UNIVERSITY OF PENNSYLVANIA

SCHOOL OF SOCIAL POLICY AND PRACTICE

MASTER OF SCIENCE IN SOCIAL POLICY AND DATA ANALYTICS

CASE STUDY REPORT ASSIGNMENT 2



# ADVENTUREWORKS BICYCLE Co.
# ANNUAL STRATEGIC PLAN:
# NEXT BEST ACTION TO GROW INTERNET SALES

Authors:

Rose Barragan Barranco

Qiyao Huang

Yuqin Li

Jingyi Zhang

Professor: Richard Hartwell

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## 1. EXECUTIVE SUMMARY

In this report, we delve into a comprehensive analysis of AdventureWorks Bicycle Co.'s dataset, examining eight different categories of variables. Our primary goal is to gain insights into the most promising markets and regions where the company operates, identify top-performing products, and explore the economic factors that influence customers' decisions to purchase bicycles.

By scrutinizing these aspects, understanding their interconnectedness, and garnering the most valuable and strategic insights, we will support AdventureWorks Bicycle Co.'s next fiscal year strategic decision-making process leveraging a set of actionable recommendations.

## 2. OVERVIEW OF THE VARIABLES IN THE DATASET

Before starting with the analysis, it is necessary to understand what kind of data we have in our dataset – "Internet Sales Data Set" – collecting a sample of 60398 sale transactions and a set of **60 different variables.** However, **not all of them are significant for the analysis**. The most relevant eight variables that will be carried out throughout the report are:

- **English Country Region Name**: categorical variable indicating the country where the sale transaction took place. The dataset collects information from six different regions: Australia, Canada, France, Germany, the United Kingdom, and the United States.

- **Email Address**: categorical variable indicating the email address with the company's domain (adventure-works).

- **Total Product Cost**: numerical variable that indicates the total costs (fixed costs like the direct materials and work labor and the manufacturing overhead costs (variable cost)). The total product cost ranges from $0.8565 to $2171.29.

- **Sales Amount:** numerical variable that indicates the total dollar amount of sales made, ranging from $2.29 to $3578.27.

- **Order Date:** date variable that provides the month, day, and year the transaction was placed. Sales are collected from the year 2010 to 2014.

- **House Owner Flag**: binary categorical variable indicating whether the buyer in each transaction owns a home, where "1" indicates ownership and "0" indicates non-ownership.

- **English Product Name:** categorical variable that indicates the name of products, using this to filter the product categories.

- **Order Quantity:** numerical variable that indicates the number of products sold to a customer in an order.

Considering these eight variables and their relationship, we will assess the regions' performance, total sales and revenue volume, and other premises. Upon those insights, we will proceed with recommendations regarding the best strategic approach to help Adventureworks Bicycle Co. in the upcoming fiscal year (2015).

## 3. ANALYSIS AND METHODS USED

To proceed with the analysis of the Internet Sales Dataset, we will work with Google Colab tools - programming in Python – Bing-powered technology, and Microsoft 365 Toolkit for a thorough analysis of the data, resulting in a comprehensive storytelling that combines a seamless narrative with visualizations that illustrate and facilitate the understanding of the analysis.

## 4. ANNUAL INTERNET SALES BY COUNTRY REGION

### 4.1. Total aggregated sales per country region

The company's sales volume is mainly consolidated in the regions of Australia and the United States, where aggregate **total sales** reach $9061000.58 and $9389789.51, respectively. These regions are followed in third place by Germany with $ 2894312.34 in total sales, in fourth place by France with $ 2644017.71, and finally in last place by Canada with $ 1977844.86 [Figure #1]. Therefore, we can classify the countries according to two markets:

- **The primary market** includes the regions with the highest annual and aggregate sales: Australia and the United States.

- **The secondary market** includes the regions regarding the three European countries (France, Germany, and the United Kingdom) since they operate in the same geographic region and have very similar business trends.

