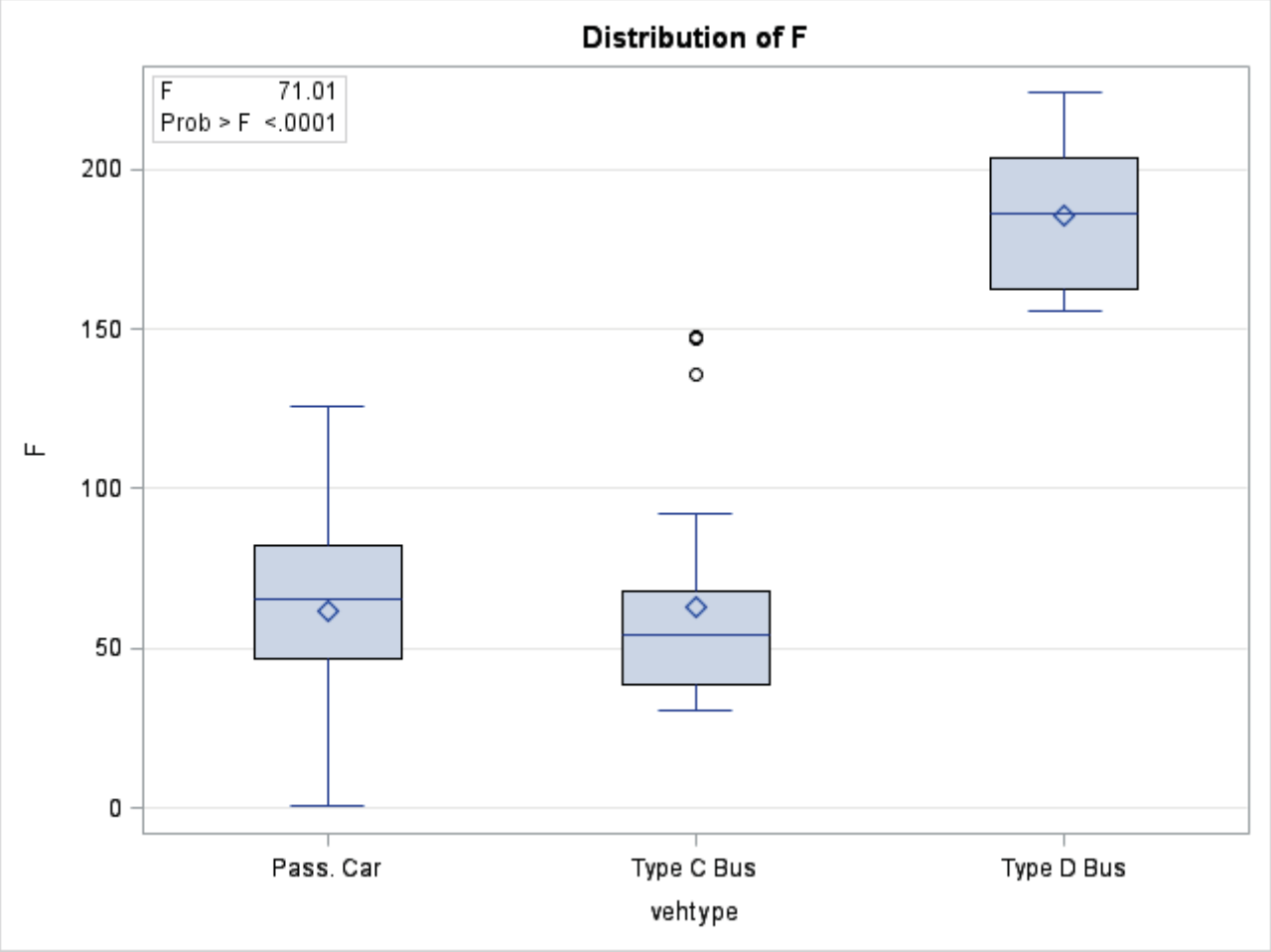
Comparisons significant at the 0.05 level were indicated by *.**

vehtype Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Type C Bus - Pass. Car	3.237	-3.829	10.304	
Type C Bus - Type D Bus	48.675	35.971	61.379	***
Pass. Car - Type C Bus	-3.237	-10.304	3.829	
Pass. Car - Type D Bus	45.438	34.008	56.867	***
Type D Bus - Type C Bus	-48.675	-61.379	-35.971	***
Type D Bus - Pass. Car	-45.438	-56.867	-34.008	***

Dependent Variable: F

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	758732.2383	252910.7461	313.93	<.0001
Error	130	104731.4317	805.6264		
Uncorrected Total	133	863463.6700			

R-Square	Coeff Var	Root MSE	F Mean
0.522099	40.77965	28.38356	69.60226



Scheffe's Test for F

Alpha	0.05
Error Degrees of Freedom	130
Error Mean Square	805.6264
Critical Value of F	3.06584

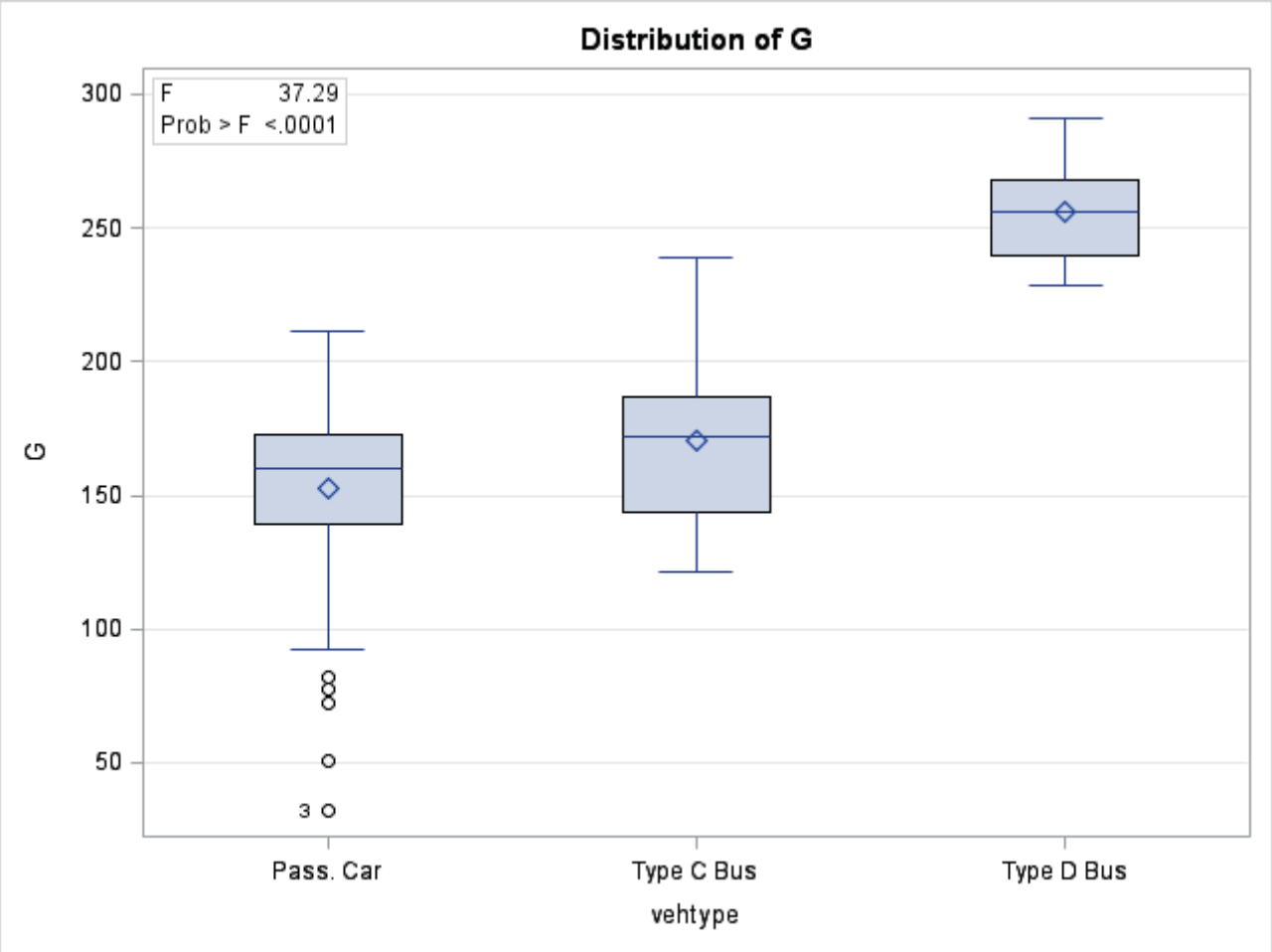
Comparisons significant at the 0.05 level were indicated by *.**

vehtype Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Type D Bus - Type C Bus	122.300	93.607	150.993	***
Type D Bus - Pass. Car	123.589	97.775	149.404	***
Type C Bus - Type D Bus	-122.300	-150.993	-93.607	***
Type C Bus - Pass. Car	1.289	-14.671	17.250	
Pass. Car - Type D Bus	-123.589	-149.404	-97.775	***
Pass. Car - Type C Bus	-1.289	-17.250	14.671	

Dependent Variable: G

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	3576776.085	1192258.695	1095.15	<.0001
Error	130	141527.055	1088.670		
Uncorrected Total	133	3718303.140			

R-Square	Coeff Var	Root MSE	G Mean
0.364580	20.35236	32.99499	162.1188



Scheffe's Test for G

Alpha	0.05
Error Degrees of Freedom	130
Error Mean Square	1088.67
Critical Value of F	3.06584

