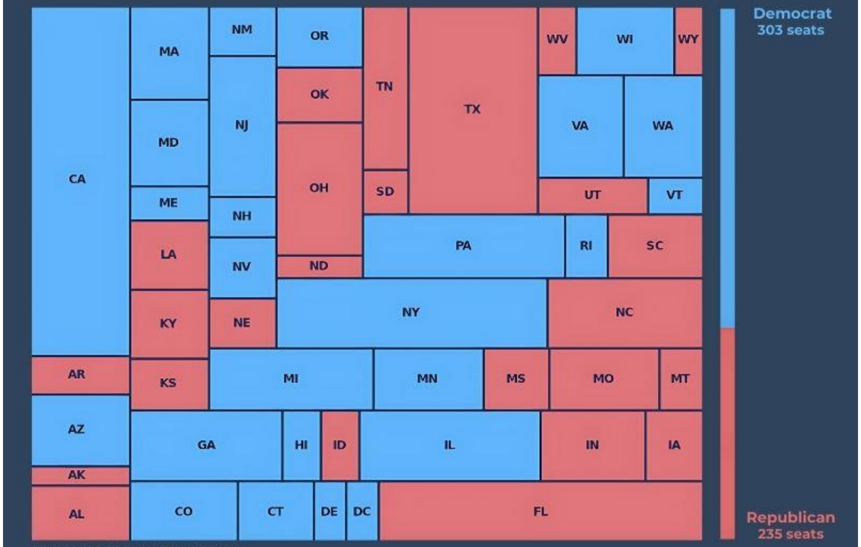
VOTE DEMOCRAT TO PROTECT REPRODUCTIVE RIGHTS

MAPPING AN ELECTORAL SEX DIVIDE

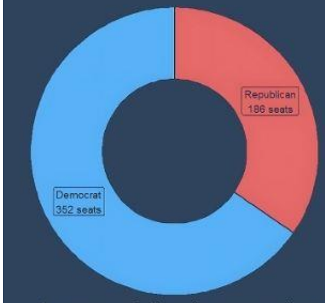
Biden aims to dismantle Trump's legacy on abortion rights and solidify Roe v. Wade, and protect women from the Republican-led war on choice (NBC, 2024). This visualisation contrasts the results of the 2020 presidential election with hypothetical single-sex voting scenarios derived from state exit polls. We urge pollsters to look beyond the sex binary and consider gender identities in societal analysis. ***States are sized according to their number of electoral seats.***

2020 PRESIDENTIAL ELECTION OUTCOME

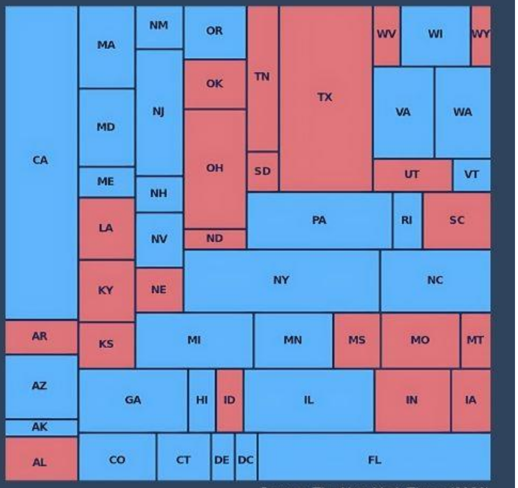


Source: US Election Data (2020)

IF ONLY FEMALES HAD VOTED

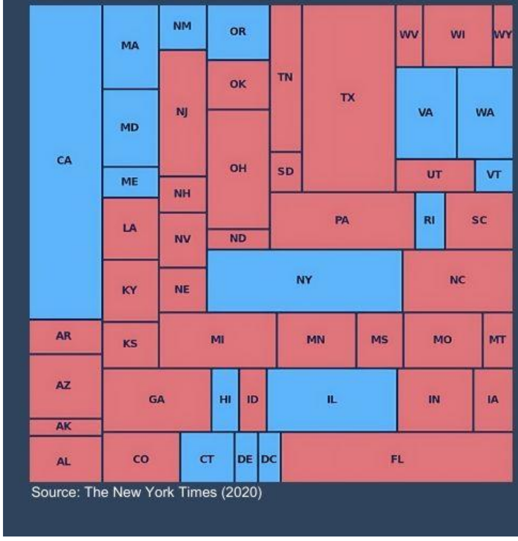


A count of female votes alone reveals a strong preference for the party defending their right to choose.
In an election where abortion is a key issue, female votes matter more than ever as it is an issue that disproprotionately affects many of them.

