BUS AN 511 Team Project

Introduction and Goal

Our team analyzed a dataset of Adidas product sales across various retailers in the United States for the years 2020 and 2021. The primary goal of this project was to explore the impact of the COVID-19 pandemic on sales and identify significant trends across regions, states, retailers, sales methods, product types, and gender segments. Additionally, we examined insights related to pricing, units sold, operating profit, and other key performance metrics. The COVID-19 lockdowns uniquely affected both consumers and sellers, and this dataset provides a valuable snapshot of that impact on Adidas retailers.

Dataset Description

The dataset encapsulates detailed information on sales transactions, retailer details, product categories, and more. Each entry includes critical metrics such as total sales, operating profit, units sold, and various operational aspects. The description of the dataset columns is:

- Retailer - Name of the retailer
- Retailer ID - Unique ID of the retailer
- Invoice Date - Date of the sales transaction/invoice
- Region - Geographic region (e.g., Northeast, Midwest)
- State - State where the sale occurred
- City - City where the sale occurred
- Product - Name of the product sold
- Price per Unit - Price of a single unit of the product

- Units Sold - Number of units sold
- Total Sales - Total revenue from the sale (Price × Units)
- Operating Profit - Profit from operations
- Operating Margin - Ratio of operating profit to total sales
- Sales Method - Channel through which the sale occurred

Data Cleaning

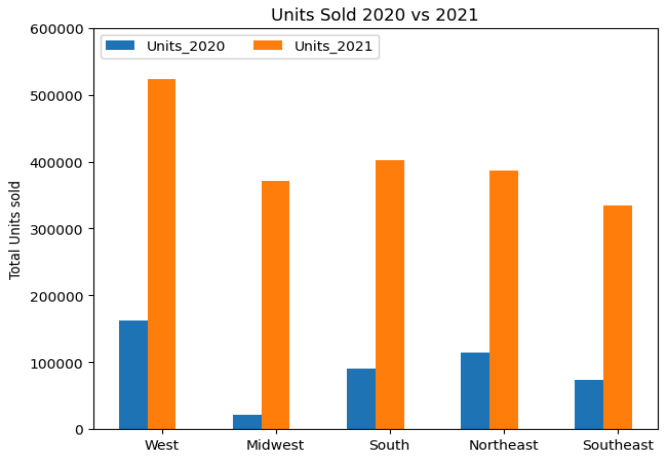
To facilitate smoother coding, we removed spaces from column names. We also standardized the Invoice Date column using the pd.to_datetime function to resolve inconsistencies between dash and slash formats, ensuring the data could be filtered accurately by year. Finally, we verified that there were no missing or null values and confirmed that all numeric fields were correctly formatted as numbers rather than text. We manually calculated total sales and operating profit using the following formulas:

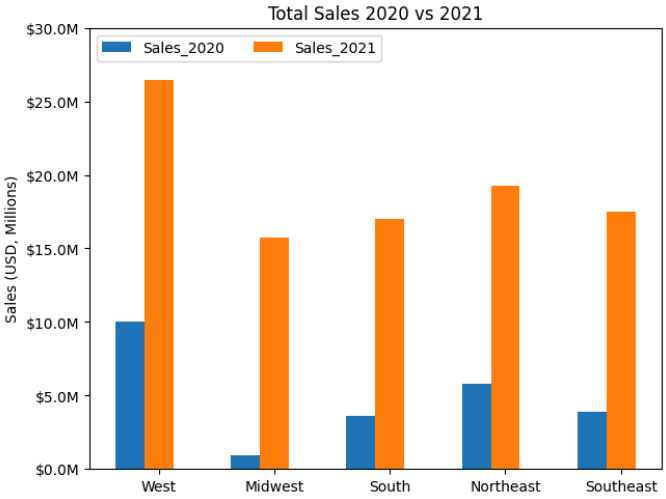
- Total Sales = Price per Unit × Units Sold
- Operating Profit = Total Sales × Operating Margin

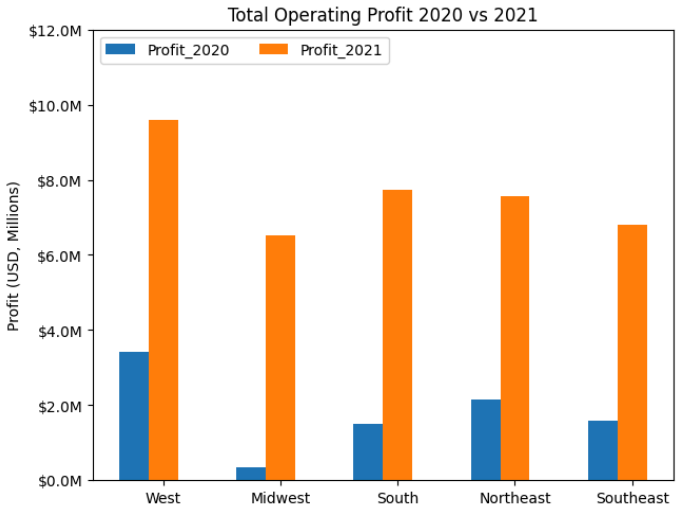
Region

The analysis reveals two major regional insights: a significant year-over-year increase in performance for 2021 and the consistent dominance of the West region. All five regions showed strong growth in units sold, total sales, and operating profit in 2021. The weaker performance in 2020 likely reflects the impact of the COVID-19 pandemic, which decreased spending on non-essential items. The sharp 2021 rebound suggests a surge in consumer demand as