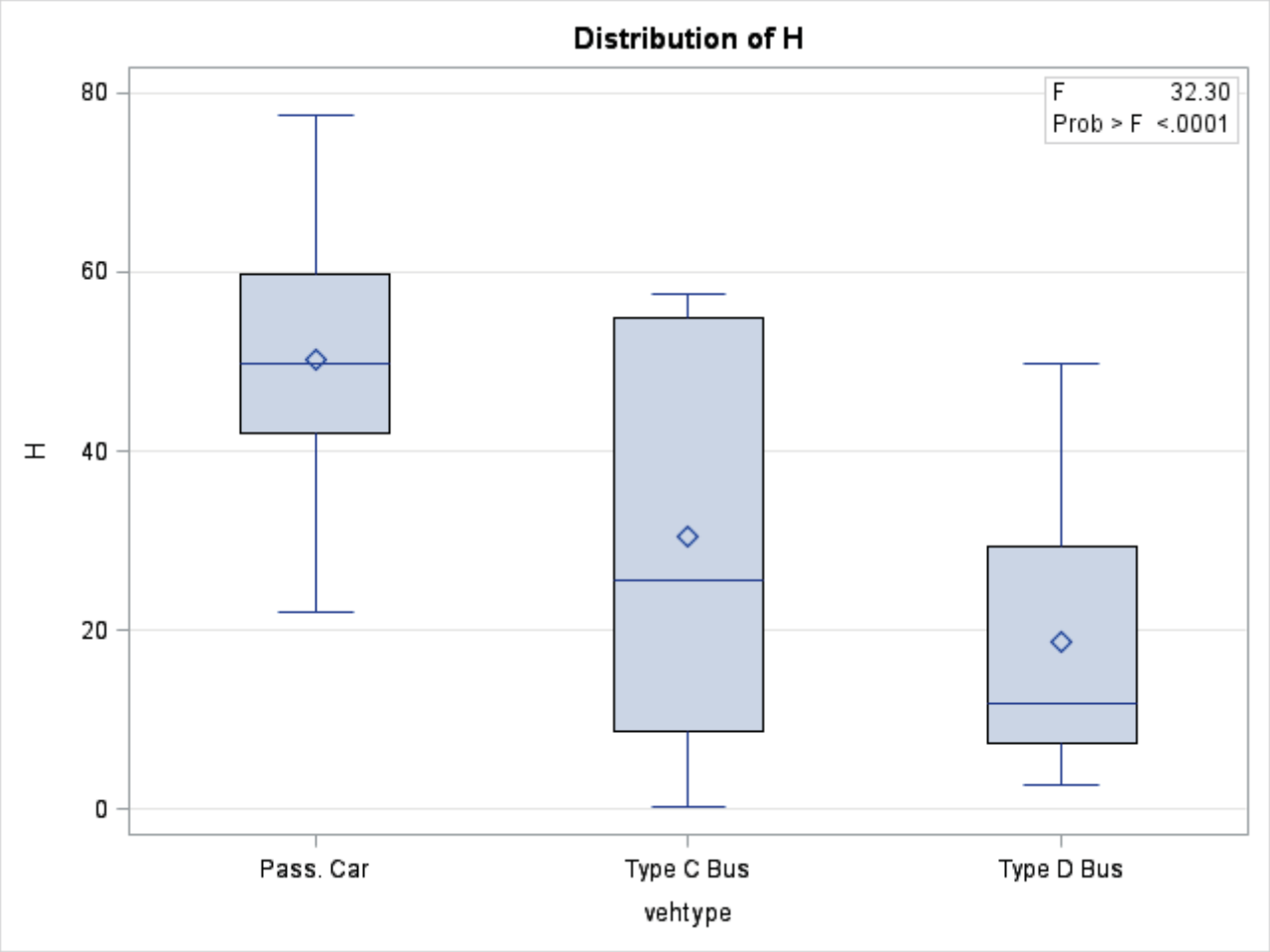
Comparisons significant at the 0.05 level were indicated by *.**

vehtype Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Type D Bus - Type C Bus	85.538	52.182	118.893	***
Type D Bus - Pass. Car	103.333	73.324	133.341	***
Type C Bus - Type D Bus	-85.538	-118.893	-52.182	***
Type C Bus - Pass. Car	17.795	-0.758	36.349	
Pass. Car - Type D Bus	-103.333	-133.341	-73.324	***
Pass. Car - Type C Bus	-17.795	-36.349	0.758	

Dependent Variable: H

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	280162.0092	93387.3364	451.81	<.0001
Error	130	26870.4508	206.6958		
Uncorrected Total	133	307032.4600			

R-Square	Coeff Var	Root MSE	H Mean
0.331939	32.09888	14.37692	44.78947



Scheffe's Test for H

Alpha	0.05
Error Degrees of Freedom	130
Error Mean Square	206.6958
Critical Value of F	3.06584

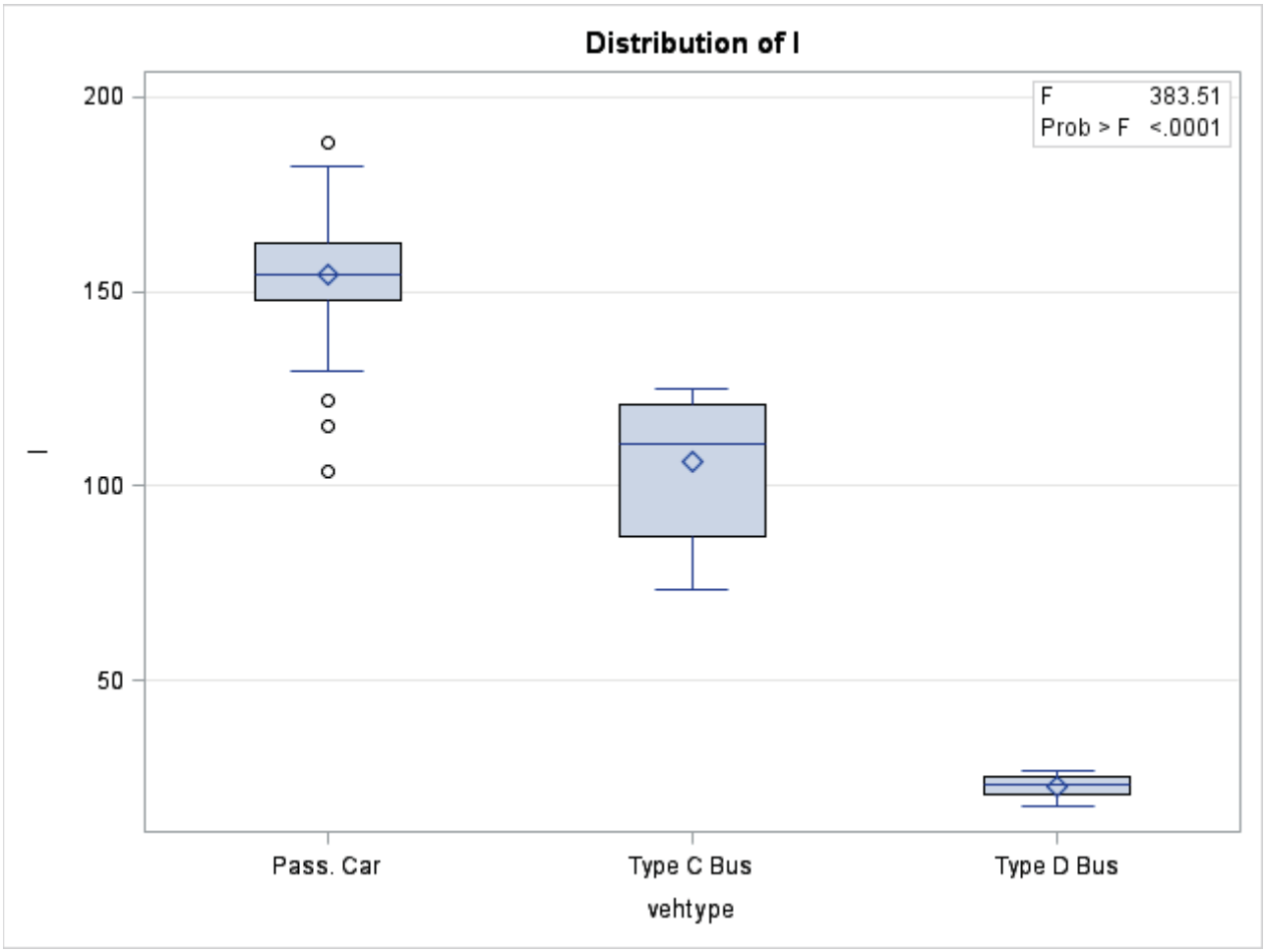
Comparisons significant at the 0.05 level were indicated by *.**

vehtype Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Pass. Car - Type C Bus	19.741	11.657	27.826	***
Pass. Car - Type D Bus	31.550	18.474	44.625	***
Type C Bus - Pass. Car	-19.741	-27.826	-11.657	***
Type C Bus - Type D Bus	11.808	-2.725	26.342	
Type D Bus - Pass. Car	-31.550	-44.625	-18.474	***
Type D Bus - Type C Bus	-11.808	-26.342	2.725	

Dependent Variable: I

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	2686310.236	895436.745	4358.85	<.0001
Error	130	26705.874	205.430		
Uncorrected Total	133	2713016.110			

R-Square	Coeff Var	Root MSE	I Mean
0.855076	10.39454	14.33282	137.8880



Scheffe's Test for I

Alpha	0.05
Error Degrees of Freedom	130
Error Mean Square	205.4298
Critical Value of F	3.06584