- **The tertiary market** includes Canada as the leading country, as the sales volume cannot be matched to the primary market and is located in a different region than the secondary market.

*Figure #1 - Total sales achieved per country region*
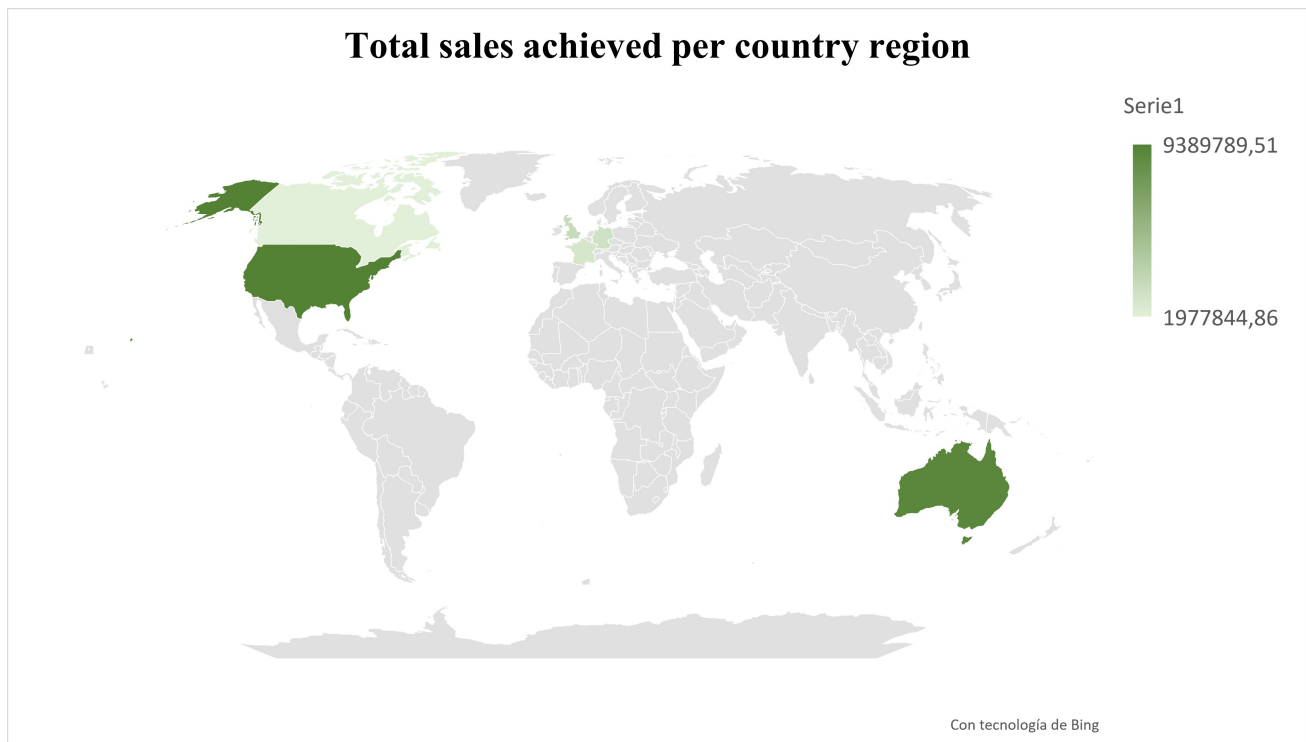


*Source: Rose Barragan Barranco (own graph).*

**4.2. Total annual sales per country region**

On the other hand, if we analyze the **sales volume of each region by year**, we observe that since 2010, each of the six regions has experienced a progressive growth in sales volume, coinciding with the year with the highest sales for all of them, 2013.

- This may be due to several causes. **2010** is the year in which AdventureWorks Bicycle Company was founded. So during 2010, sales are not expected to be very relevant, as can be seen. It is worth mentioning that for the German region, **there is no data for 2010**, either because it is a region where the company had no presence during 2010 or because they have not kept a proper record of sales.