lockdowns ended, combined with strategic discounting by Adidas to clear excess inventory from the previous year.







Notably, the region with the second-highest units sold did not always have the second-highest total sales. For example, the South region ranked second in units sold in 2021 but fell behind the Northeast and Southeast in total sales. This indicates that higher volume does not always translate to higher revenue, as factors like pricing strategies and product mix play a critical role.

Retailers

We used a bar chart (Revenue by Retailer and Year) and a scatter plot (Units Sold vs. Revenue) to visualize retailer performance. The data shows a clear pattern: slow revenue in 2020 followed by a strong economic shift upward in 2021.

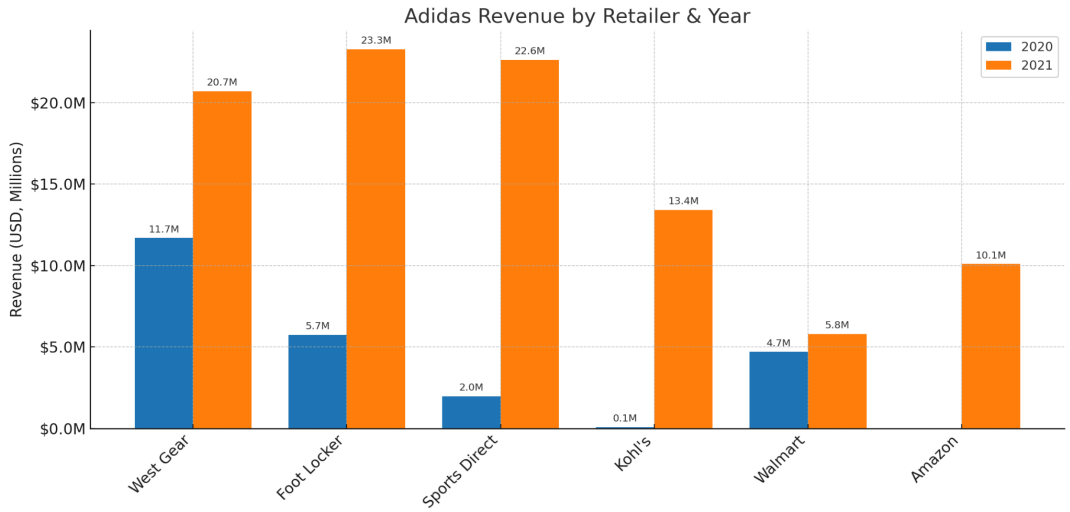


Exhibit 1.1

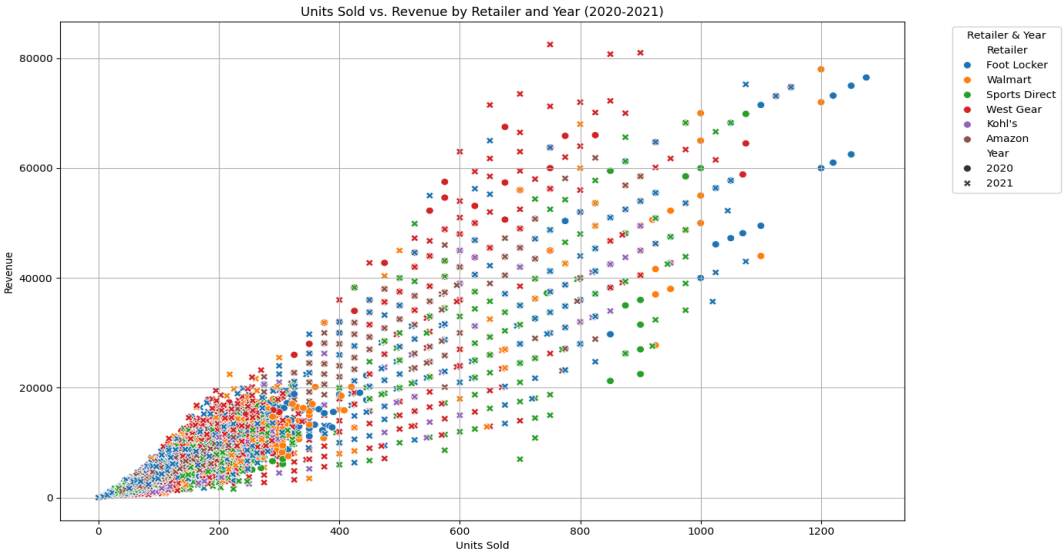
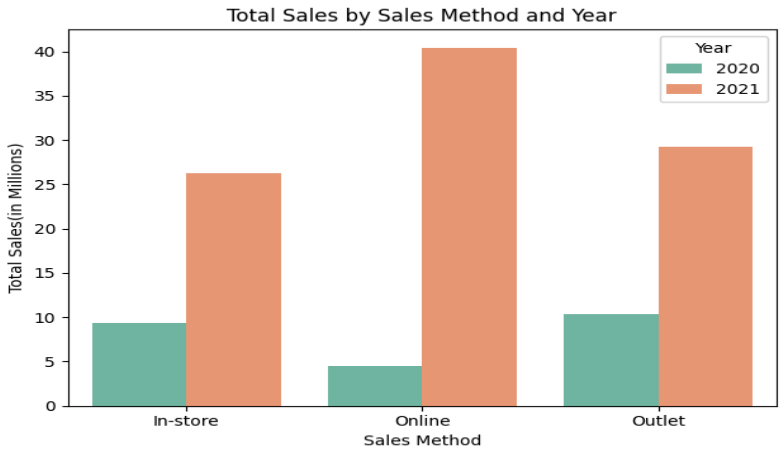
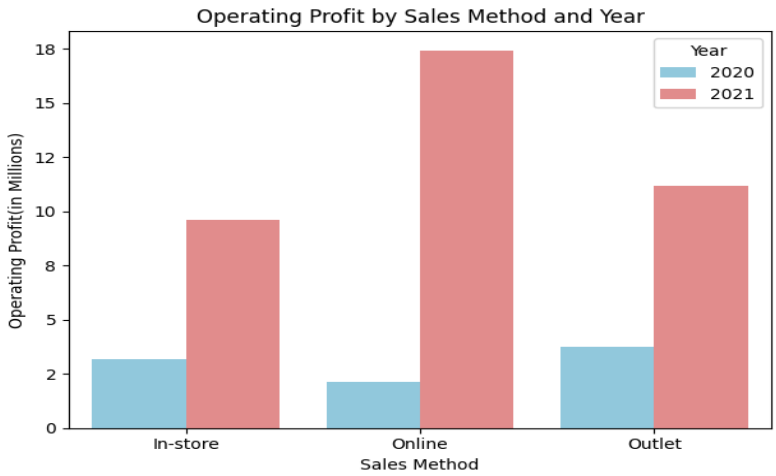


Exhibit 1.2

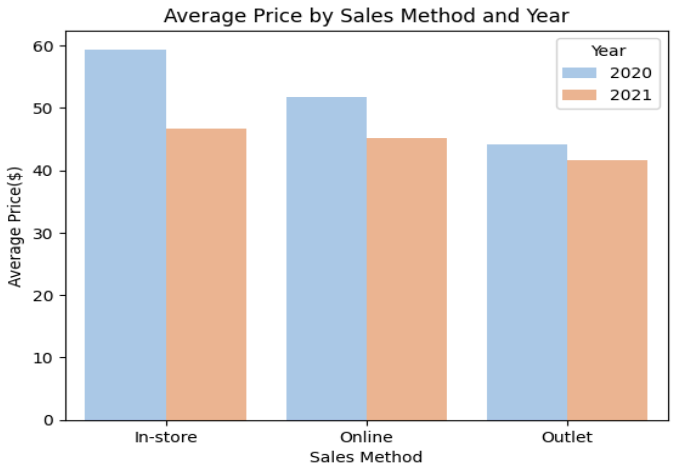
- **Exhibit 1.1:** Retailers like Foot Locker, Sports Direct, and West Gear outperformed in 2021. West Gear nearly doubled its revenue, while Foot Locker and Sports Direct saw increases of over 200% year-over-year.
- **Exhibit 1.2:** This scatterplot confirms that while more units sold generally lead to higher revenue, most retailers maintain consistent pricing. Retailers with a wider spread likely offer a wider variety of products or price points