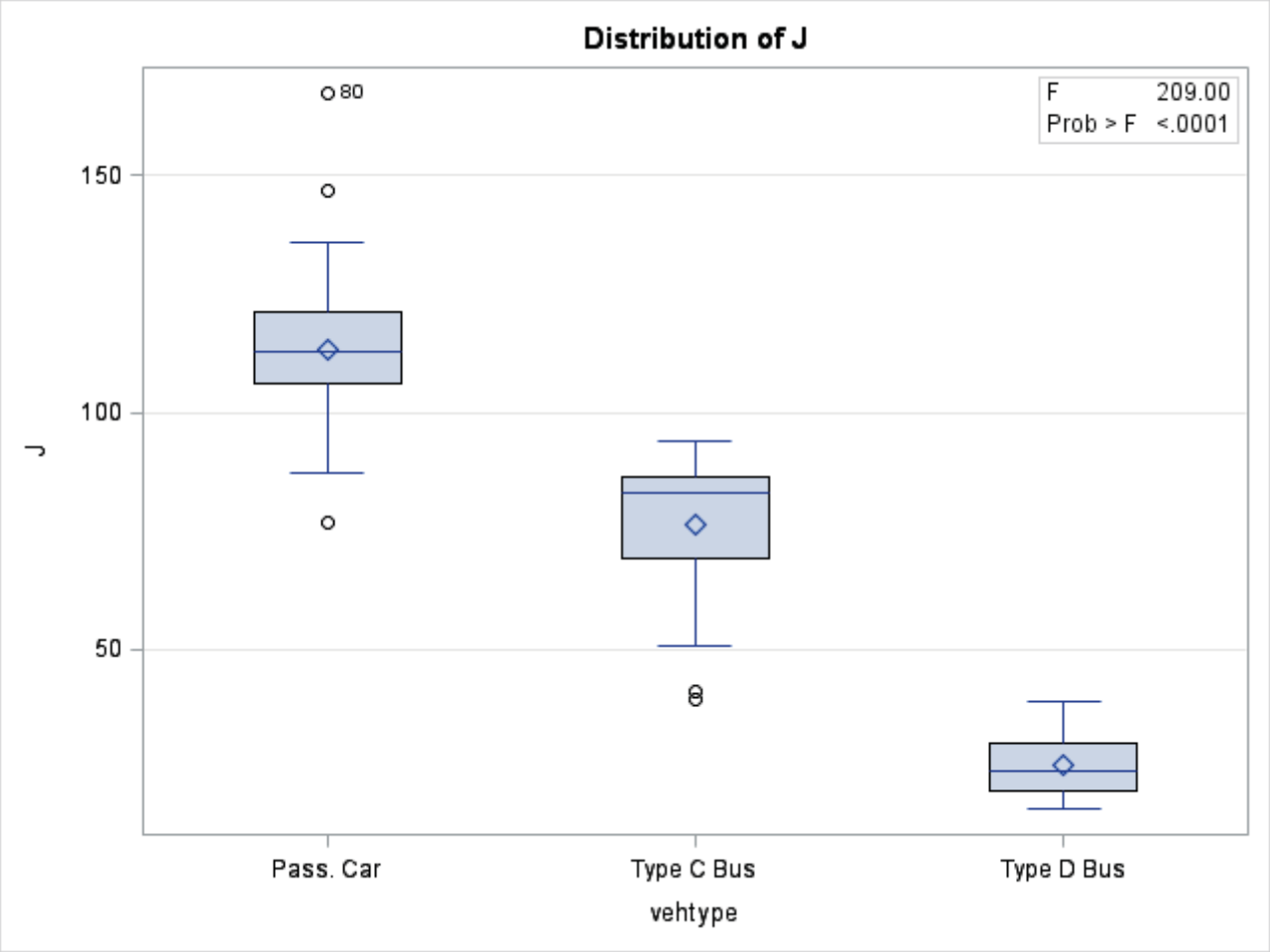
Comparisons significant at the 0.05 level were indicated by *.**

vehtype Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Pass. Car - Type C Bus	48.105	40.045	56.164	***
Pass. Car - Type D Bus	131.663	118.628	144.699	***
Type C Bus - Pass. Car	-48.105	-56.164	-40.045	***
Type C Bus - Type D Bus	83.558	69.069	98.048	***
Type D Bus - Pass. Car	-131.663	-144.699	-118.628	***
Type D Bus - Type C Bus	-83.558	-98.048	-69.069	***

Dependent Variable: J

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	1443169.991	481056.664	2666.67	<.0001
Error	130	23451.499	180.396		
Uncorrected Total	133	1466621.490			

R-Square	Coeff Var	Root MSE	J Mean
0.762774	13.24445	13.43116	101.4098



Scheffe's Test for J

Alpha	0.05
Error Degrees of Freedom	130
Error Mean Square	180.3961
Critical Value of F	3.06584

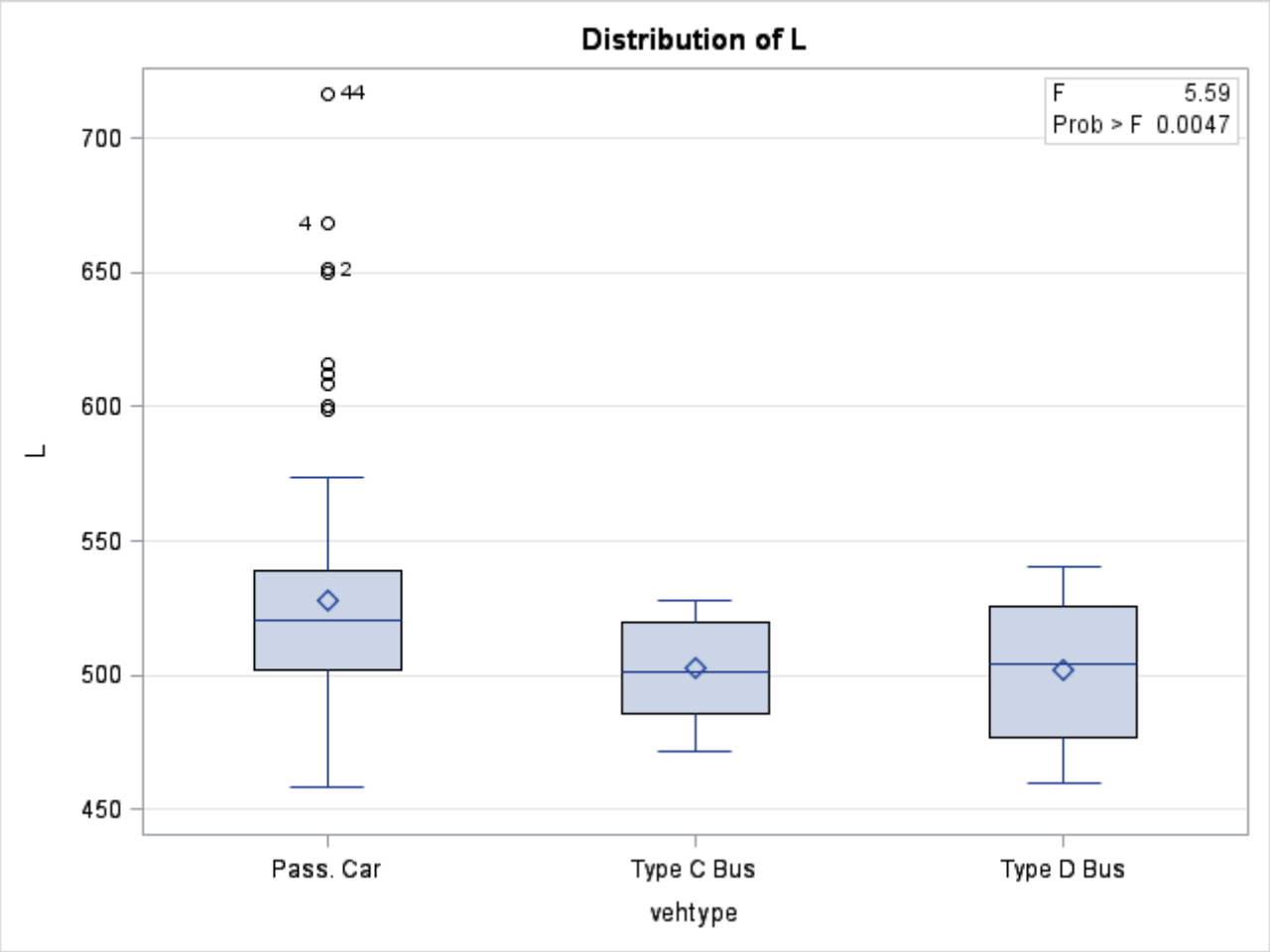
Comparisons significant at the 0.05 level were indicated by *.**

vehtype Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Pass. Car - Type C Bus	37.081	29.528	44.633	***
Pass. Car - Type D Bus	87.635	75.419	99.850	***
Type C Bus - Pass. Car	-37.081	-44.633	-29.528	***
Type C Bus - Type D Bus	50.554	36.976	64.132	***
Type D Bus - Pass. Car	-87.635	-99.850	-75.419	***
Type D Bus - Type C Bus	-50.554	-64.132	-36.976	***

Dependent Variable: L

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	36207172.50	12069057.50	8568.78	<.0001
Error	130	183103.87	1408.49		
Uncorrected Total	133	36390276.37			

R-Square	Coeff Var	Root MSE	L Mean
0.079193	7.194491	37.52987	521.6474



Scheffe's Test for L

Alpha	0.05
Error Degrees of Freedom	130
Error Mean Square	1408.491
Critical Value of F	3.06584

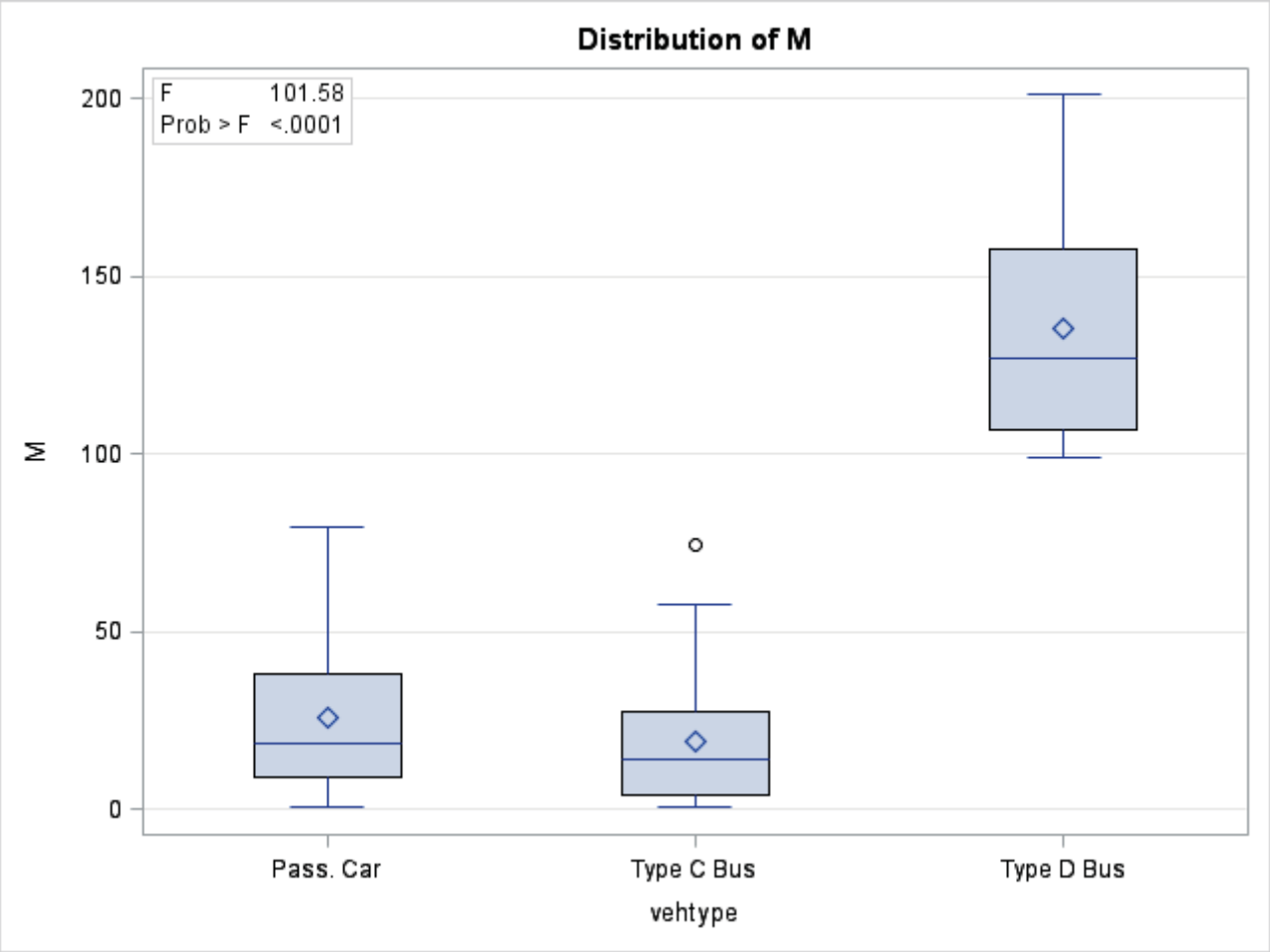
Comparisons significant at the 0.05 level were indicated by *.**