- However, in **2011,** we see how the company began to take off internationally as sales grew exponentially in all regions. It is at this point that we can observe the dynamics of three markets:

    o The primary market includes the regions with the highest sales for 2011, Australia (with $ 2563732.25) and the United States (with $ 2458285.17).

    o The secondary market is where the three European powers with intermediate sales levels operate: France ($410845.3), Germany ($520500.16), and the United Kingdom ($550591.22).

    o The tertiary market (Canada) presents a sales volume of $571571.8.

- In **2012**, the primary and tertiary markets experienced a slight decline in sales volume, while the secondary market continued to grow steadily and slowly.

- In **2013**, there was a significant upturn in all six markets, with sales doubling compared to the 2011 figures.

- Finally, in **2014** all regions suffered a significant downturn in total sales volume, with sales almost at 2010 levels [Figure #2].

*Figure #2 – Annual sales per country region during the years 2010 - 2014*
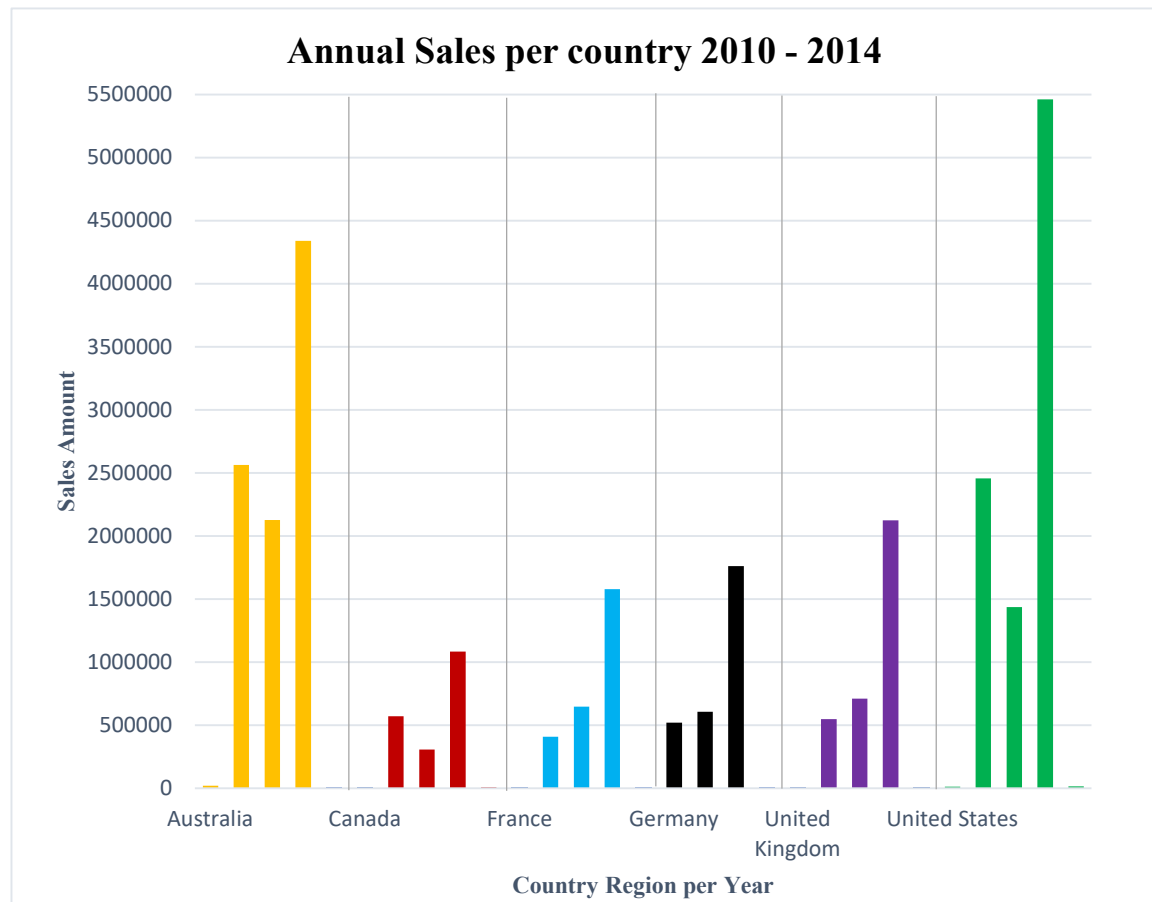
## 4.3. Total revenue per country region