Sales Method and Price Analysis



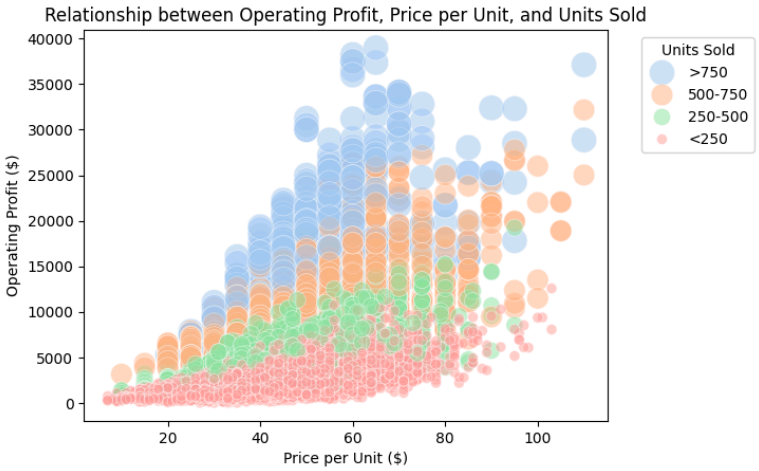


Sales and profits across all channels grew significantly in 2021. Online sales saw a dramatic permanent shift, increasing from $4.5 million to $40.4 million. This underscores the necessity for retailers to maintain strong e-commerce platforms. Additionally, the 2021 partnership with Amazon boosted total sales, while brick-and-mortar stores also saw over 100% growth as consumers returned to physical shopping.



Interestingly, the average price per unit was lower in 2021 than in 2020. This may be due to inventory clearance sales or a higher volume of sales through online channels, which often feature lower average prices than premium in-store options.

Relationship between Profit, Price per unit, and Units sold

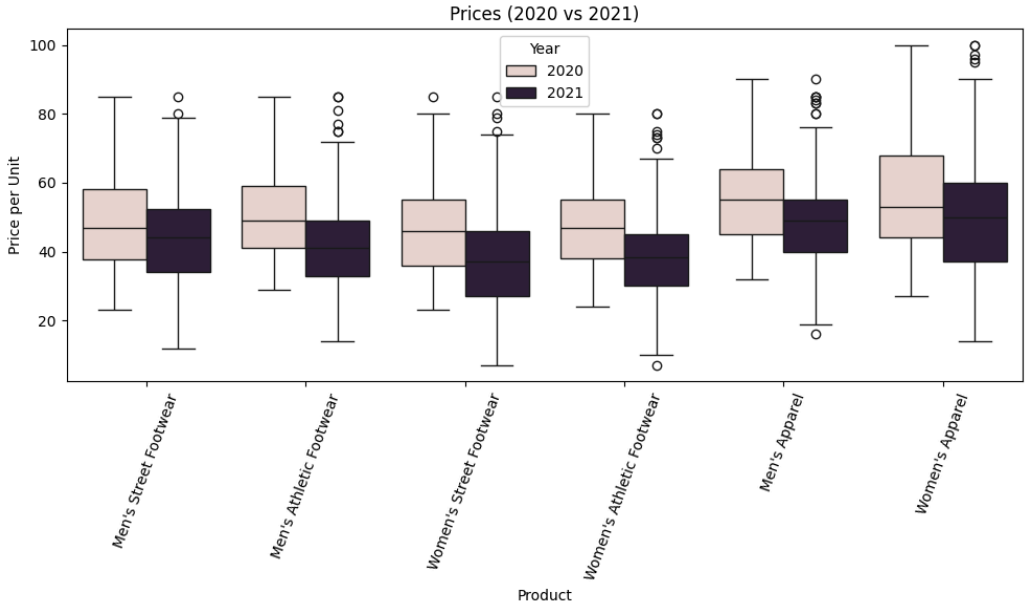


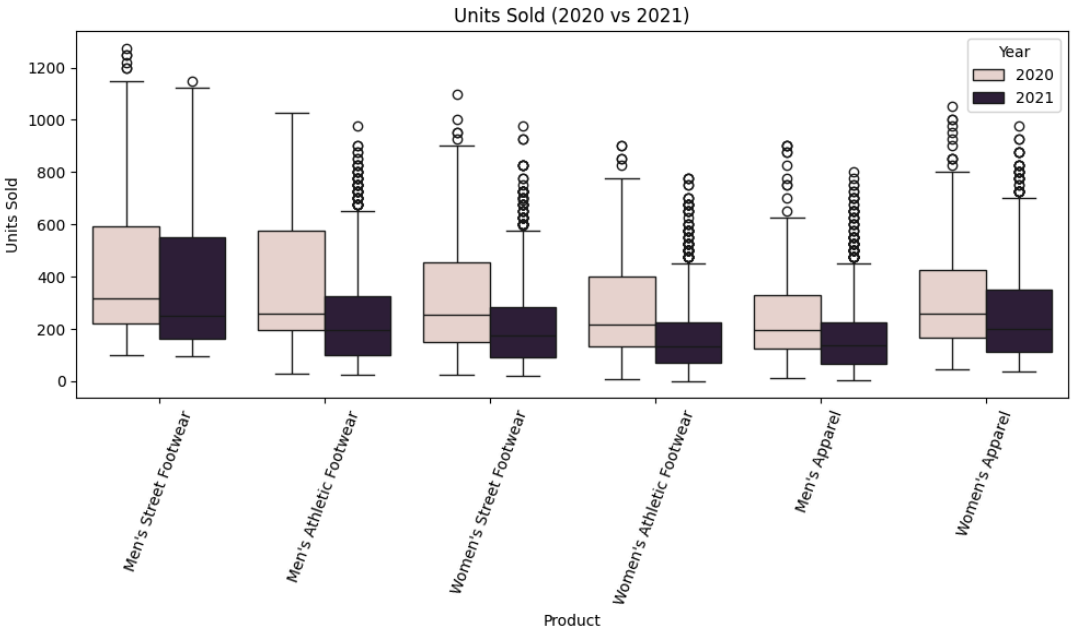
We can see a clear segmentation of units sold. The higher the units sold, the higher the operating profit. At a lower price range, we see lower profit. As the price increases, the profit is scattered. The mid-price ranges deliver the highest profits, driven by higher volumes. The key takeaway is that keeping the price very low or very high doesn't necessarily yield profits. We