vehtype Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Pass. Car - Type C Bus	25.230	4.126	46.333	***
Pass. Car - Type D Bus	26.121	-8.012	60.254	
Type C Bus - Pass. Car	-25.230	-46.333	-4.126	***
Type C Bus - Type D Bus	0.892	-37.048	38.831	
Type D Bus - Pass. Car	-26.121	-60.254	8.012	
Type D Bus - Type C Bus	-0.892	-38.831	37.048	

Dependent Variable: M

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	221563.7471	73854.5824	160.17	<.0001
Error	130	59941.4529	461.0881		
Uncorrected Total	133	281505.2000			

R-Square	Coeff Var	Root MSE	M Mean
0.609801	69.24747	21.47296	31.00902



Scheffe's Test for M

Alpha	0.05
Error Degrees of Freedom	130
Error Mean Square	461.0881
Critical Value of F	3.06584

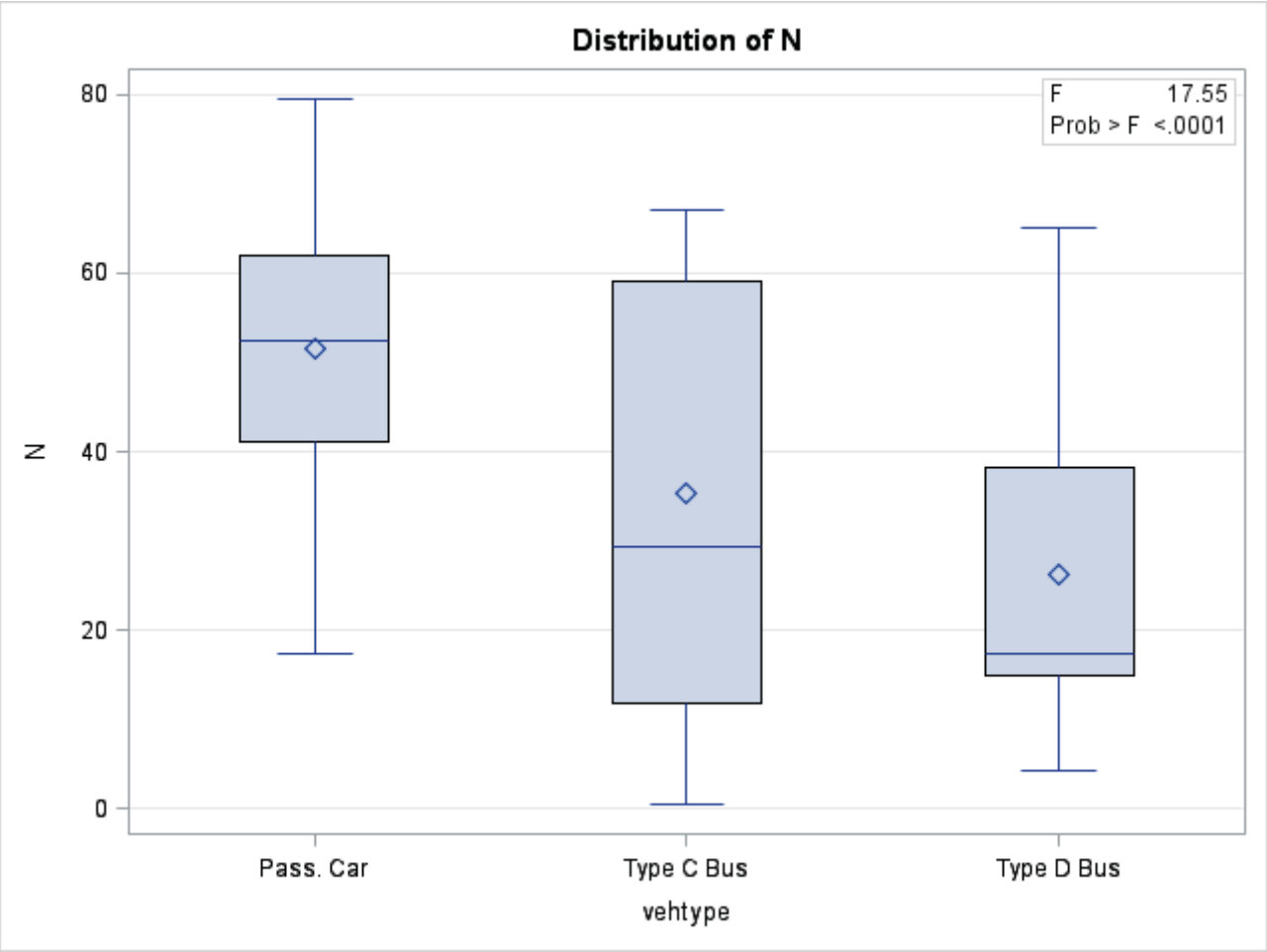
Comparisons significant at the 0.05 level were indicated by *.**

vehtype Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Type D Bus - Pass. Car	109.840	90.311	129.370	***
Type D Bus - Type C Bus	116.463	94.755	138.170	***
Pass. Car - Type D Bus	-109.840	-129.370	-90.311	***
Pass. Car - Type C Bus	6.622	-5.453	18.697	
Type C Bus - Type D Bus	-116.463	-138.170	-94.755	***
Type C Bus - Pass. Car	-6.622	-18.697	5.453	

Dependent Variable: N

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	303361.3286	101120.4429	406.63	<.0001
Error	130	32328.6414	248.6819		
Uncorrected Total	133	335689.9700			

R-Square	Coeff Var	Root MSE	N Mean
0.212568	33.50474	15.76965	47.06692



Scheffe's Test for N

Alpha	0.05
Error Degrees of Freedom	130
Error Mean Square	248.6819
Critical Value of F	3.06584

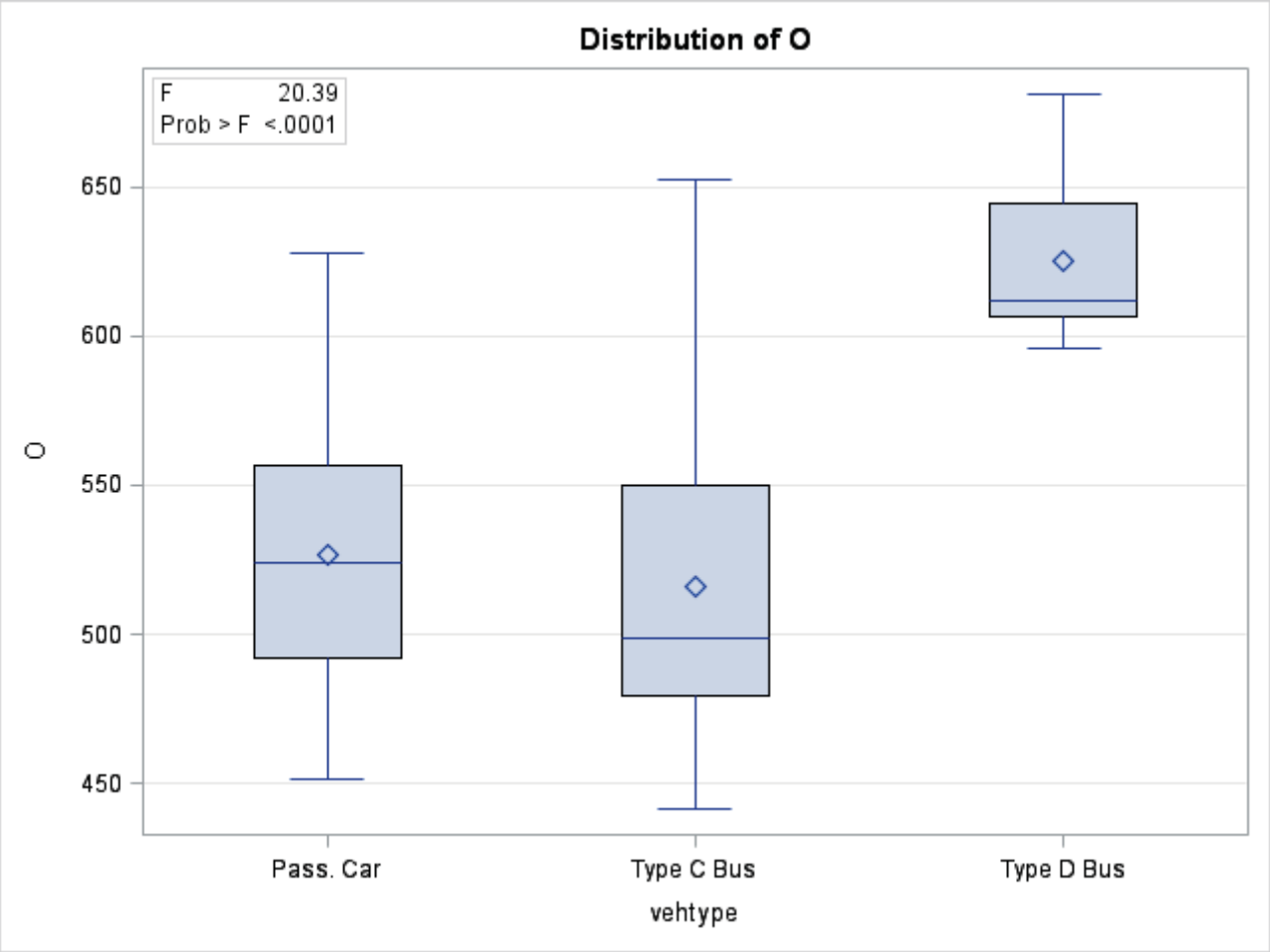
Comparisons significant at the 0.05 level were indicated by *.**

vehtype Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Pass. Car - Type C Bus	16.119	7.252	24.987	***
Pass. Car - Type D Bus	25.244	10.902	39.586	***
Type C Bus - Pass. Car	-16.119	-24.987	-7.252	***
Type C Bus - Type D Bus	9.125	-6.817	25.067	
Type D Bus - Pass. Car	-25.244	-39.586	-10.902	***
Type D Bus - Type C Bus	-9.125	-25.067	6.817	