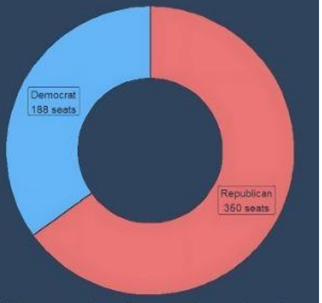


Source: The New York Times (2020)

IF ONLY MALES HAD VOTED

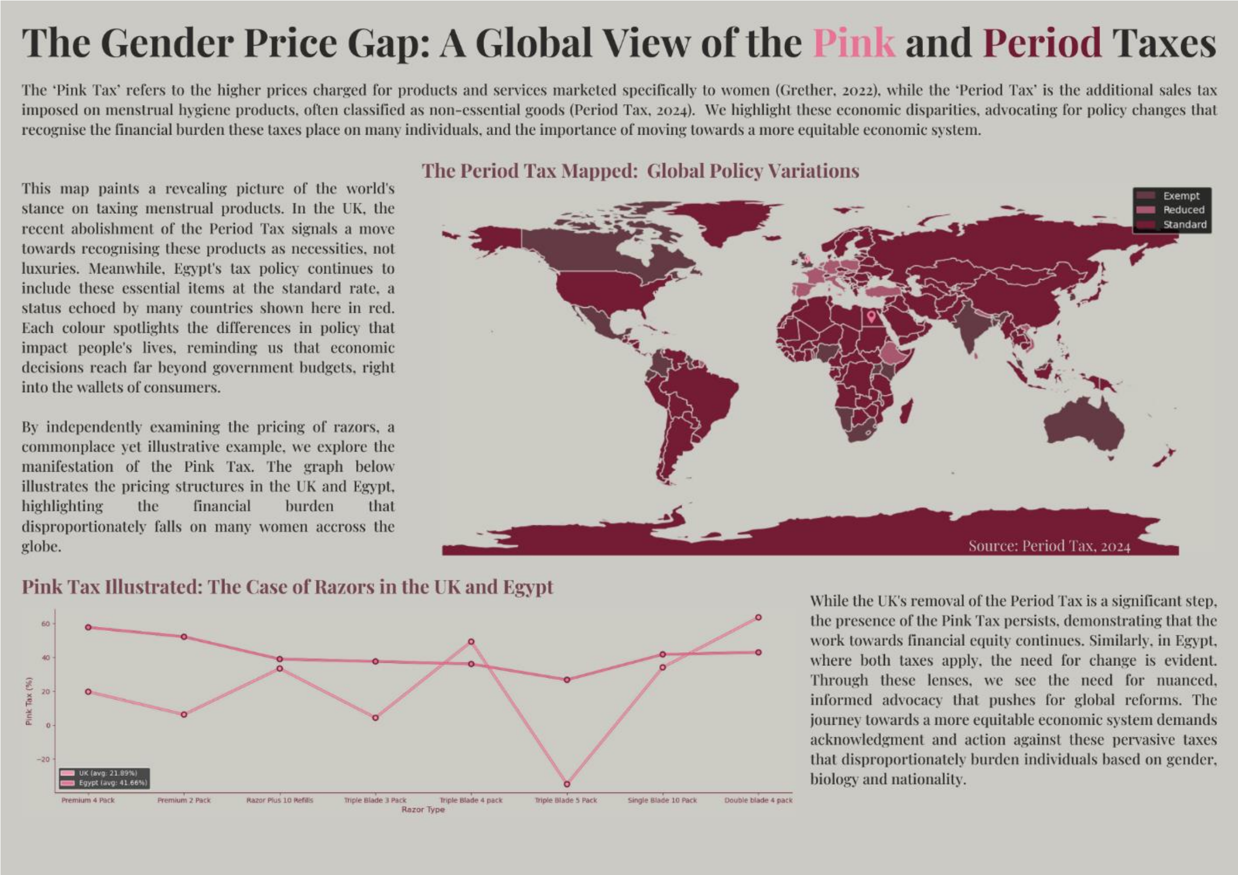


Source: The New York Times (2020)



When only the male vote is considered, there is a clear lean towards the party restricting reproductive freedoms.

Remember it is your ballot, your body, your choice. Vote Biden to protect your reproductive rights.



The Gender Price Gap: A Global View of the Pink and Period Taxes

The 'Pink Tax' refers to the higher prices charged for products and services marketed specifically to women (Grether, 2022), while the 'Period Tax' is the additional sales tax imposed on menstrual hygiene products, often classified as non-essential goods (Period Tax, 2024). We highlight these economic disparities, advocating for policy changes that recognise the financial burden these taxes place on many individuals, and the importance of moving towards a more equitable economic system.

This map paints a revealing picture of the world's stance on taxing menstrual products. In the UK, the recent abolishment of the Period Tax signals a move towards recognising these products as necessities, not luxuries. Meanwhile, Egypt's tax policy continues to include these essential items at the standard rate, a status echoed by many countries shown here in red. Each colour spotlights the differences in policy that impact people's lives, reminding us that economic decisions reach far beyond government budgets, right into the wallets of consumers.

By independently examining the pricing of razors, a commonplace yet illustrative example, we explore the manifestation of the Pink Tax. The graph below illustrates the pricing structures in the UK and Egypt, highlighting the financial burden that disproportionately falls on many women accross the globe.