In order to be able to **make an informed strategic decision** by the end of this report, it must be taken into account that companies also analyze total costs and **total revenues**. It often happens that although the volume of sales is high, these are not able to meet the costs, incurring losses for the company.

For this reason, we will analyze which region has the highest revenue volume using the formula **"total revenue = total sales - total costs."**

As in the previous section, it can be seen that the countries corresponding to the primary market, Australia and the United States, are the countries with the highest total revenue ($3685855.08 and $3900980.80, respectively). It is also observed, that the three European countries (secondary market), France, Germany, and the U.K., are relatively evenly matched ($1086264.72, $1187370.77, and $1390490.78, respectively). However, the tertiary market

(Canada) presents a big gap with respect to the rest of the regions, not reaching a million sales ($829921.50) [Figure #3].

*Figure #3 – Annual sales per country region during the years 2010 - 201*



Total Revenue per country region
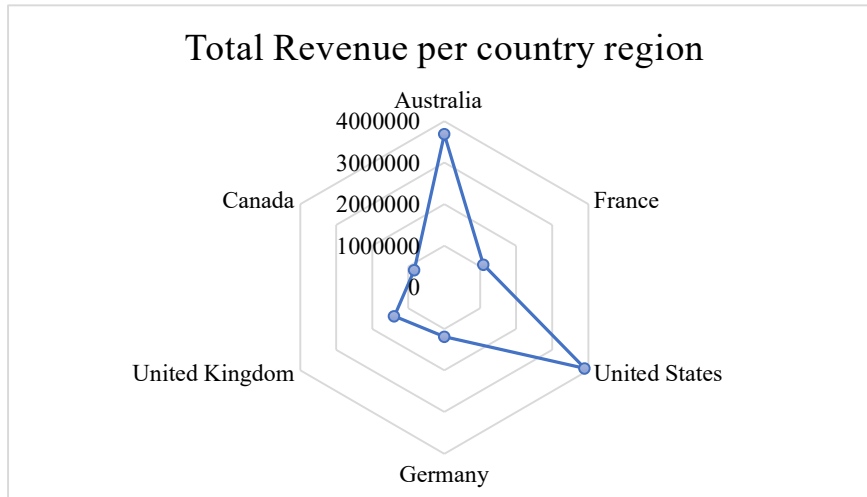
*Source: Rose Barragan Barranco (own graph).*

## 5. DESCRIPTIVE STATISTICS FOR YEARLY INCOME BY COUNTRY REGIONS.

*Table #1 – Summary statistics for Yearly Income, Gender by Country Regions during 2010 - 2014*

| | SalesAmount | | | | | | | |
| EnglishCountryRegionName | count | mean | std | min | 25% | 50% | 75% | max |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Australia | 5.00 | 1812200.12 | 1838054.23 | 8507.72 | 20909.78 | 2128407.46 | 2563732.25 | 4339443.38 |
| Canada | 5.00 | 395568.97 | 452117.60 | 3578.27 | 9457.62 | 307604.52 | 571571.80 | 1085632.65 |
| France | 5.00 | 528803.54 | 648524.90 | 3195.06 | 3399.99 | 410845.33 | 648065.54 | 1578511.80 |
| Germany | 4.00 | 723578.08 | 741921.61 | 3277.83 | 391194.58 | 564579.07 | 896962.58 | 1761876.36 |
| United Kingdom | 5.00 | 678342.44 | 869162.28 | 699.10 | 3713.64 | 550591.22 | 712700.96 | 2124007.29 |
| United States | 5.00 | 1877957.90 | 2253301.96 | 14833.90 | 17542.85 | 1437048.73 | 2458285.17 | 5462078.86 |