Dependent Variable: O

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	37522244.93	12507414.98	6492.93	<.0001
Error	130	250420.87	1926.31		
Uncorrected Total	133	37772665.80			

R-Square	Coeff Var	Root MSE	O Mean
0.238765	8.271800	43.88980	530.5955



Scheffe's Test for O

Alpha	0.05
Error Degrees of Freedom	130
Error Mean Square	1926.314
Critical Value of F	3.06584

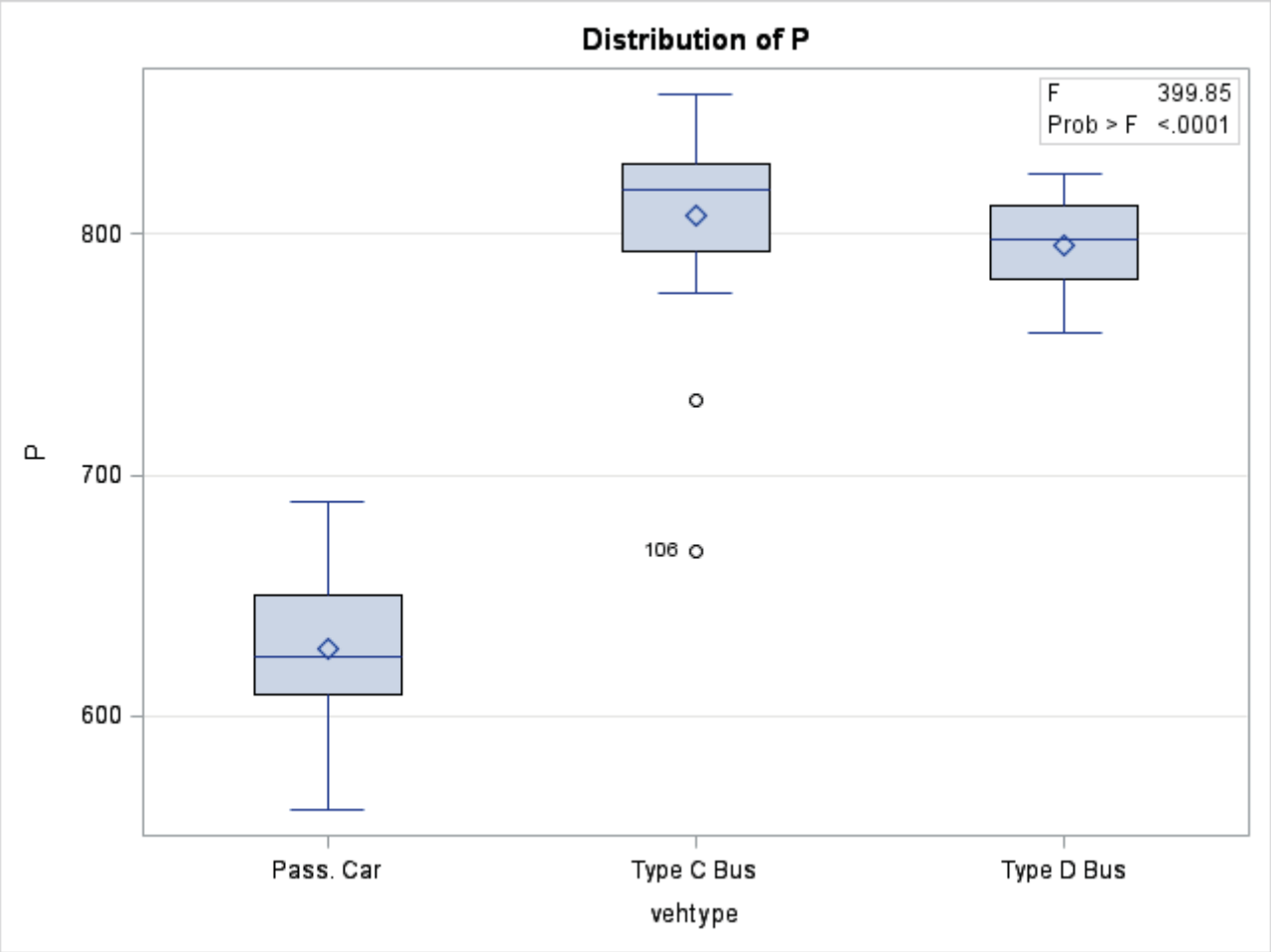
Comparisons significant at the 0.05 level were indicated by *.**

vehtype Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Type D Bus - Pass. Car	98.607	58.690	138.524	***
Type D Bus - Type C Bus	109.504	65.135	153.873	***
Pass. Car - Type D Bus	-98.607	-138.524	-58.690	***
Pass. Car - Type C Bus	10.897	-13.782	35.577	
Type C Bus - Type D Bus	-109.504	-153.873	-65.135	***
Type C Bus - Pass. Car	-10.897	-35.577	13.782	

Dependent Variable: P

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	60590355.42	20196785.14	21256.6	<.0001
Error	130	123518.64	950.14		
Uncorrected Total	133	60713874.06			

R-Square	Coeff Var	Root MSE	P Mean
0.860169	4.595777	30.82440	670.7113



Scheffe's Test for P

Alpha	0.05
Error Degrees of Freedom	130
Error Mean Square	950.1434
Critical Value of F	3.06584

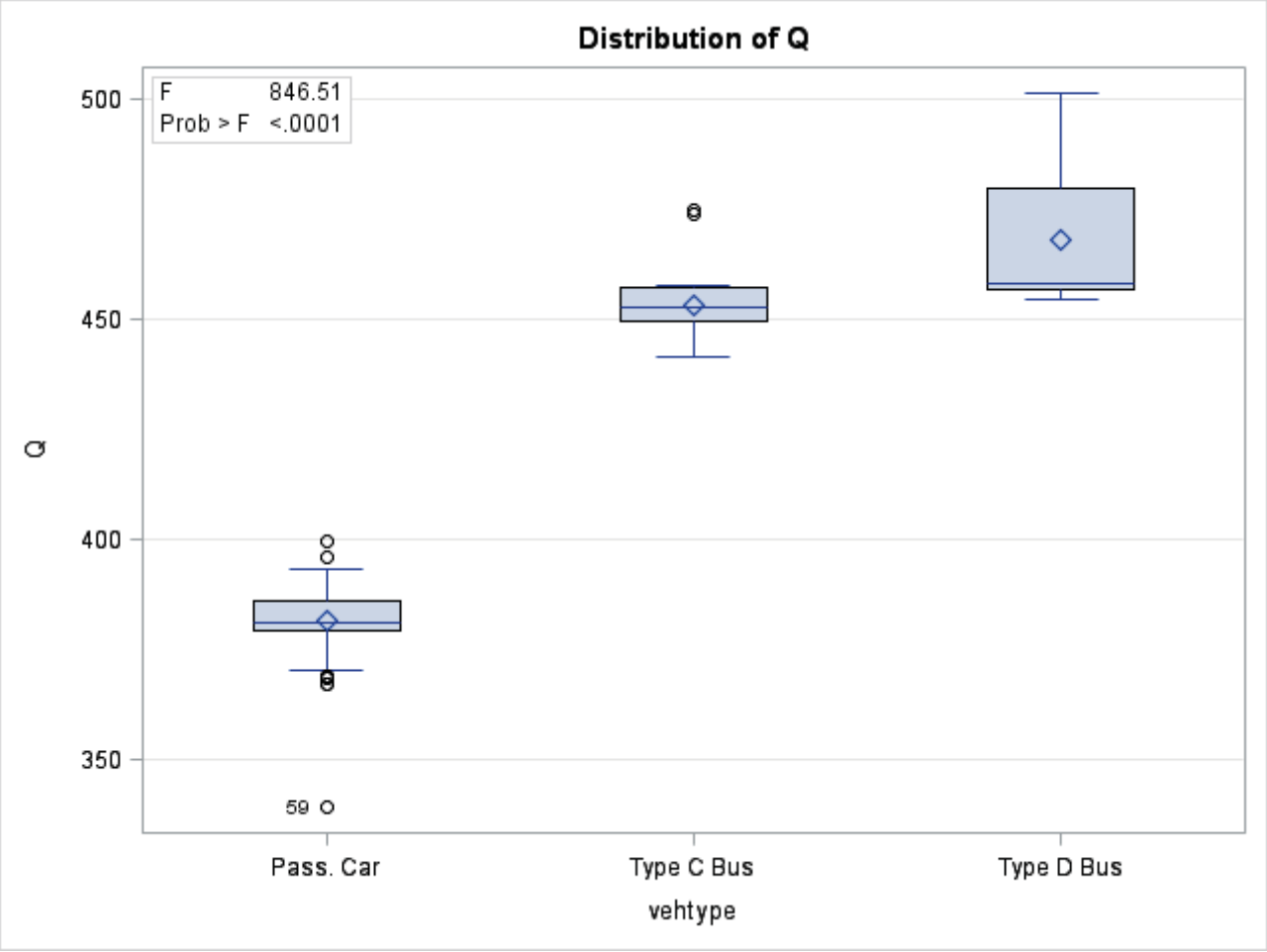
Comparisons significant at the 0.05 level were indicated by *.**

vehtype Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Type C Bus - Type D Bus	12.546	-18.615	43.707	
Type C Bus - Pass. Car	179.853	162.520	197.186	***
Type D Bus - Type C Bus	-12.546	-43.707	18.615	
Type D Bus - Pass. Car	167.307	139.272	195.341	***
Pass. Car - Type C Bus	-179.853	-197.186	-162.520	***
Pass. Car - Type D Bus	-167.307	-195.341	-139.272	***

Dependent Variable: Q

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	21400316.05	7133438.68	86073.7	<.0001
Error	130	10773.87	82.88		
Uncorrected Total	133	21411089.92			