The Period Tax Mapped: Global Policy Variations

Source: Period Tax, 2024

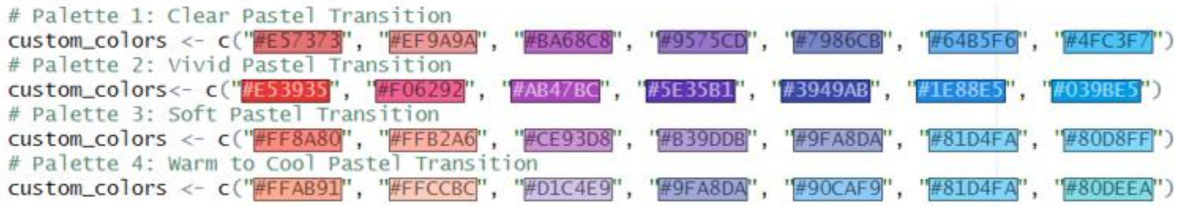
Pink Tax Illustrated: The Case of Razors in the UK and Egypt

While the UK's removal of the Period Tax is a significant step, the presence of the Pink Tax persists, demonstrating that the work towards financial equity continues. Similarly, in Egypt, where both taxes apply, the need for change is evident. Through these lenses, we see the need for nuanced, informed advocacy that pushes for global reforms. The journey towards a more equitable economic system demands acknowledgment and action against these pervasive taxes that disproportionately burden individuals based on gender, biology and nationality.

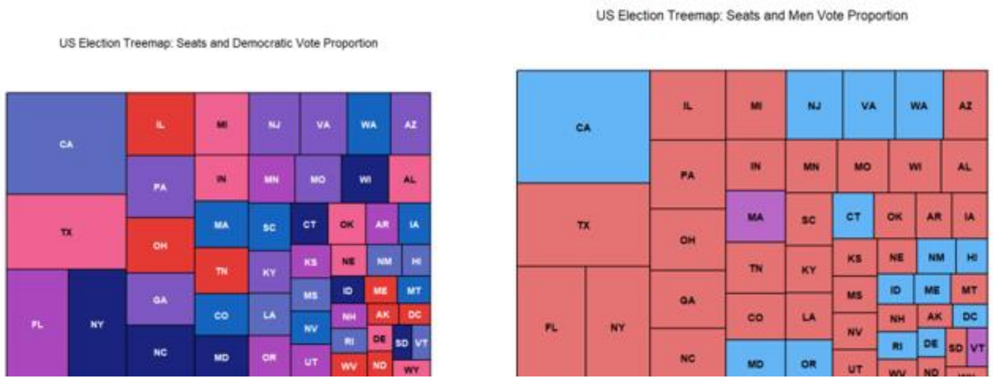
Challenge One

When asked to produce a visualisation as a swatch of options, the first design element that came to mind was colour. I started by creating maps with multiple intervals to depict the 2020 presidential election outcomes and experimenting with different colours as options, as illustrated by Figure 1. However, my focus shifted beyond colour to encompass spatial dynamics, orientation, and symmetry.

Figure 1: Different Colour Palettes and Intervals I Experimented With



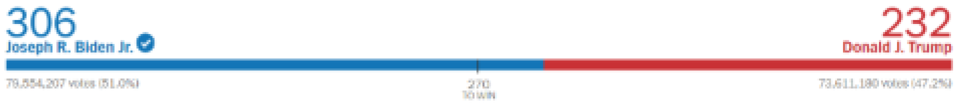
```
# Palette 1: Clear Pastel Transition
custom_colors <- c("#E57373", "#EF9A9A", "#BA68C8", "#9575CD", "#7986CB", "#64B5F6", "#4FC3F7")
# Palette 2: Vivid Pastel Transition
custom_colors<- c("#E53935", "#F06292", "#AB47BC", "#5E35B1", "#3949AB", "#1E88E5", "#039BE5")
# Palette 3: Soft Pastel Transition
custom_colors <- c("#FF8A80", "#FFB2A6", "#CE93D8", "#B39DDB", "#9FA8DA", "#81D4FA", "#80D8FF")
# Palette 4: Warm to Cool Pastel Transition
custom_colors <- c("#FFAB91", "#FFCCBC", "#D1C4E9", "#9FA8DA", "#90CAF9", "#81D4FA", "#80DEEA")
```