*Source: Jingyi Zhang (own graph).*

Table #1 displays the descriptive statistics of the sales. Over the period, **Australia's** sales peaked in 2013, reaching approximately $4.34 million. However, this figure has to be considered an outlier compared to the otherwise moderate sales figures in other years, with 2010 starting at roughly $20,909 and 2014 dropping to about $8,507. The standard deviation is a measure of sales dispersion,

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provides high values, reaching approximately $1.81 million, indicating a high level of volatility in Australia's year-to-year sales figures.

**Canada** displayed a consistent increase in sales from 2010, beginning at around $3,578, to a peak in 2013 of over $1 million. However, this growth did not persist into 2014, which saw a decrease to nearly $9,457. The standard deviation for Canada is approximately $450,000, which is less than that of Australia, suggesting that while there is variability in Canada's sales, it is not as extreme as in Australia.

**France's** sales have been erratic, with a low in 2010 at about $3,399, a significant rise in 2013 to roughly $1.58 million, and again a fall to $3,195 in 2014. The standard deviation for France is around $648,000, highlighting inconsistent sales performance over the five-year period.

**Germany's** sales showed an upward trend from 2011, starting at approximately $520,500 and reaching its zenith in 2013, with sales nearing $1.76 million. However, like other countries, a sharp decline was noted in 2014, when sales plummeted to around $3,277. In this case, the standard deviation is significant at about $741,000, which indicates a large variability that reflects Germany's unstable sales over the years.

The sales in the **United Kingdom** were modest in 2010 but surged to over $712,700 in 2012 and even higher to about $2.12 million in 2013, only to fall to $3,713 in 2014. With a standard deviation of $869,000, the U.K.'s sales also show considerable fluctuation, with 2013 as an outlier when compared to other years.

The **United States** showed a remarkable increase in sales from 2010 to 2013, with the minimum sales amount corresponding to $148,333 (in 2010) to the maximum sales amount corresponding to $5.46 million (in 2013). The standard deviation for U.S. sales amount is $2.25 million, which is the highest among all the countries observed, signaling the greatest volatility in sales amounts over the period.

## 6. THE BEST-SELLING PRODUCT CATEGORIES

### 6.1. Top-selling category in five years

Upon filtering the product categories, it becomes evident that products related to "Road" have seen the highest demand over the past 5 years. Sales of Road products are 45% greater than the next highest category, "Mountain" [Table #2]. With a sales quantity of 8068 units for this category, the average price of a "Road" product is close to $1802. Despite being pricier, they generate the most sales, suggesting that the company's profit is driven by quality rather than lower pricing.

*Table #2 – Top 5 Categories in Total Sales*

|   | Product Category | Sales Amount | Sales Quantity | Average Price |
|---|------------------|--------------|----------------|---------------|
| 1 | Road | $14520584.04 | 8060 | $1802 |
| 2 | Mountain | $9952759.56 | 4970 | $2002 |
| 3 | Touring | $3844801.05 | 2167 | $1774 |
| 4 | Sport | $225335.60 | 6440 | $350 |
| 5 | Long | $86782.64 | 1736 | $50 |

*Source: Qiyao Huang (own graph).*

The store's Road gear products will likely have superior quality and craftsmanship, making them highly appealing to customers. In addition, since the top three products are all related to outdoor sports, the company may consider capitalizing on this trend by investing further in outdoor gear and apparel to increase future revenues.