R-Square	Coeff Var	Root MSE	Q Mean
0.928690	2.276976	9.103623	399.8120



Scheffe's Test for Q

Alpha	0.05
Error Degrees of Freedom	130
Error Mean Square	82.87596
Critical Value of F	3.06584

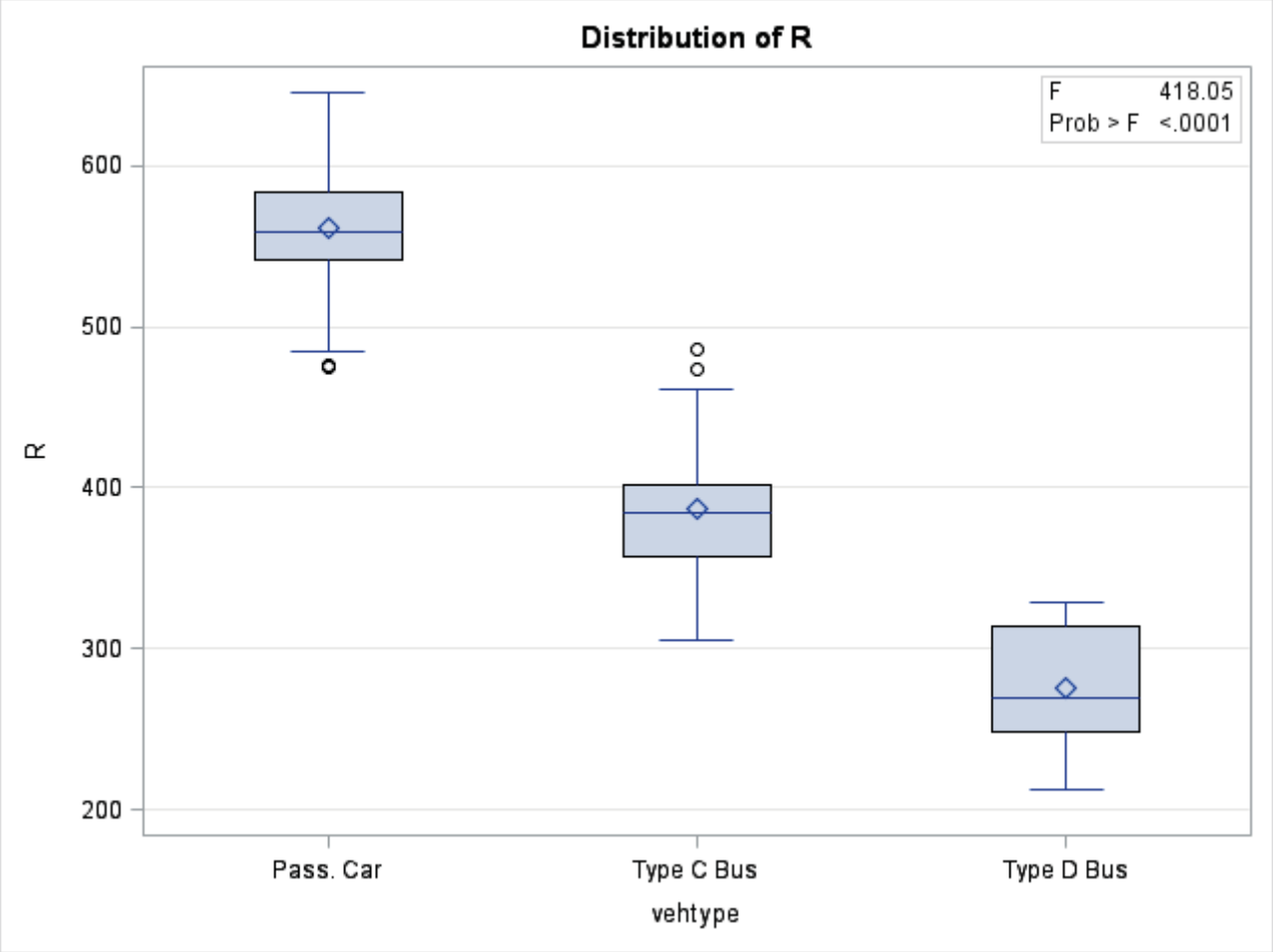
Comparisons significant at the 0.05 level were indicated by *.**

vehtype Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Type D Bus - Type C Bus	14.754	5.551	23.957	***
Type D Bus - Pass. Car	86.698	78.418	94.977	***
Type C Bus - Type D Bus	-14.754	-23.957	-5.551	***
Type C Bus - Pass. Car	71.943	66.824	77.063	***
Pass. Car - Type D Bus	-86.698	-94.977	-78.418	***
Pass. Car - Type C Bus	-71.943	-77.063	-66.824	***

Dependent Variable: R

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	36069305.70	12023101.90	9359.99	<.0001
Error	130	166987.72	1284.52		
Uncorrected Total	133	36236293.42			

R-Square	Coeff Var	Root MSE	R Mean
0.865438	6.987011	35.84021	512.9549



Scheffe's Test for R

Alpha	0.05
Error Degrees of Freedom	130
Error Mean Square	1284.521
Critical Value of F	3.06584

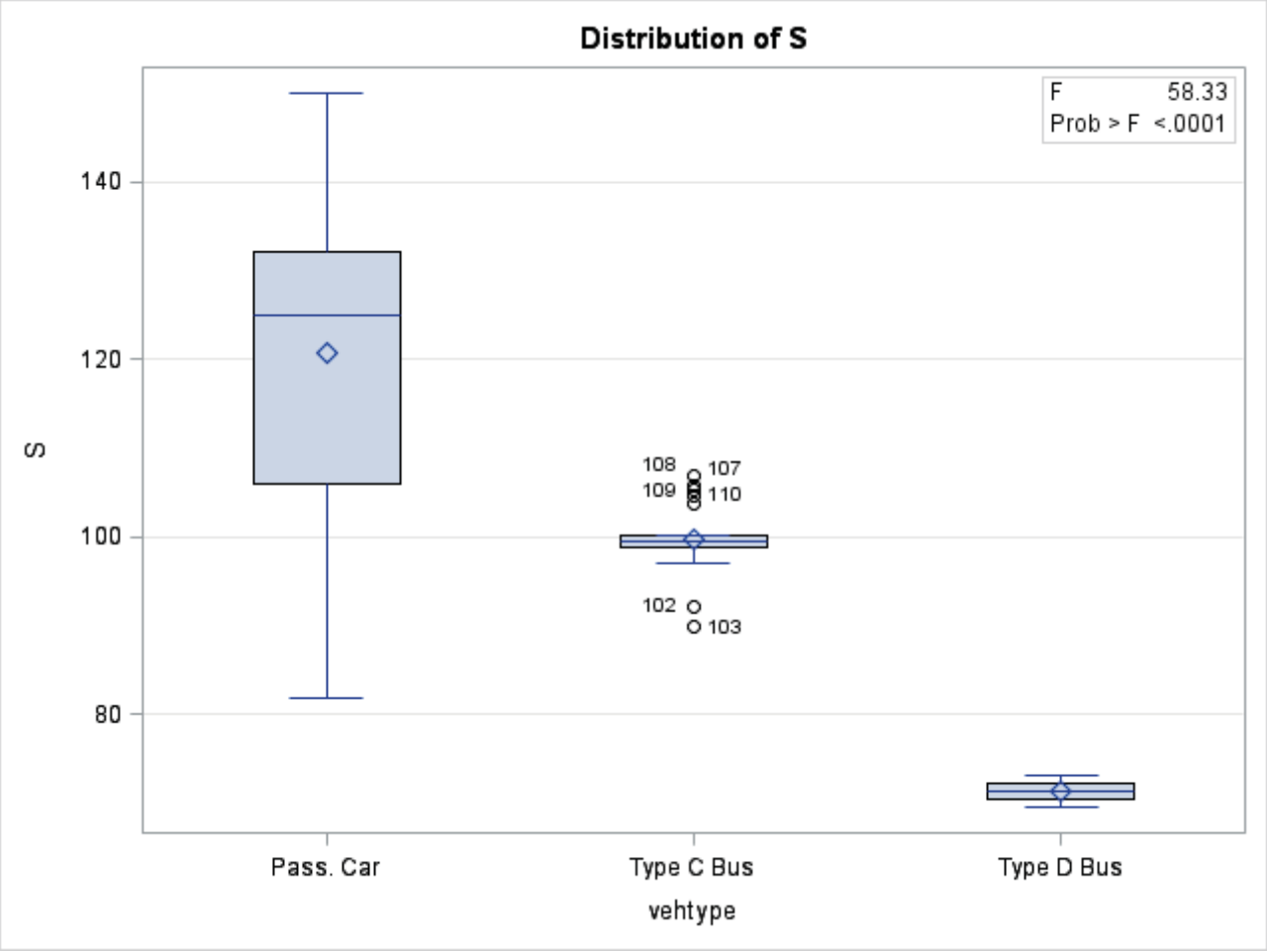
Comparisons significant at the 0.05 level were indicated by *.**

vehtype Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Pass. Car - Type C Bus	175.023	154.870	195.177	***
Pass. Car - Type D Bus	286.256	253.660	318.853	***
Type C Bus - Pass. Car	-175.023	-195.177	-154.870	***
Type C Bus - Type D Bus	111.233	75.002	147.465	***
Type D Bus - Pass. Car	-286.256	-318.853	-253.660	***
Type D Bus - Type C Bus	-111.233	-147.465	-75.002	***

Dependent Variable: S

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	1750557.232	583519.077	2846.88	<.0001
Error	130	26645.828	204.968		
Uncorrected Total	133	1777203.060			

R-Square	Coeff Var	Root MSE	S Mean
0.472971	12.56514	14.31670	113.9398



Scheffe's Test for S

Alpha	0.05
Error Degrees of Freedom	130
Error Mean Square	204.9679
Critical Value of F	3.06584