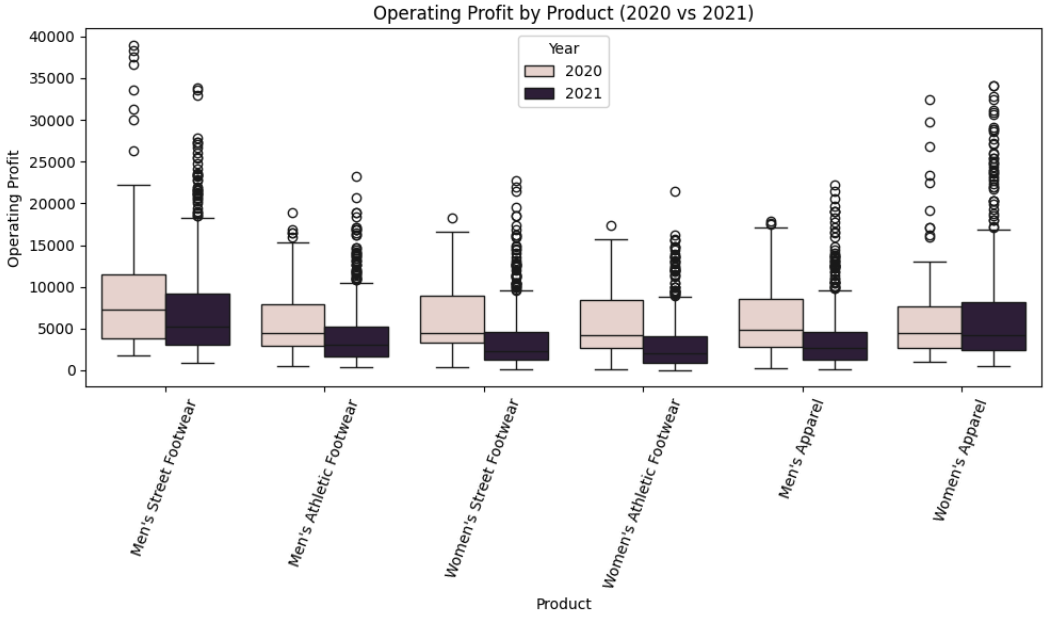
need to price the products optimally so that we have a greater number of units sold, which will maximize the profits.

Product

Using Box Plots to find the distribution of Price per unit for each product type, we can see that the distribution of prices was higher in 2020 compared to 2021. Despite rates of inflation between 2020 and 2021, this data seems to show that prices decreased between the year 2020 and 2021. However, this data visualization likely does not capture the entire market story. In 2021, people's savings accounts were probably running low, and many were still left without work. Our data only captures the products that were sold, not necessarily all the products on the shelf. With budgets being tighter, when people did have the extra cash to purchase adidas products, they might have purchased cheaper product options compared to in 2020, before all of the financial impacts of COVID-19 were realized.