### 6.2. Yearly Sale by Category

*Figure #4 – Sales Distribution Per Year*
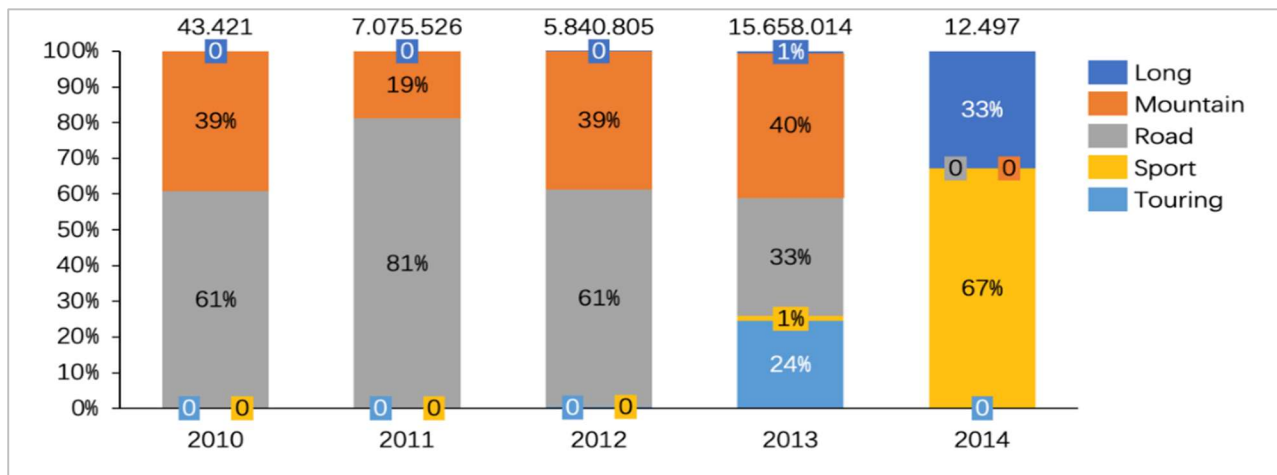


*Source: Qiyao Huang (own graph).*

From **2010 to 2012,** the market was primarily dominated by Road and Mountain categories, with Road making up the greatest share of sales, peaking at 81% in 2011. We must note that the percentage in the 2010 and 2012 product portfolios are exactly the same (61% for Road and 39% for Mountain), but the dollar amount on annual sales was significantly higher in 2012 than in 2010 ($5.8 million to $43.000). The reason why this might be, it is because the company launched its business in 2010, and so it had lower visibility in the market or lower product demand, and so we expected sales to be low; but in 2012, we can observe a great jump in sales from $43,000 to $5 million even though the product mix portfolio was the same. This might be because the company has a better positioning in the market or there is a shift in customer behavior.

Furthermore, a notable transformation occurred in **2013**, with a marked diversification in sales across different categories, such as Touring (24%), Sport (1%), and Long (1%) categories, suggesting a relevant change in consumer preferences or strategic changes in product offerings. Moreover, the Road category plummets to a mere 33%, which is half the share portfolio compared to the previous year (61%). At the same time, the Mountain category maintains a relatively stable presence (40%).

In **2014**, the trend was underscored by a meteoric rise in the Sport and Long category, which commands 67% and 33% of total sales (respectively), possibly indicating a successful product marketing strategy or an emerging trend in consumer interests. This dramatic shift could also reflect broader market trends or a result of targeted marketing efforts. Meanwhile, Touring, Mountain and Road sales dropped to 0%, which is a different behavior with respect to the four previous years.

To sum up, the fluctuations in total sales figures, especially the spike in 2013 (with $15.6 million), might be reflective of changes in product pricing, promotion effectiveness, market expansion, or a combination of these factors.