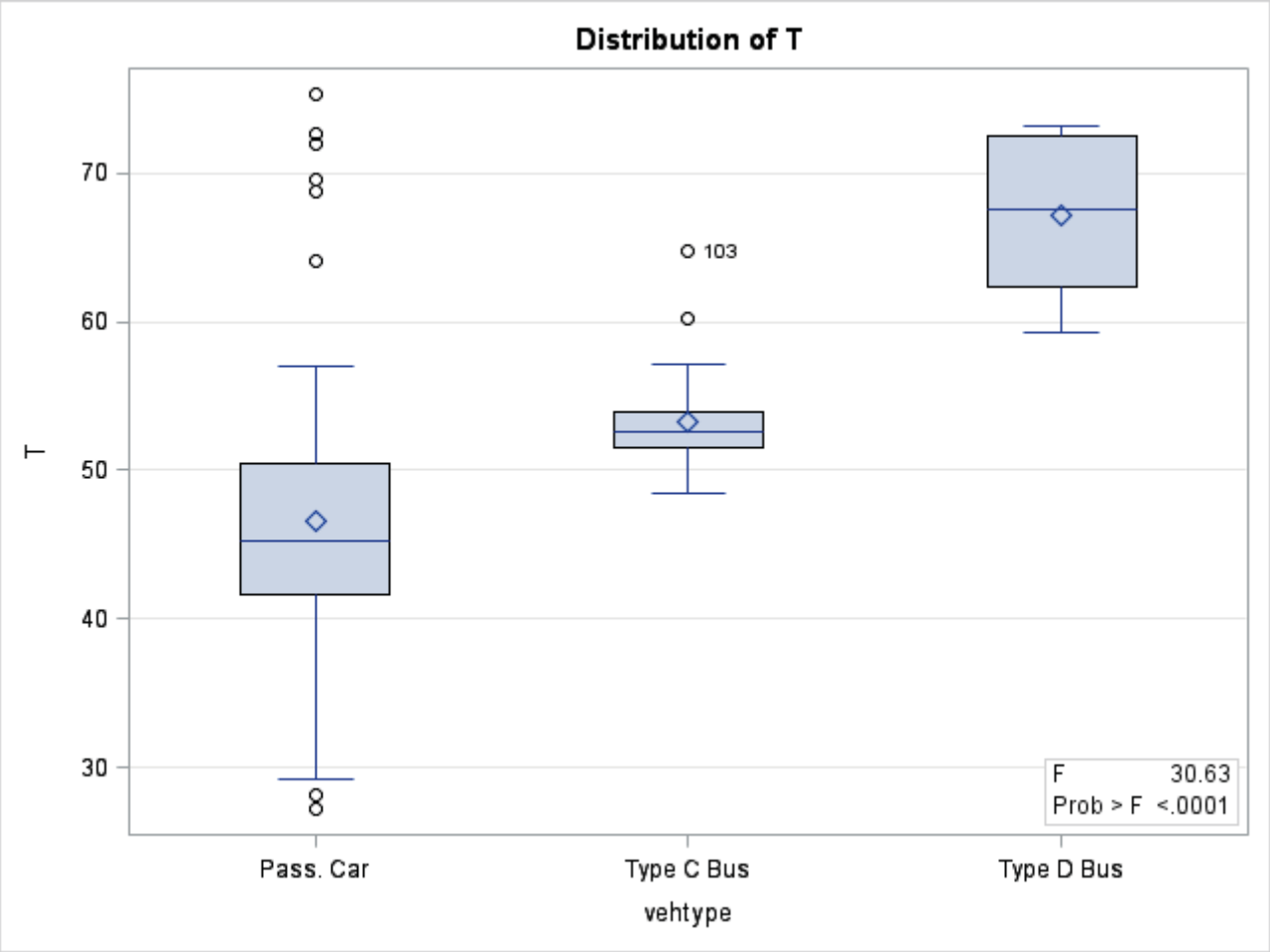
Comparisons significant at the 0.05 level were indicated by *.**

vehtype Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Pass. Car - Type C Bus	20.880	12.830	28.931	***
Pass. Car - Type D Bus	49.351	36.330	62.372	***
Type C Bus - Pass. Car	-20.880	-28.931	-12.830	***
Type C Bus - Type D Bus	28.471	13.998	42.944	***
Type D Bus - Pass. Car	-49.351	-62.372	-36.330	***
Type D Bus - Type C Bus	-28.471	-42.944	-13.998	***

Dependent Variable: T

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	322867.5113	107622.5038	1781.55	<.0001
Error	130	7853.2387	60.4095		
Uncorrected Total	133	330720.7500			

R-Square	Coeff Var	Root MSE	T Mean
0.320321	15.86609	7.772357	48.98722



Scheffe's Test for T

Alpha	0.05
Error Degrees of Freedom	130
Error Mean Square	60.40953
Critical Value of F	3.06584

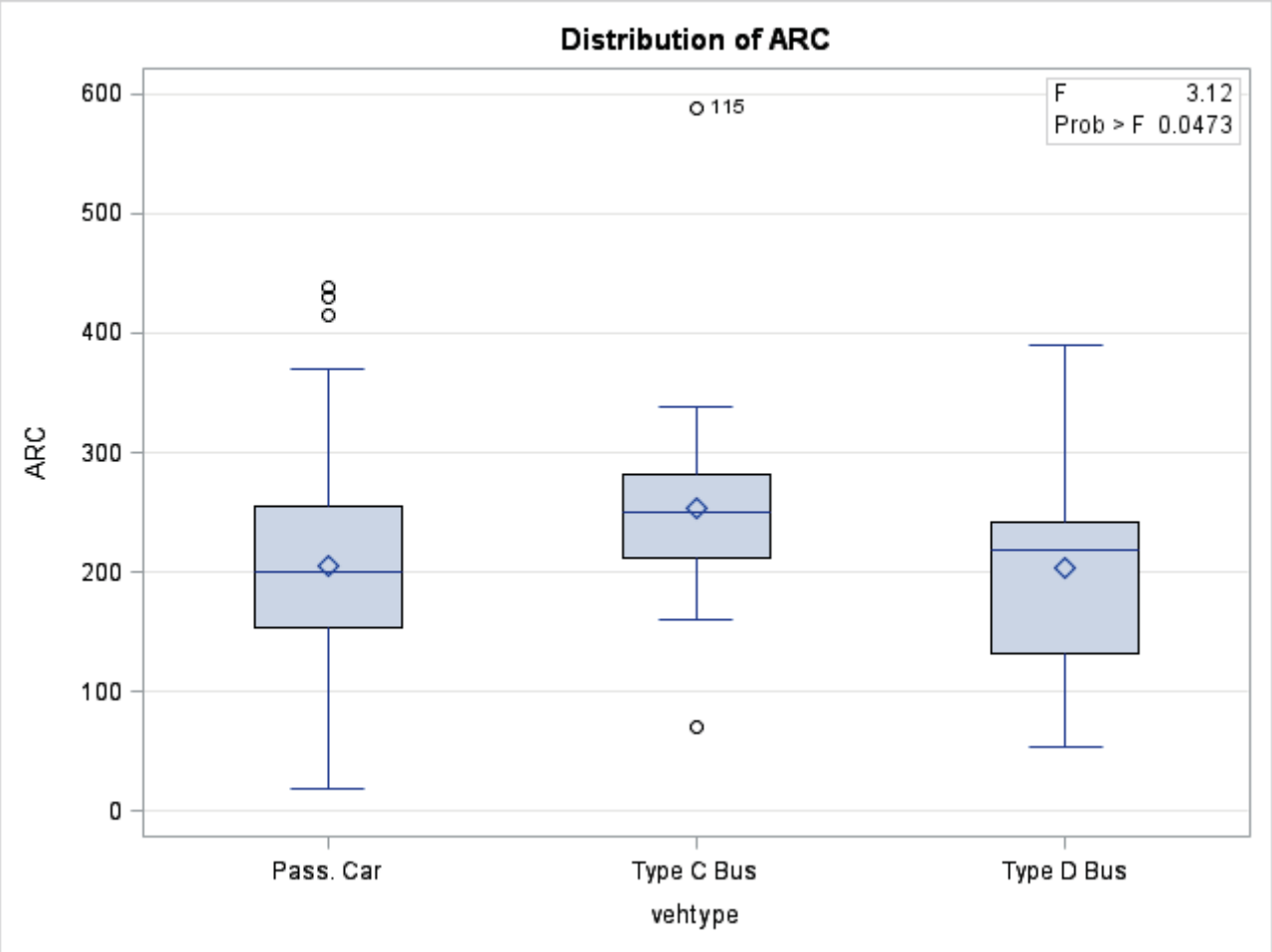
Comparisons significant at the 0.05 level were indicated by *.**

vehtype Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Type D Bus - Type C Bus	13.817	5.959	21.674	***
Type D Bus - Pass. Car	20.618	13.549	27.687	***
Type C Bus - Type D Bus	-13.817	-21.674	-5.959	***
Type C Bus - Pass. Car	6.801	2.431	11.172	***
Pass. Car - Type D Bus	-20.618	-27.687	-13.549	***
Pass. Car - Type C Bus	-6.801	-11.172	-2.431	***

Dependent Variable: ARC

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	6079298.273	2026432.758	272.09	<.0001
Error	129	960734.567	7447.555		
Uncorrected Total	132	7040032.840			

R-Square	Coeff Var	Root MSE	ARC Mean
0.046210	40.36789	86.29922	213.7818



Scheffe's Test for ARC

Alpha	0.05
Error Degrees of Freedom	129
Error Mean Square	7447.555
Critical Value of F	3.06639