Evolution of Design Philosophy

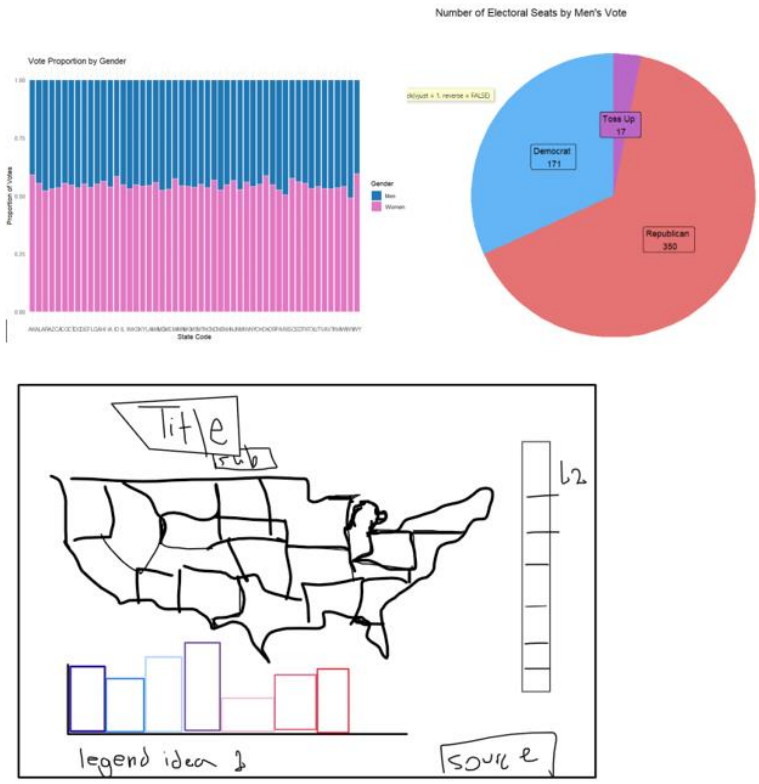
Central to my design was the deconstruction of traditional electoral legends (inspiration shown in Figure 2). Initially experimenting with bar charts and pie charts as legends (shown in Figure 3), I discovered that these did not adequately align with the overarching goal of illustrating disparities in voting behaviours across groups. The objective was to not only represent data but to highlight significant electoral asymmetries that impact the understanding of gendered voting patterns. The inspiration came from reading a Financial Times article on an ideological gender divide which found that men tend to vote more conservatively (Burn-Murdoch, 2024). This led me to create an infographic as an activist encouraging women to vote to protect their reproductive rights. While I could only find data which looked at sex and not gender, I opted to use it rather than abandoning the issue as abortion can be seen as a sex issue rather than a gender one. However, looking beyond binaries could have made for a more compelling visualisation and is something I typically strive to do when drawing on data feminism (D’Ignazio and Klein, 2016; Dork et al., 2013), so I decided to overtly criticise the data in the visualisation’s description.

Figure 2: Traditional ‘stacked-bar’ legend from which I drew inspiration from



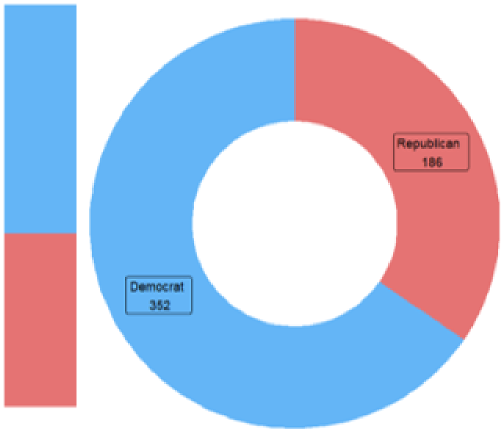
Source: Network, T.L. (2020)

Figure 3: Different Legend Types I Considered



Drawing on the principles outlined by Few (2017), who emphasises the efficacy of using positions or lengths for clarity, I opted to deconstruct the traditional stacked bar (shown by figure 4) legend and turn it into a doughnut chart, encapsulating the dichotomy of voting behaviours in a single, compelling visual element. This reimagined legend plays with spatial organisation and colour by positioning the majority segment externally, making it immediately apparent to the viewer. The almost perfectly inverse relationship between male and female voting patterns is visually encoded by the doughnut chart, where segments that are dominant in one gender's voting outcome are countered in the others, providing a stark visual contrast that is both informative and memorable. I included the traditional stacked bar legend in the first map as a subtle nod to it and present it as a more neutral visualisation to use as a point of reference.

Figure 4: From Bar to Doughnut



Intervals

Although I opted to focus on having just two intervals, working with different data sets meant that different techniques were used to set colour intervals for both. For the polling data, colours were assigned based on a straightforward threshold, where a proportion equal to or greater than 50% triggered one colour, and less than 50% another. This was feasible as there was no ‘other’ data. In contrast, the electoral data involved a different approach, where colours were determined by the highest proportion among three possible choices—Democratic, Republican, or Other. I initially explored setting 5 different intervals for each map but the contrast was not as stark or memorable as with a simple red-blue divide.