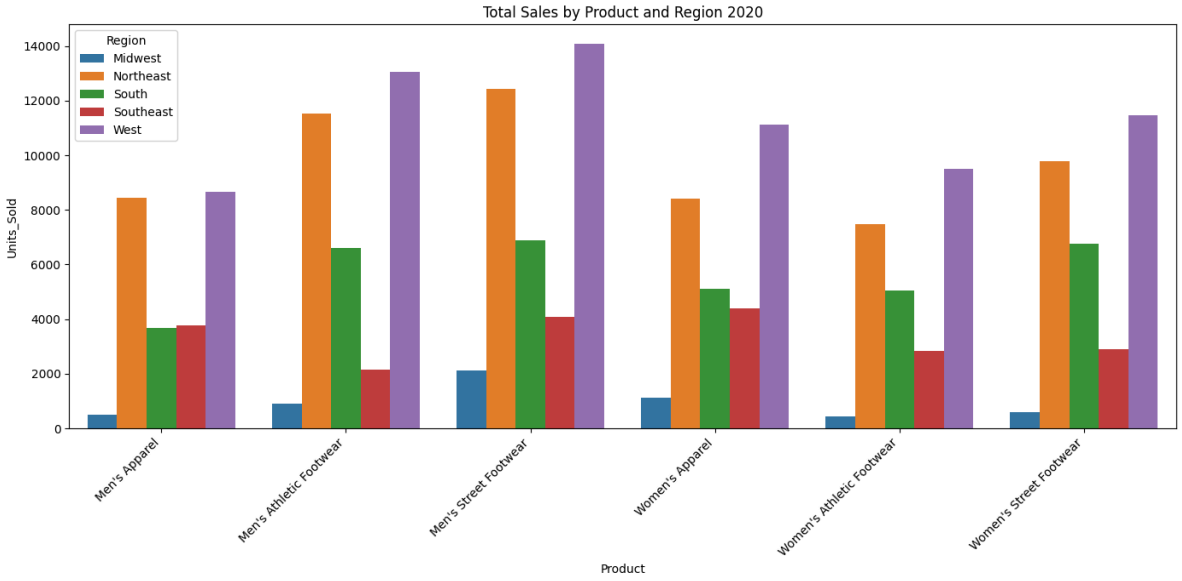


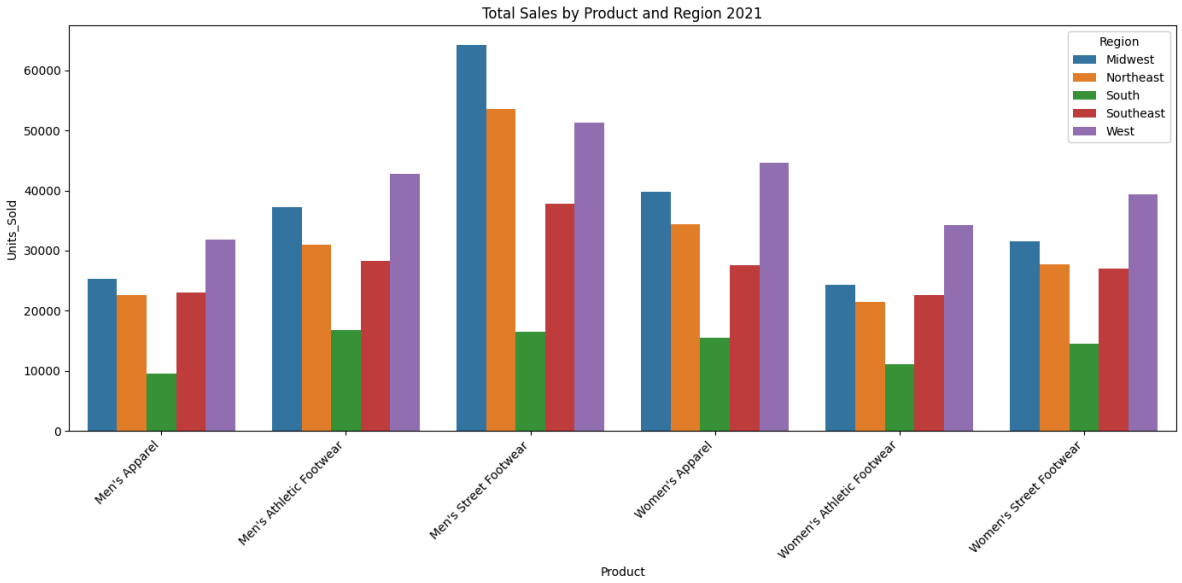




Similarly, box plots were used to compare the distribution of units sold by product and year, as well as the distribution of operating profit by product and year. For each type of product, the median units sold at these retailers in 2021 were fewer compared to 2020. So it is no surprise that the median operating profit by product type was also lower in 2021 than in 2020, with the exception of Women's Apparel being similar in both years. Intuitively, when the

price of a product goes down, then usually the demand for the product goes up. However, as mentioned, this dataset overlooks other economic factors between 2020 and 2021. This information can still be useful for these Adidas retailers to learn the behaviors of their consumers during economic recessions. Additionally, though the median units sold at each retailer decreased, the total units sold in 2021 increased, likely due to stores reopening and new entrants such as Amazon.

