Problem Set 3

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Introduction

In this problem set, I use FDA Orange Book data to explore patterns of
patent expirations and generic entry. My eventual research question is whether
patient-directed advertising slows switching to generics after patent expiry.
However, I do not yet have advertising data, so I focus here on visualizing
patent expirations and generic entry patterns.

Figure 1: Patent Expiration Distribution

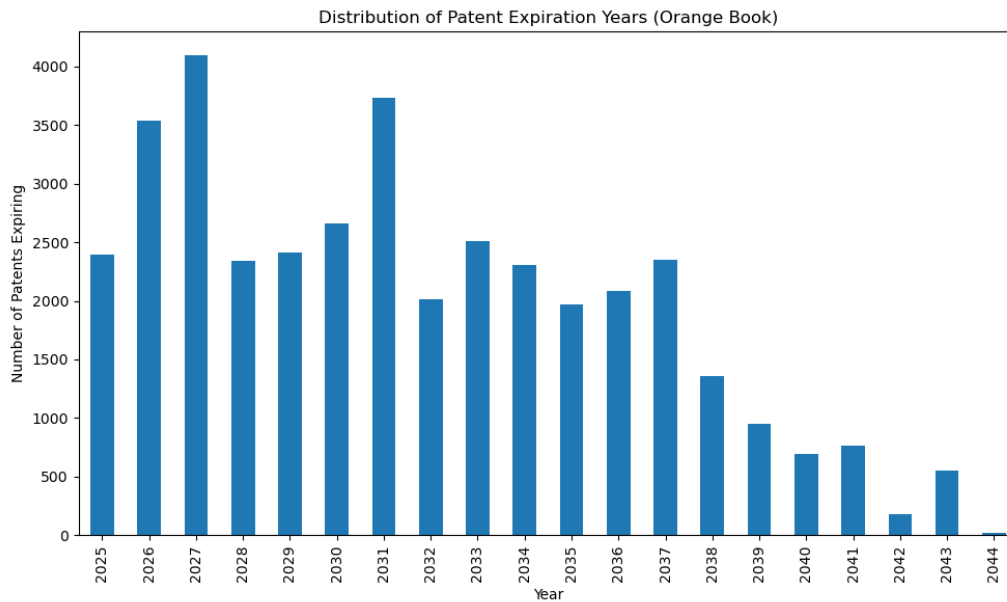Distribution of Patent Expiration Years (Orange Book)

Figure 1: This figure shows how many drug patents expire in each year. Each bar represents a year, and the height of the bar shows how many patents end in that year. Some years have only a few expirations, while others, like 2027, show a large wave of expirations. When many patents end together, it creates a big opening for generic competition. These are the times when brand-name companies are under the most pressure to defend their market share, which is when they may turn to strategies like patient-directed advertising.
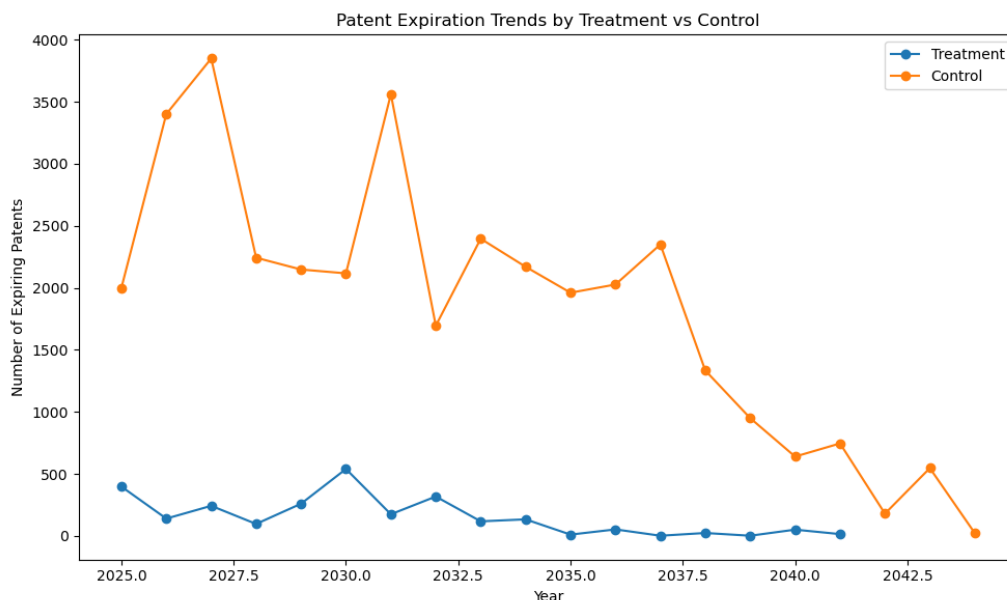
Figure 2: Treatment vs. Control Trends