Textual Integration and Symmetry

The integration of text and the use of annotations enhance the narrative without overwhelming the viewer. Text is asymmetrically positioned to complement the visual flow, and the colours used in the legend and map are used to highlight key information (Segel and Heer, 2010), according to my goals and intentions when designing (Dork et al., 2013). I view annotations as integral to the design process as a means of accounting for different levels of data visualisation literacy, increasing accessibility. The empowering final line of text is essentially what I want to resonate with viewers, the fact that while the subject matter and electoral focus on abortion may seem daunting and overwhelming, the power resides with their ability to vote. That is after all what the visualisation aims to mobilise people to do.

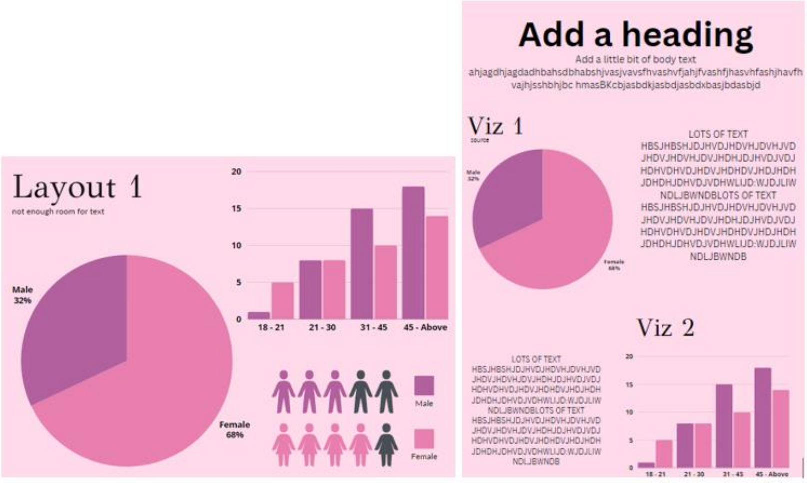
Challenge 3

Conceptual Framework

In this project, I chose to tackle the underrepresented issue of the 'Pink Tax,' a challenge amplified by the absence of a comprehensive global dataset documenting these gender-driven pricing discrepancies. Faced with this gap and aiming to shed light on an often overlooked financial burden rather than continuing to fail to represent it, I linked it to the slightly better-documented 'Period Tax.' This connection was suitable for two main reasons. The first is that both fall under the umbrella of taxes which disproportionately affect women, falling under the gender price gap (Grether, 2022). The second is that I observed a common misconception among colleagues who often conflated the 'Pink Tax' and the 'Period Tax.

This misconception inspired me to clarify these distinct economic burdens right from the start. Under the main title of the visualisation, I included definitions for both terms, using text to educate viewers and set a clear context for the data presented. This ensures that the viewers understand that while both taxes contribute to gender-based financial inequity, they are fundamentally different issues. My decision to incorporate large bodies of text ultimately impacted how I approached setting the layout for the A4 sheet. Figure 5 shows earlier templates I experimented with on Canva.