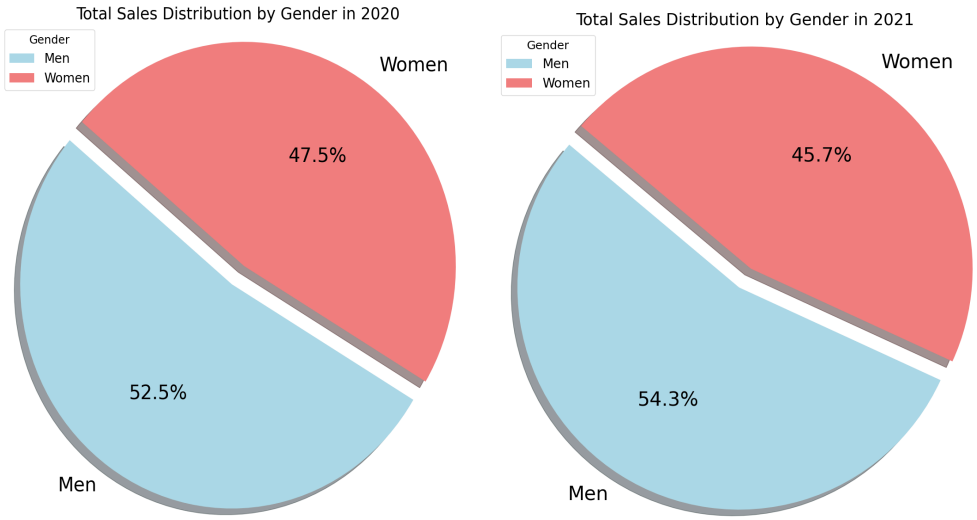




It was also interesting to look at the difference in units sold for each type of product by the region from 2020 to 2021. For example, the units sold of men's street footwear in the Midwest grew significantly. It could be in each retailer's best interest to sell more men's street footwear in the Midwest since it seems like the demand for that product type in that region is on a rising trend.

Gender-Based Product Segmentation

1. **Gender-based Sales across 2020 and 2021**

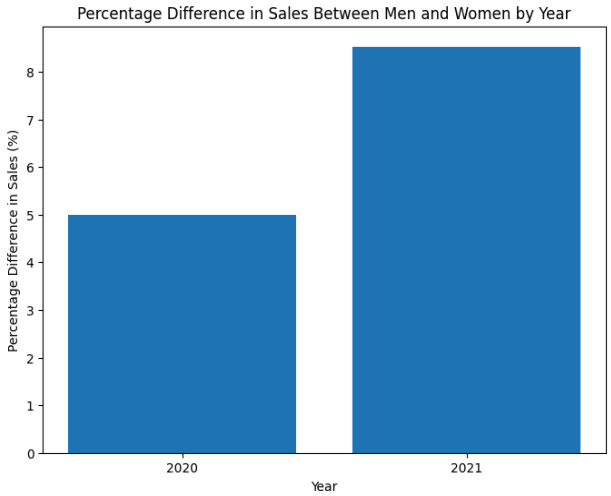


There are certain themes in the above exhibits. Firstly, it is observable that across both years, men have generated more revenue than women. The gap appears to have increased over the next year. This suggests two things:

- Either the demand for women's products (shoes and apparel) has decreased from 2020 to 2021, or
- Despite a consistent demand, supply chain limitations have led to a drop in sales. However, this seems unlikely given that there is no major impact on men's sales.

It could also be possible that the company has directed more marketing efforts towards the men's segment.

It can be argued that the change is not drastic enough to warrant an explanation; however, the exhibit below gives us another lens into the same results.



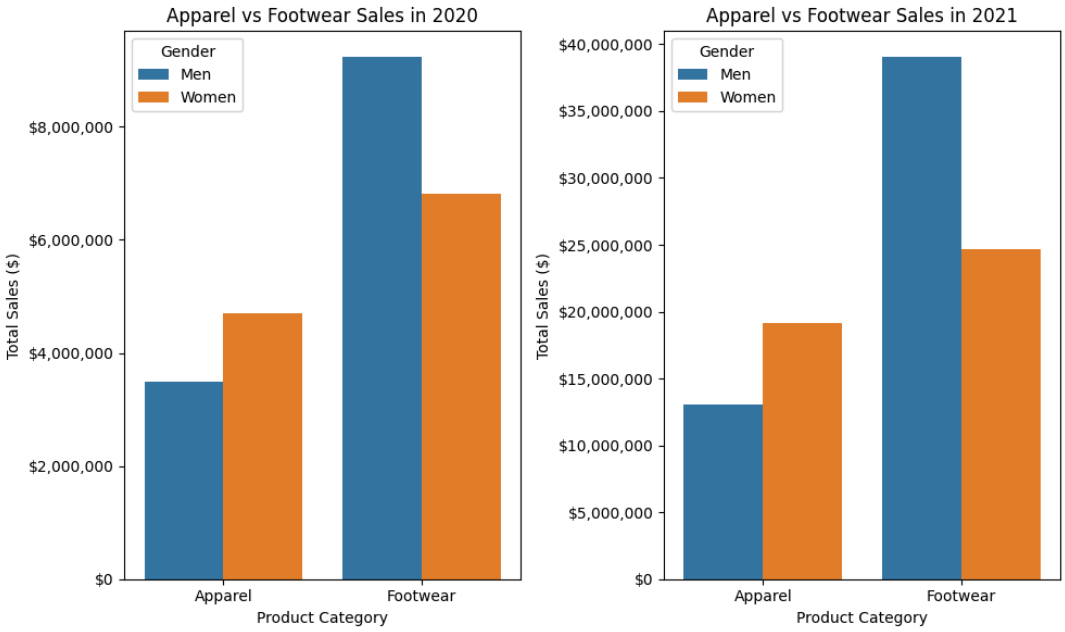
Comparing the gender based percentage difference in sales between 2020 and 2021, we can see that the difference in 2021 is almost twice the difference in 2020. This does, in certain ways, suggest that the change is slightly alarming. This could be attributed to some of the above-mentioned reasons or a shift in the general company focus. Regardless, the way forward should be redirecting more marketing efforts towards women's products.