Figure 2: This figure compares patent expirations between large pharma firms (treatment) and all other firms (control)between 2025 and 2045. In my research question, I eventually want to compare drugs that did patient-directed advertising (treatment) to those that did not (control), before and after patent expiry. However, since I do not yet have advertising data, I create a placeholder treatment definition for illustration: drugs made by large pharmaceutical firms (Pfizer, Merck, Novartis, Johnson & Johnson) are coded as treatment, while all other firms are control. The control group experiences far more expirations, peaking at nearly 3,800 in 2027,while the treatment group shows smaller peaks around 2027 and 2030 with fewer than 500 expirations. Both groups show a general decline in expirations after the mid-2030s.

Figure 3: Proxy for Generic Entry

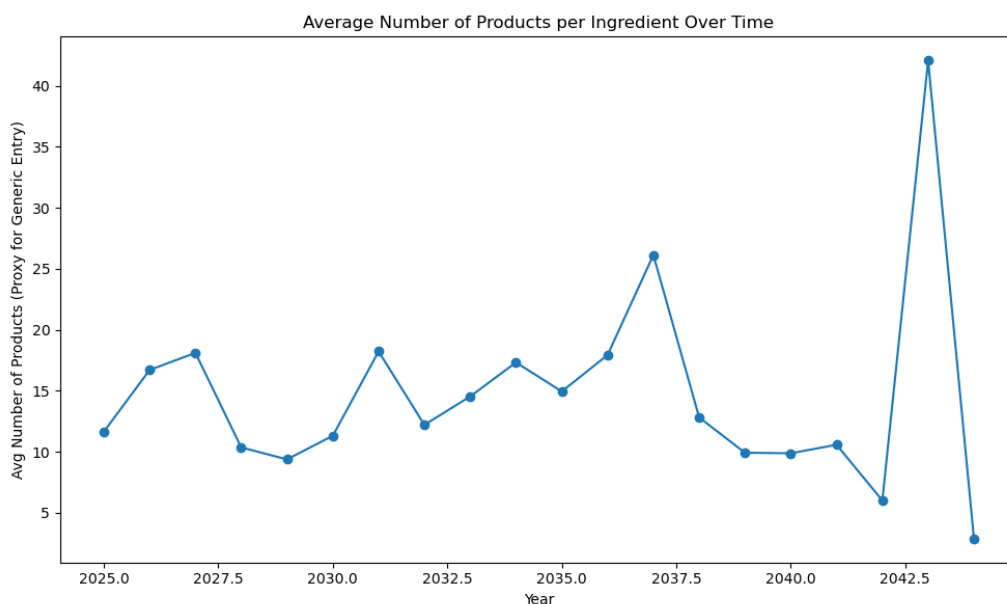Average Number of Products per Ingredient Over Time

Figure 3: This figure shows, on average, how many drug products exist for each active ingredient in a given year. At first, most ingredients usually have only one branded drug. When patents expire, generics enter the market and the number of products for that ingredient goes up. In this figure, the average number of products rises in years such as 2027 and 2037, reflecting waves of generic entry. The very large spike around 2043 suggests that many drugs are projected to lose patent protection in that year, which would create a major opening for competition. Although this measure does not capture patient switching directly, it shows when patients have more opportunities to switch away from branded drugs. In my future analysis, I will examine whether patient-directed advertising slows this increase in generic competition by helping brands retain patients even after patent expiry.