Food Distribution Research Society

Journal of Food Distribution Research
Volume 55, Issue 3, pp. 1–20

The Effect of Amazon Prime on Sales Ranks

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Abstract

This study estimates the effect of the Amazon Prime status of beverage products on their sales ranks. Specifically, using fixed effects regressions and data from Amazon's platforms in the United States and Canada, we first show that Amazon Prime improves grocery sales ranks of ground coffee and black tea by 20% and 17% in the United States and by 8% and 17% in Canada, respectively. Then, we confirmed the validity of these results using product-level sales ranks. These findings suggest that Amazon Prime's economic success is observed in Amazon's marketplaces, as reported in the mass media.

Keywords: black tea; e-commerce; fixed effects; ground coffee

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Introduction

In his 2020 letter to shareholders, Jeff Bezos noted that Amazon Prime allows 200 million subscribers worldwide to receive fast and free delivery of millions of eligible online products within two, one, or the same business days (Smith, 2013; Weissmann, 2014; Del Rey, 2019; Hatch, 2020; Bezos, 2021; Spangler, 2021). Due to this logistical prowess, Amazon Prime has become very popular and extremely successful. The success of the subscription program has been widely examined by several media reports, including articles in the New York Times (Ovide, 2022) and the Wall Street Journal (Brown, 2022). Yet, few economic and marketing studies have carefully considered the managerial and regulatory implications of the subscription program (Ramadan, Farah, and Bou Saada, 2021; Snyder, Canaday, and Hughes, 2022), likely because the causal impact of Amazon Prime requires experimental or observational big data, which are not readily available. Given that Amazon is a nongovernmental enterprise, gathering experimental data on Amazon Prime violates the company's terms and conditions and could cause legal problems for researchers. In addition, collecting observational big data from Amazon's websites requires substantial investments in web scraping, and such data may suffer from nonrandom biases that could lead to incorrect research conclusions. In this study, we circumvent these challenges through an online Amazon database and fixed effects regression approaches, thereby addressing these limitations and contributing to the literature on subscription programs in economics and marketing.

There are at least three reasons why it is essential to consider the effect of Amazon Prime on sales. First, Amazon is a global economic powerhouse with billions of monthly visits to its websites across the globe. Therefore, every third-party seller wants to sell on Amazon and thus considers the Amazon Prime program as one of the ways to improve sales on the platform. However, justifying any investments in Amazon Prime-eligible products depends on understanding the subscription program's heterogeneous effects on underperforming, median-performing, and top-performing products. However, to our knowledge, limited economic and marketing studies have quantified the effect of Amazon Prime and ascertained its managerial importance to third-party sellers. Second, anti-trust investigations of Amazon in the United States have occurred (California Department of Justice-Office of the Attorney General, 2022). For example, the Attorney General of California, Rob Bonta, recently filed a lawsuit against Amazon, alleging that the company is stifling competition using its dominance in e-commerce through several mechanisms, including the Amazon Prime program. Thus, because of its regulatory importance, this study seeks to contribute to the understanding of anti-competition implications of the Amazon Prime program. Third, from Amazon's perspective, providing evidence of the effect of Amazon Prime on sales using data collected from Amazon's websites could confirm or dispute the success of the subscription program. Since Amazon is the predominant e-commerce firm, sustaining Amazon Prime's short- and long-term success is necessary for its brand to thrive in the highly competitive retail sector.

Most products sold in Amazon's global marketplaces have a sales rank. This Amazon-assigned number indicates a snapshot of the sales level of a product relative to other products at a particular time (Hanks and Spils, 2006). Thus, the sales rank is a good indicator of a product's sales performance. Amazon assigns a sales rank at the broad category level and the more specific

product level. For example, Amazon can assign a sales rank of 2,000 to a ground coffee product at the grocery category level and a sales rank of 1 to the same ground coffee at the ground coffee product level. This example indicates that although the product is the highest-selling ground coffee, it is the 2,000th highest-selling grocery item. This information allows us to estimate the effect of Amazon Prime on the grocery and product sales ranks of ground coffee and black tea beverages, two of the most popular products in the grocery category. We chose both products for this study because they are nonperishable food items with enormous economic contributions, which can serve as gateway products to the emergence of online grocery shopping (Heng et al., 2018; Etumnu et al., 2020).