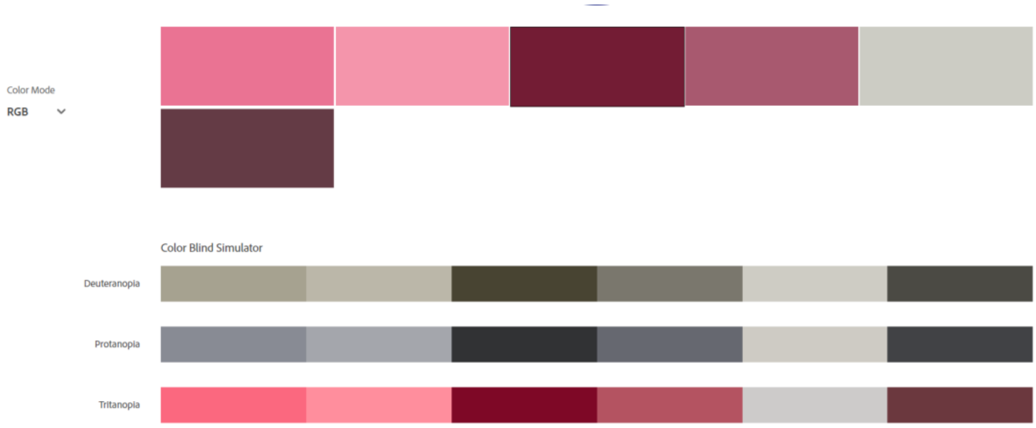
Figure 5: Early Layout Ideas


Layout 1
not enough room for text
Male
32%
Female
68%
20
15
10
5
0
18 - 21
21 - 30
31 - 45
45 - Above
Male
Female
Add a heading
Add a little bit of body text
ahjagdhjagdadhbahsdbhabshjvasjvavsfhvashvfjahjfvashfjhasvhfashjhavfh vajhjsshbhjbc hmasBKcbjasbdkjasbdjasbdxbasjbdasbjd
Viz 1
source
Male
32%
Female
68%
LOTS OF TEXT
HBSJHBSHJDJHVDJHDVHJDVHJVD JHDVJHDVHJDVJHDHJDJHVDJVDJ HDHVDHVDJHDVJHDHDVJHDJHDH JDHDHJDHVDJVDHWLIJD:WJDJLIW NDLJBWNDBLOTS OF TEXT HBSJHBSHJDJHVDJHDVHJDVHJVD JHDVJHDVHJDVJHDHJDJHVDJVDJ HDHVDHVDJHDVJHDHDVJHDJHDH JDHDHJDHVDJVDHWLIJD:WJDJLIW NDLJBWNDB
Viz 2
LOTS OF TEXT
HBSJHBSHJDJHVDJHDVHJDVHJVD JHDVJHDVHJDVJHDHJDJHVDJVDJ HDHVDHVDJHDVJHDHDVJHDJHDH JDHDHJDHVDJVDHWLIJD:WJDJLIW NDLJBWNDBLOTS OF TEXT HBSJHBSHJDJHVDJHDVHJDVHJVD JHDVJHDVHJDVJHDHJDJHVDJVDJ HDHVDHVDJHDVJHDHDVJHDJHDH JDHDHJDHVDJVDHWLIJD:WJDJLIW NDLJBWNDB
20
15
10
5
0
18 - 21
21 - 30
31 - 45
45 - Above

Data Collection and Methodological Choices

My data collection involved gathering the average prices of men's and women's razors in the UK and Egypt and calculating the markup. This involved going to stores and taking images of product prices or noting them down when taking photos was not feasible. As mentioned above to extend the narrative to a global scale, I integrated a dataset on the Period Tax that captures global policy variations on menstrual products. I selected a colour palette relating to both issues and ensured the colours used in the visualisation were accessible and distinct, utilising Adobe Colour to ensure my palette was colour-blind-friendly (as depicted by Figure 6).

Figure 6: Checking Colour Palette Accessibility in Adobe Colour

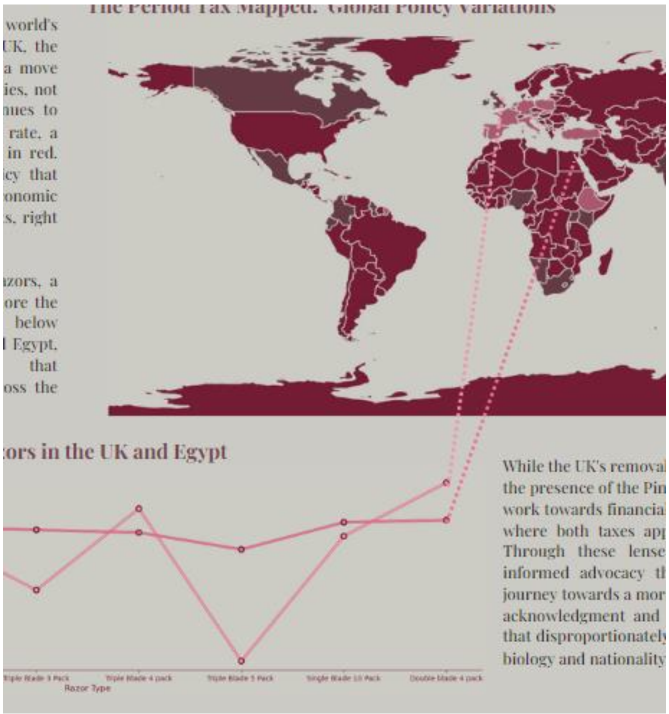


Source: Adobe (2024)

Visual Design and Implementation

Initially, I considered extending the line graph from the pricing data directly to the countries on the world map to signify the geographic data points (shown in Figure 7). However, this approach proved too cluttered, detracting from the clarity of the information. Instead, I opted for colour-coded location markers that correspond with the line graph, maintaining visual cleanliness and coherence.

Figure 7: Connecting the visualisations with extended lines



References

Visualisations

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Report

Adobe (2024) *Color blind safe colors on color wheel | Adobe Color* (2024). Available at: https://color.adobe.com/create/color-accessibility (Accessed: 2 May 2024).

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D'Ignazio, C., & Klein, L. F. (2016). Feminist data visualization. Workshop on Visualization for the Digital Humanities (VIS4DH), Baltimore. IEEE.

Dörk, M., Feng, P., Collins, C. and Carpendale, S., (2013). Critical InfoVis: exploring the politics of visualization. In *CHI'13 Extended Abstracts on Human Factors in Computing Systems* (pp. 2189-2198).

Few, S. (2017). Data Visualization Effectiveness Profile. https://www.perceptualedge.com/articles/visual_business_intelligence/data_visualiza tion_effectiveness_profile.pdf

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Network, T.L. (2020) 'What's Going On in This Graph? | 2020 Presidential Election Maps', *The New York Times*, 19 November. Available at: https://www.nytimes.com/2020/11/19/learning/whats-going-on-in-this-graph-2020-presidential-election-maps.html (Accessed: 2 May 2024).