2. **Gender based comparison between apparel and footwear across 2020 and 2021**

Another interesting aspect of the gender-based segment analysis would be the breakdown of sales into the two categories: Apparel and Footwear. The exhibit below gives an overview of this breakdown and offers some interesting insights.

From the exhibit, we observe:

- **Footwear Segment Dominance:** During both years, footwear appears to have a considerable margin over apparel. This establishes the footwear category as the primary revenue driver for adidas for both men and women.
- **Revenue Growth:** There is a drastic growth in revenue in 2021, but it is important to highlight the COVID impact, and thus, the change can largely be attributed to the reopening of retail stores and resumption of normal consumer spending.
- **Gender Differences within Categories:**
    - In Apparel, women's sales were higher than men's sales in both years, although the gap appears to have widened in 2021.
    - In Footwear, men's sales were significantly higher than women's sales in both years, and the absolute difference in footwear sales between men and women seems much larger than the difference in apparel sales.



The insights from the exhibit and the exhibit itself offer some key recommendations for adidas as a brand:

- **Capitalise on Footwear Strength:** Footwear's consistent lead across the two years is an indication that it is a very successful segment. To maintain this, Adidas should continue to incorporate innovation in its marketing techniques while also looking towards expanding the product lines within the segment.
- **Strategize for Apparel Growth:** While apparel lags behind footwear in terms of revenue growth, some of this change can also be attributed to differing prices. Apparel sales have decreased from 2020 to 2021, particularly for men. In contrast, revenue figures for women show promise and an opportunity for the segment to grow further through product development, expanding existing product lines, while also adding newer innovative ones that could help bridge the gap between men and women. Analyzing which specific types of apparel (e.g., activewear, casual wear) are performing well could help refine this strategy.
- **Address the Gender Gap:** While women lead men in apparel sales, this difference is offset by the difference in footwear sales. A look into industry trends could offer a better understanding of this; however, it is clear that the demand for women's footwear products is not being met. This could be due to limited product offerings, male-oriented categories, or less female-targeting marketing campaigns. There is a need for further efforts and research within these factors to minimise the gender gap and ultimately, maximise profitability.

Improvements

There are certain ways the project results could be improved. While the dataset is pretty detailed, certain elements are missing that could offer additional perspective. The dataset currently only contains data for 2020 and 2021 - 2020 being a COVID-affected year and 2021 being the post-COVID recovery year. To set the right benchmarks, it is important to have data for at least five years. This would allow us to set trends and identify underperforming and outstanding figures. Additionally, the product type only accounts for specific segments such as “men”, “women”, “apparel”, and “footwear”. For a more detailed analysis, we would need access to subcategories and subbrands within each broader segment.

Additionally, access to other demographic data that accounts for the lockdown impact, industry averages, and inflation rates would have allowed us to develop a richer and more detailed analysis. The analysis could have been much more insightful if we had data for its competitors for the same time period. This would have helped us understand how Adidas actually performed during that time and where it stood in the industry.

Obstacles

During the project, we faced multiple challenges and had to manage discrepancies throughout. The four major hurdles we ran into were inconsistent date formats, choosing the right visualization, connecting our insights across Region/Retailer/Products/Sales, and code formatting. We were able to fix the date by standardizing everything to pd.to_datetime, which helped validate the years 2020 and 2021. To tie it all together, we were about to come up with a

conclusion for each of our insights and connections. Then, overall, code formatting took a little longer because we wanted to keep it consistent without overanalyzing the Adidas dataset.

AI Disclosure

Some of the ways AI tools helped us complete this project are as follows:

- It suggested the right python codes to generate charts based on the data.
- If there was an issue with the data type, it suggested ways to correct it for better analysis.
- When experiencing an error in the code, we could ask Gemini to explain the error so the code could be corrected.

Conclusion

In summary, these insights from regional trends, sales methods, product segmentation, and gender-based patterns from 2020 to 2021 provided valuable guidance for Adidas to optimize strategies for growth. Being able to have all our different insights from this time period helps us know what to prep for in the future.