Using sales ranks as an indicator of sales performance is appropriate because Schnapp and Allwine (2001) have shown that the relationship between log sales and log sales ranks is close to linear. Thus, if we used log sales ranks as our dependent variable, we would adjust our estimation coefficients and standard errors by a constant value (Chevalier and Mayzlin, 2006). In addition, some studies (Chevalier and Mayzlin, 2006; Etumnu et al., 2020; Reimers and Waldfogel, 2021) have successfully used log sales ranks in place of log sales because, as a nongovernmental enterprise, Amazon is not required to share its product sales data with the public. Given the inverse relationship between the sales rank and product sales performance, our main objective is to address whether Amazon Prime products are associated with lower sales ranks (i.e., an increase in sales). This result is expected because e-commerce thrives on cheap, fast, and free delivery of products, which Amazon Prime promises its loyal subscribers (Del Rey, 2019; Brown, 2023). To test our hypotheses, we collected ground coffee and black tea data on sales ranks, Amazon Prime status, customer ratings, and prices from Amazon's platforms in Canada and the United States through an online Amazon database (Keepa.com). With this data, we estimated the effect of Amazon Prime on the sales ranks of beverage products using a fixed effects approach.

Specifically, we first show that Amazon Prime improves the grocery sales ranks of ground coffee and black tea by 20% and 17% in the United States and 8% and 17% in Canada, respectively. Next, we confirmed the validity of the results using product-level sales ranks. These findings suggest that the economic success of Amazon Prime reported in the mass media is observed at the product level on Amazon's websites (Brown, 2022; Ovide, 2022). The results contribute to a growing body of literature that uses internet data and theoretical modeling to investigate several aspects of e-commerce (Edelman, 2012; Einav et al., 2015; Richards, Hamilton, and Empen, 2017; Lu and Reardon, 2018; Harris-Lagoudakis, 2022 ; Reimers and Waldfogel, 2021; Teh, 2022). However, the value that e-commerce firms create in society has led to the growth of these studies. For example, according to the U.S. Department of Commerce-Bureau of the Census (2011, 2021), the e-commerce subsector led by Amazon contributed $871 billion to the economy in 2021 compared to $194 billion in 2011, making e-commerce one of the fastest-growing subsectors in the economy of the United States. Thus, this study expands upon a growing body of research by estimating the effect of Amazon Prime, one of the most iconic e-commerce brands in the 21st century.

This study also shows that Amazon Prime increases sales, and thus, it can provide insights that might guide marketing strategies and decisions (Ailawadi, Lehmann, and Neslin, 2003; Gilbert, 2021; Teh, 2022; Teh and Wright, 2022; Etumnu, 2022a). Measuring the success of Amazon Prime

in terms of sales ranks only satisfies some of the attributes of an ideal brand equity measure (Ailawadi, Lehmann, and Neslin, 2003). Yet, sales ranks have several advantages that could be appealing to e-commerce managers. For example, the sales rank is an objective measure derived from sales readily available on Amazon's platforms across the globe. Thus, it reflects the overall health of Amazon Prime over time, and e-commerce managers can use it to assess the impact of their marketing strategies and decisions. Furthermore, the availability of databases like Keepa provides a resource for third-party e-commerce managers who may lack the expertise or tools required to monitor their products and those of their competitors continuously. Thus, the challenge of identifying and monitoring one's and competitors' Amazon Prime products can be quickly and adequately addressed through Keepa and similar databases and trackers, such as JungleScout and camelcamelcamel.

An Overview of Amazon Prime

Amazon Prime is a paid subscription program that, as of April 2021, gives 200 million subscribers exclusive access to additional services offered by Amazon (Howley, 2021; Spangler, 2021). These services include same-, one-, or two-day delivery of purchased products and access to video, music, reading, gaming, photos, grocery shopping, and exclusive deals such as Prime Day (Amazon 2022a). Amazon Prime is believed to be one of the most iconic retail inventions in the world, which has led to unprecedented success for Amazon (Brown, 2022; Ovide, 2022). Although there are several media reports on the economic success of Amazon Prime, only some empirical studies focus on these success stories (Ramadan, Farah, and Bou Saada, 2021; Snyder, Canaday, and Hughes, 2022). Given the rich history of Amazon Prime and the need to provide some context for this study, an overview of the subscription program follows.