Appendix

US Election Map Code

```
import pandas as pd
import matplotlib.pyplot as plt
import squarify data =
pd.read_csv(r"C:\Users\hayak\Downloads\AdvVisLabs\Spatial US
Election\merged_electoral_data.csv")
```

```
border_text_color = '#2E425A'

plt.rc('font', size=10, weight='bold')
# Function to assign colours for 'Men' and 'Women' (OpenAI, 2024)
def assign_color_gender(proportion):
    return '#64B5F6' if proportion >= 0.5 else '#E57373'
# Function to assign colours for 'DEM_prop'  (OpenAI, 2024)
def assign_color_demprop(dem, rep, oth):
    if dem >= max(rep, oth):
        return '#64B5F6'
    elif rep > max(dem, oth):
        return '#E57373'

def display_treemap(data, column):
    if column == 'DEM_prop':
        data['color'] = data.apply(lambda row: 
assign_color_demprop(row['DEM_prop'], row['REP_prop'], row['OTH_prop']), 
axis=1)
    else:
        data['color'] = data[column].apply(assign_color_gender)

    sizes = data['Seats']
    labels = data['state_code']
    colors = data['color']
    plt.figure(figsize=(10, 8)) #I edited this in final steps for plots, do not 
remember exact numbers
    ax = plt.gca()
    squarify.plot(sizes=sizes, label=labels, color=colors, alpha=0.8, 
edgecolor=border_text_color, linewidth=2)
    plt.axis('off')
    # Set the text color #with help from OpenAI (2024)
    texts = [child for child in ax.get_children() if isinstance(child, plt.Text)]
    for text in texts:
        text.set_color(border_text_color)
    plt.rc('font', size=10, weight='bold')
    plt.show()
#for the purpose of creating legends
display_treemap(data, 'Men')
display_treemap(data, 'Women')
display_treemap(data, 'DEM_prop')

library(ggplot2)

# Data for the donut chart legend for Men
legend_data_men <- data.frame(
  Category = c("Democrat", "Republican"),
  Seats = c(188, 350),  # Update with the actual number of seats for Men
  Color = c("#64B5F6", "#E57373")
)

# Function to create a donut chart
donut <- function(chart) {
  chart +
    theme(plot.margin = margin(-1, -1, -1, -1, "cm"),
          panel.background = element_rect(fill = "#A7CDEF", colour =
"#2E425A"),  # Background color
          plot.background = element_rect(fill = "#A7CDEF", colour = "#2E425A"),
# Background color
          panel.grid = element_blank(),
          axis.text = element_blank(),
          axis.title = element_blank(),
          axis.ticks = element_blank()) +
    geom_label(aes(label = paste(Category, "\n", Seats)), color = "#2E425A",
               position = position_stack(vjust = 0.5), size = 5, fontface = "bold")  #
Dark blue text
}

#snippet of what was used for doughnut charts
```

```
base_donut_chart <- ggplot(legend_data_men, aes(x = "", y = Seats, fill = Category)) +
  geom_bar(stat = "identity", width = 1) +
  coord_polar("y", start = 0) +
  xlim(0.5, 2.5) +
  scale_fill_manual(values = legend_data_men$Color) +
  theme_void() +
  labs(title = "")  # No title

donut_chart <- donut(base_donut_chart)
print(donut_chart)
```