When the company shifted its product strategy in 2014, focusing on Sport and Long, annual sales dropped dramatically in all six regions, changing the trend from previous year-on-year growth. This indicated that Sport and Long were not attracting the brand's key customers. Thus, for the next fiscal year (2015), AdventureWorks Bicycles Co. might need to refocus its strategy and product mix portfolio on Road and Moutain.

## 7. HOME OWNERSHIP AND SALES AMOUNT.

Another aspect that is considered in this analysis is whether the ownership of a real estate property (house) influences the sales. In the dataset, 69% of the orders come from buyers who own a home, while the remaining 31% comes from those that don't. The average sales amount for customers with a home is approximately $488.869, while for customers without a home, the average sales amount is $479.883 [Figure #5]. The difference between the two groups is $8.986. Therefore, in order to make further investigations, an ANOVA test was conducted.

*Figure #5 - Comparison of Sales with and without Home Ownership*
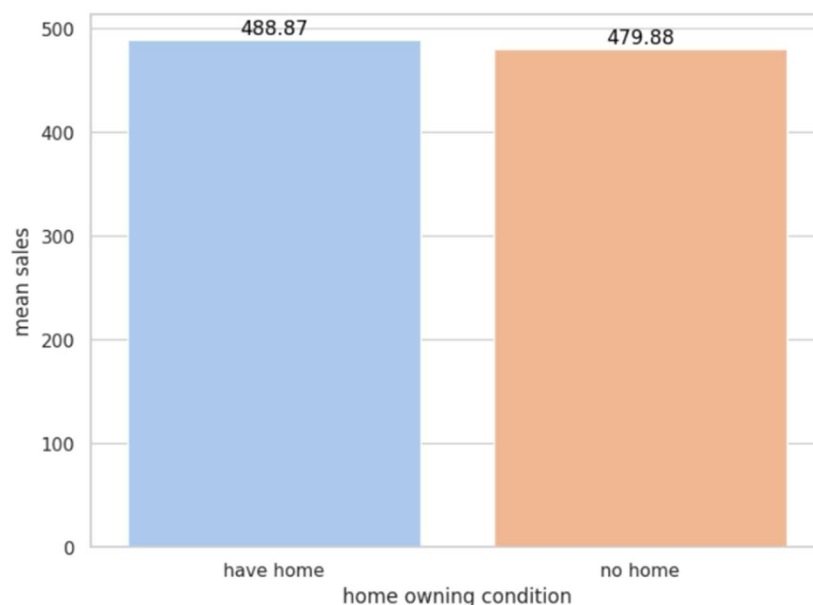


*Source: Yuqin Li(own graph).*

The results showed an F-statistic of 1.209 with a p-value of 0.271. Since the p-value is greater than the 0.05 significance level, there's not enough evidence to conclude that home ownership can significantly impact sales performance.

Although the overall sample did not demonstrate a significant impact of home ownership on bicycle sales amount, considering the potential differences in economic, cultural, and lifestyle factors among different regions, we further analyzed the data for each specific region. We observe that individuals without home ownership tend to spend more on bicycle purchases in the United Kingdom, France, and Germany. However, the pattern is slightly reversed in Canada, the United States, and Australia, with homeowners demonstrating higher spending habits [Figure #6].