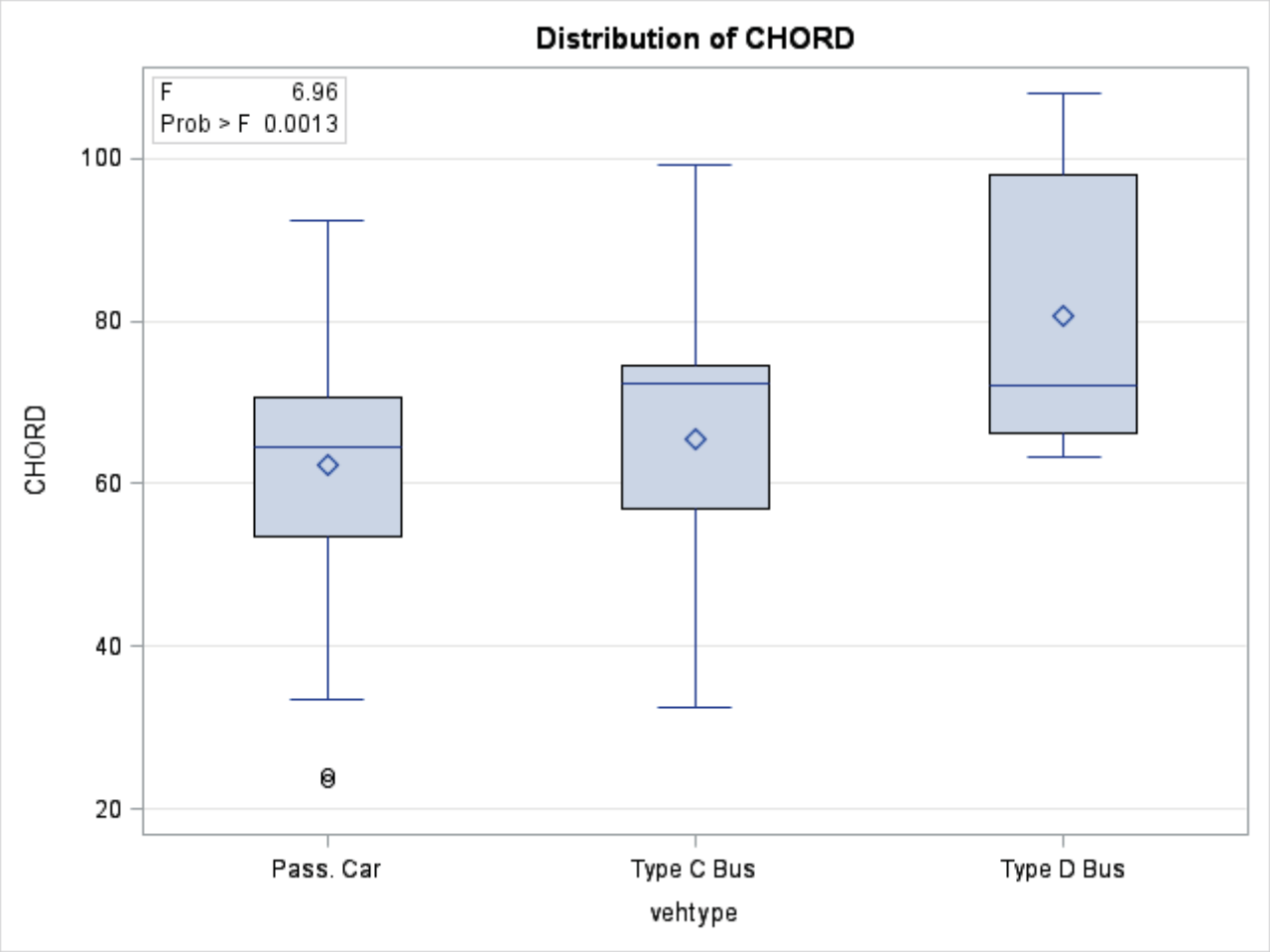
Comparisons significant at the 0.05 level were indicated by *.**

vehtype Comparison	Difference Between Means	Simultaneous 95% Confidence Limits	
Type C Bus - Pass. Car	48.56	-0.02	97.14
Type C Bus - Type D Bus	50.17	-37.08	137.42
Pass. Car - Type C Bus	-48.56	-97.14	0.02
Pass. Car - Type D Bus	1.61	-76.91	80.14
Type D Bus - Type C Bus	-50.17	-137.42	37.08
Type D Bus - Pass. Car	-1.61	-80.14	76.91

Dependent Variable: CHORD

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	547216.5025	182405.5008	1015.90	<.0001
Error	130	23341.6775	179.5514		
Uncorrected Total	133	570558.1800			

R-Square	Coeff Var	Root MSE	CHORD Mean
0.096733	20.93798	13.39968	63.99699



Scheffe's Test for CHORD

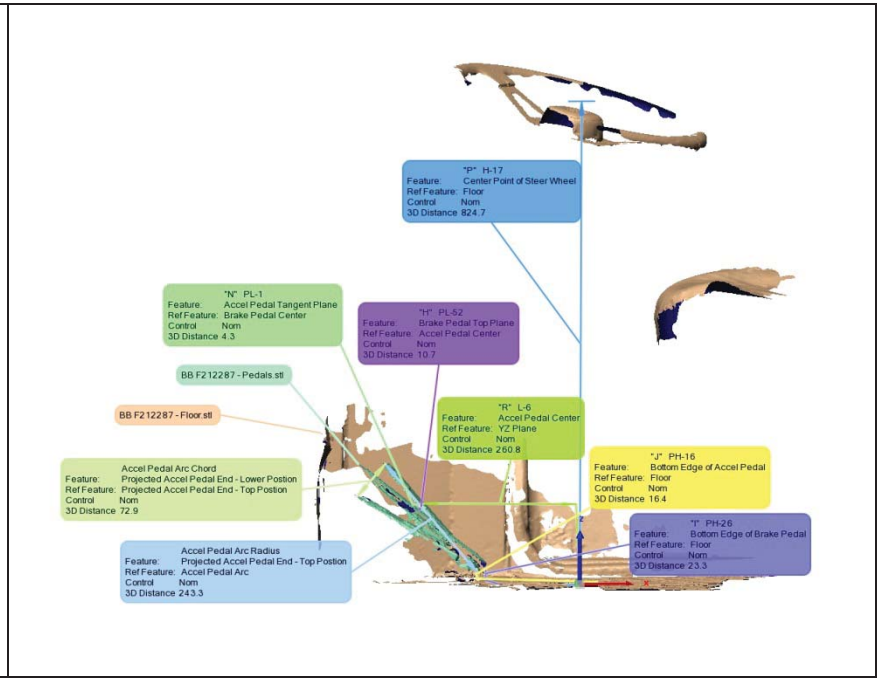
Alpha	0.05
Error Degrees of Freedom	130
Error Mean Square	179.5514
Critical Value of F	3.06584

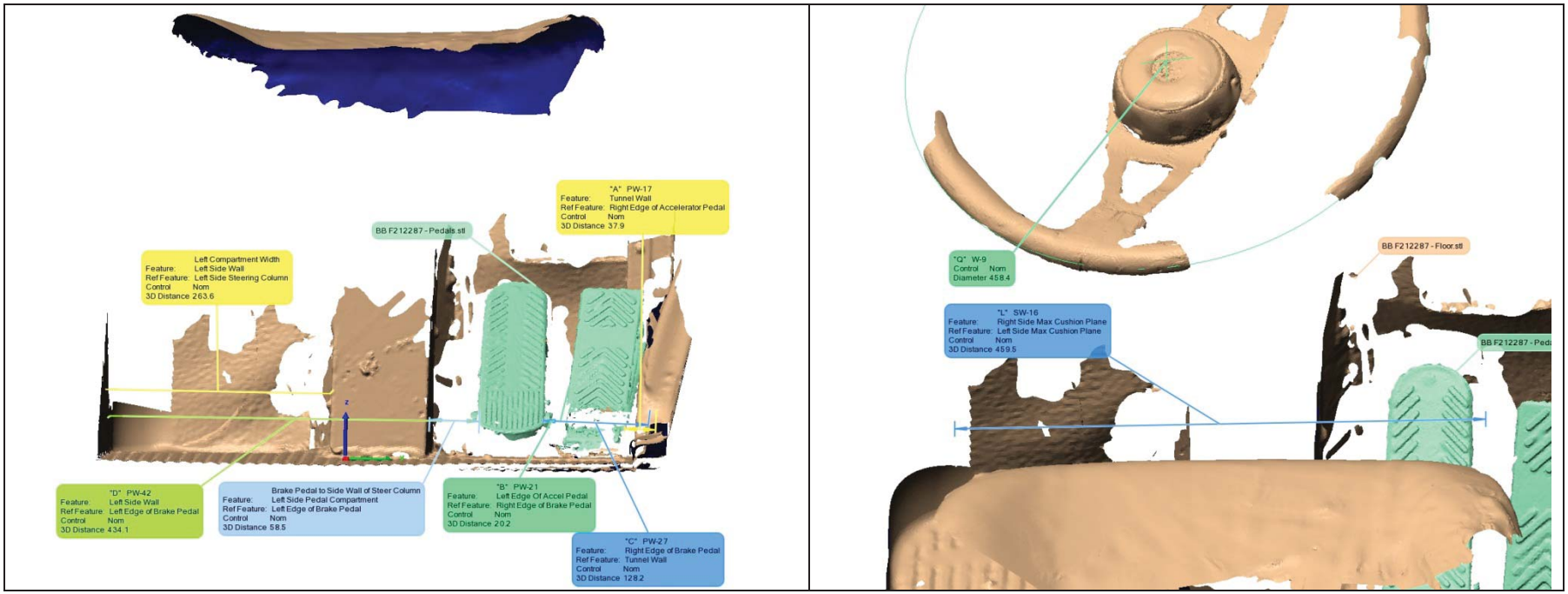
Comparisons significant at the 0.05 level were indicated by *.**

vehtype Comparison	Difference Between Means	Simultaneous 95% Confidence Limits		
Type D Bus - Type C Bus	15.088	1.542	28.633	***
Type D Bus - Pass. Car	18.147	5.960	30.333	***
Type C Bus - Type D Bus	-15.088	-28.633	-1.542	***
Type C Bus - Pass. Car	3.059	-4.476	10.594	
Pass. Car - Type D Bus	-18.147	-30.333	-5.960	***
Pass. Car - Type C Bus	-3.059	-10.594	4.476	

12. Appendix G - Photos and Scans


SCHOOL BUS
BLUE BIRD
17
16198
08/23/2012


"P" H-17
Feature: Center Point of Steer Wheel
Ref Feature: Floor
Control Nom
3D Distance 824.7
"N" PL-1
Feature: Accel Pedal Tangent Plane
Ref Feature: Brake Pedal Center
Control Nom
3D Distance 4.3
"H" PL-52
Feature: Brake Pedal Top Plane
Ref Feature: Accel Pedal Center
Control Nom
3D Distance 10.7
BB F212287 - Pedals.stl
BB F212287 - Floor.stl
"R" L-6
Feature: Accel Pedal Center
Ref Feature: YZ Plane
Control Nom
3D Distance 260.8
"J" PH-16
Feature: Bottom Edge of Accel Pedal
Ref Feature: Floor
Control Nom
3D Distance 16.4
Accel Pedal Arc Chord
Feature: Projected Accel Pedal End - Lower Postion
Ref Feature: Projected Accel Pedal End - Top Postion
Control Nom
3D Distance 72.9
"I" PH-26
Feature: Bottom Edge of Brake Pedal
Ref Feature: Floor
Control Nom
3D Distance 23.3
Accel Pedal Arc Radius
Feature: Projected Accel Pedal End - Top Postion
Ref Feature: Accel Pedal Arc
Control Nom
3D Distance 243.3



BlueBird Bus BB F2122XX

DOT HS 812 168
June 2015

U.S. Department
of Transportation
**National Highway
Traffic Safety
Administration**

10928-061515-v2