Gender Price Gap

```
 import matplotlib.patheffects as pe
import pandas as pd
import matplotlib.pyplot as plt
from matplotlib.patches import Patch
palette = {
    'background': '#cccccc4',
    'uk_line': '#f495ab',
    'egypt_line': '#ea7393',
    'text_color': '#731c34',
    'legend_background': '#2a2a2a',
    'legend_text': '#ffffff'
}
file_path = 'C:\\Users\\hayak\\Downloads\\AdvVisLabs\\project 3\\My Pink Tax Data.csv'
pink_tax_data = pd.read_csv(file_path)
pink_tax_data.columns = pink_tax_data.columns.str.strip()
average_pink_tax_uk = pink_tax_data['Pink Tax UK (%)'].mean()
average_pink_tax_egypt = pink_tax_data['Pink Tax Egypt (%)'].mean()
plt.figure(figsize=(20, 5))
ax = plt.axes()
```

```
ax.set_facecolor(palette['background'])
plt.gcf().set_facecolor(palette['background'])
uk_line, = ax.plot(pink_tax_data['Razor Type/Brand'], pink_tax_data['Pink Tax
UK (%)'],
             marker='o', color=palette['uk_line'], label=f'UK (avg:
{average_pink_tax_uk:.2f}%)',
             markeredgewidth=0.5, markeredgecolor=palette['text_color'],
linewidth=3,
             path_effects=[pe.Stroke(linewidth=3.5,
foreground=palette['text_color']), pe.Normal()],
             zorder=3)
egypt_line, = ax.plot(pink_tax_data['Razor Type/Brand'], pink_tax_data['Pink
Tax Egypt (%)'],
               marker='o', color=palette['egypt_line'], label=f'Egypt (avg:
{average_pink_tax_egypt:.2f}%)',
               markeredgewidth=0.5, markeredgecolor=palette['text_color'],
linewidth=3,
               path_effects=[pe.Stroke(linewidth=3.5,
foreground=palette['text_color']), pe.Normal()],
               zorder=3)
plt.xlabel('Razor Type', color=palette['text_color'], fontsize=12)
plt.ylabel('Pink Tax (%)', color=palette['text_color'], fontsize=12)
ax.tick_params(colors=palette['text_color'])
plt.xticks(rotation=0)
#With help from OpenAI (2024)
ax.spines['top'].set_visible(False)
ax.spines['right'].set_visible(False)
ax.spines['left'].set_color(palette['text_color'])
ax.spines['bottom'].set_color(palette['text_color'])
legend_elements = [Patch(facecolor=palette['uk_line'],
edgecolor=palette['legend_text'], label=f'UK (avg:
{average_pink_tax_uk:.2f}%)'),
            Patch(facecolor=palette['egypt_line'],
edgecolor=palette['legend_text'], label=f'Egypt (avg:
{average_pink_tax_egypt:.2f}%)')]
legend = ax.legend(handles=legend_elements, loc='lower left',
facecolor=palette['legend_background'], edgecolor=palette['legend_text'],
fontsize=10)
plt.setp(legend.get_texts(), color=palette['legend_text'])
ax.grid(False)


#with help from OpenAI (2024) in creating data frame (data mining the period
tax site was not working so manually entered the exempt/reduced countries
from their annual report and counted the others as standard)
# Create a DataFrame from the provided list
tax_df = pd.DataFrame({
    "Country": [
        "Canada", "Mexico", "Jamaica", "Ecuador", "Colombia", "Guyana",
        "Trinidad and Tobago", "Ireland", "United Kingdom", "Nigeria",
        "Uganda", "Kenya", "Malawi", "Namibia", "South Africa", "Lesotho",
        "India", "Bhutan", "Bangladesh", "South Korea", "Malaysia",
        "Australia", "Maldives", "Mauritius", "Lebanon", "Rwanda",
        "Saint Kitts and Nevis", "France", "Portugal", "Spain", "Belgium",
        "Netherlands", "Germany", "Poland", "Austria", "Italy", "Slovakia",
        "Slovenia", "Turkey", "Nepal", "Ethiopia", "Sri Lanka", "Vietnam",
        "Cyprus", "Luxembourg"
    ],
    "Tax Category": [
        "Exempt", "Exempt", "Exempt", "Exempt", "Exempt", "Exempt",
        "Exempt", "Exempt", "Exempt", "Exempt", "Exempt", "Exempt",
        "Exempt", "Exempt", "Exempt", "Exempt", "Exempt", "Exempt",
        "Exempt", "Exempt", "Exempt", "Exempt", "Exempt", "Exempt",
        "Exempt", "Exempt", "Exempt", "Reduced", "Reduced", "Reduced",
        "Reduced", "Reduced", "Reduced", "Reduced", "Reduced", "Reduced",
        "Reduced", "Reduced", "Reduced", "Reduced", "Reduced", "Reduced",
        "Reduced", "Reduced", "Reduced"
    ]
})

# Load world geometry for mapping
world_geometry = gpd.read_file(gpd.datasets.get_path('naturalearth_lowres'))

# Ensure the 'Country' names match the 'name' field in the world geometry DataFrame
world_geometry = world_geometry.rename(columns={'name': 'Country'})

# Merge the tax category data with the world geometry data using the 'Country' column
complete_tax_df = world_geometry.merge(tax_df, on='Country', how='left')

# For countries not listed, we'll assume 'Standard' tax rate
complete_tax_df['Tax Category'] = complete_tax_df['Tax Category'].fillna('Standard')

# Display the first few rows of the merged DataFrame
complete_tax_df[['Country', 'Tax Category']].head()
```

Map code:

```
import matplotlib.pyplot as plt
from matplotlib.patches import Patch
import geopandas as gpd
map_colors = {
    'Exempt': '#643b45',
    'Reduced': '#a8596f',
    'Standard': '#731c34',
    'background': '#ccccc4',
}

# line generated by OpenAI (2024)
```

```
complete_tax_df['color'] = complete_tax_df['Tax Category'].apply(lambda x:
map_colors.get(x, 'lightgrey'))

fig, ax = plt.subplots(1, 1, figsize=(15, 10),
facecolor=map_colors['background'])
complete_tax_df.plot(ax=ax, color=complete_tax_df['color'],
edgecolor=map_colors['background'], linewidth=1)
legend_map_labels = [Patch(facecolor=color, label=category) for category,
color in map_colors.items() if category not in ['background']]
plt.legend(handles=legend_map_labels)

# Axis removal for map (OpenAI, 2024)
ax.axis('off')
```