*Figure #6 - Comparison of Sales Amount with and without Home Ownership in Different Countries*
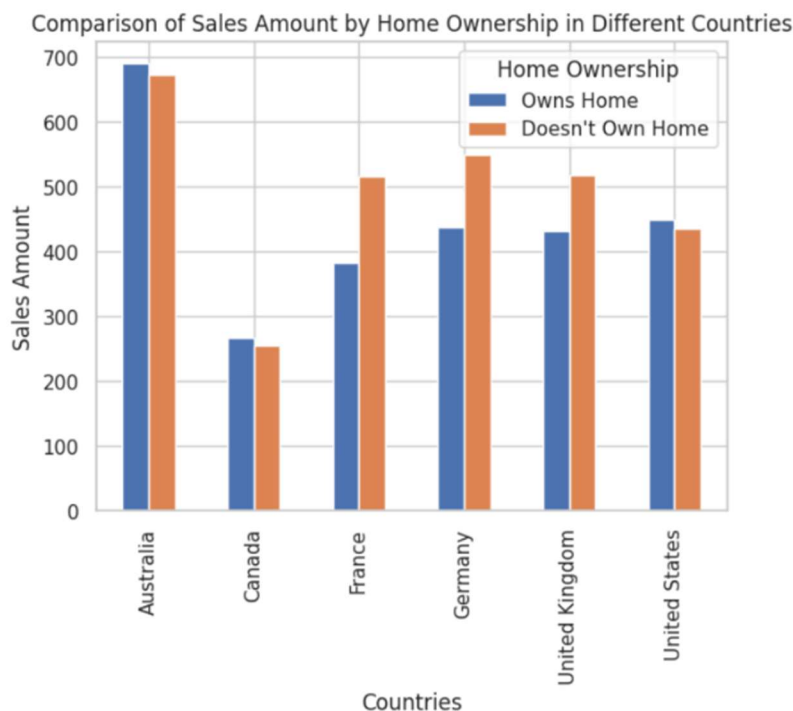


*Source: Yuqin Li (own graph).*

The ANOVA results revealed that in the United Kingdom, France, and Germany, the p-values were 0.0002, 0.0000002, and 0.00003, respectively—each below the significance level of 0.05. Therefore, it can be concluded that home ownership significantly influences sales in these three countries. On the other hand, Canada, the United States, and Australia showed p-values higher than 0.05, indicating that homeownership does not significantly impact sales in these regions.

## 8. CONCLUSIONS

After performing this thorough analysis, we can provide AdventureWorks Bicycle Co. with recommendations for a better decision-making strategy for the next fiscal year (2015).

Regarding market global positioning, we conclude that presence in the tertiary market (Canada) does not provide the same level of performance as the other two markets. Furthermore, the primary market, comprised of Australia and the U.S., is outperforming as the leading region with the highest total revenue and total sales amount and has a positive trend.

In terms of product portfolio mix, we must conclude that although the average price of the Road product category isn't the lowest compared to Touring, Sport, and Long, it still outpaces all other categories in sales amount. This suggests that consumers are drawn to quality rather than cheaper prices. On top of that, another key takeaway - obtained from the analysis of total sales by product category and region - is that the top four products are associated with outdoor activities.

Finally, the study reveals that home ownership in the United States, Australia, and Canada does not appear to significantly impact bicycle sales, suggesting that the demand for bicycles in these countries is high and goes beyond the financial situation of individuals. On the other hand, in Germany, the United Kingdom, and France, those who are not homeowners prefer purchasing bicycles, which may indicate that bicycles are perceived as a practical and economically efficient means of transportation.

## 9. RECOMMENDATIONS

In order to proceed with the strategic and actionable lines of action to be implemented for the next fiscal year (2015), the company should:

1. **Exclude** Canada from the regional focus and **reallocate** resources (employees, working space, equipment, or capital) to the primary market (the U.S. and Australia) and the secondary market (France, the U.K, and Germany) based on their respective total aggregated revenue performance, with a 68% resource allocation to the primary market and a 32% allocation to the secondary market.

2.  **Allocate** additional resources towards in-depth market research and target strategies for these two markets to further capitalize on their impressive performance.

3.  **Design** an enhanced product portfolio mix with Moutain (45%), Road (35%), and Touring (20%) gear.

4.  **Invest** more R&D in outdoor equipment and clothing to capitalize more revenue and gain a greater market share.

5.  **Implement** a robust marketing initiative with a strategic emphasis on the UK, Germany, and France, featuring competitive pricing and targeting individuals who do not own homes, and highlighting Bicycle Co. products' global presence, eco-friendly nature, healthier lifestyle benefits, and cost-effective commuting options.