Amazon Prime was launched in 2005 as a membership service in the United States, offering two-day free shipping on eligible products within the country (Del Rey, 2019). This service was initially provided to Amazon customers for an annual fee of $79, which increased to $139 as of December 31, 2022 (Weissmann, 2014; Del Rey, 2019; Amazon, 2022a). After launching in the United States, Amazon subsequently implemented the subscription service in other countries, starting with Germany and the United Kingdom in 2007 and Canada in 2013 (Smith, 2013; Weissmann, 2014; Amazon, 2022b). As of October 2021, Amazon Prime memberships are available to Amazon customers in 23 countries across the globe (see Table 1).

Table 1. What Is Amazon Prime?

Type of program	Subscription service
Founded	February 2, 2005
Revenue	$31.8 billion (2021)
Number of subscribers	200 million
Services offered	Fast, free delivery
	Prime video
	Prime music
	Prime day

Table 1. (cont)

Services offered	Prime gaming Exclusive deals Rx savings Prime reading Amazon photos Prime try before you buy Free Grubhub+ for a year
Countries available	Austria, Australia, Belgium, Brazil, Canada, China, France, Germany, India, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, Poland, Portugal, Saudi Arabia, Singapore, Spain, Sweden, Turkey, the UK, and the US
Subscription plans (US)	Prime monthly ($14.99) Prime annual ($139) Prime student monthly ($7.49) Qualified government assistance ($6.99)
Subscription plans (CA)	Prime monthly (CDN$9.99) Prime annual (CDN$99.00) Prime student monthly (CDN4.99)

Since its launch, Amazon Prime has contributed to Amazon's net sales—total revenue minus sales returns, allowances, and discounts (Kenton, 2024). The other sources of consolidated net sales include online stores, physical stores, third-party seller services, advertising services, Amazon Web Services (AWS), and others. However, records of Amazon Prime's contribution to net sales began to appear in Amazon's annual report in 2014. Amazon Prime (included under subscription services in the annual reports) contributed $2.8 billion in fees, which represents about 3.1% of Amazon's consolidated net sales in 2014 (Amazon, 2022c). As of 2021, this contribution level has increased almost 12 times to $31.8 billion, representing 6.8% of Amazon's total net sales (Amazon, 2022c). Despite this tremendous increase, Amazon Prime subscription fees still represent a small portion of Amazon's total revenue. In 2021, the major revenue contributors were online stores ($222 billion, 47%) and AWS ($62 billion, 13%) (Amazon, 2022c).

However, in recent years, Amazon Prime has also contributed to sales through Prime Day—an annual two-day sales event exclusive to Amazon Prime members (Amazon, 2022d). The event started in 2015, and its eighth edition took place on July 12–13, 2022. The 2022 event sold more than 300 million items, resulting in $1.7 billion in savings for Amazon Prime members (Amazon, 2022d). Although Amazon did not disclose the total sales from the 2022 Prime Day event, it was estimated to have generated approximately $12 billion (Morris, 2022; Reuters, 2022; Walk-Morris, 2022). Additionally, a survey of Amazon shoppers in the United States by Bank of America found that the average Amazon Prime member spent $1,968 per year on Amazon (Bain, 2021). This estimate is about four times the amount spent on Amazon by non-Prime members (Bain, 2021).

Therefore, Amazon Prime's contribution to Amazon's total revenue now includes three channels: subscription fees, Prime Day sales, and regular sales from Prime members, making it one of the main foundations of Amazon's business and of interest not only to academics but also to third-party sellers and regulators (Bain, 2021).

Two different fulfillment methods operate on Amazon for third-party sellers: (i) Fulfilled by Amazon (FBA)—independent third-party sellers who sell their products to the final consumer but pay Amazon a fulfillment fee to handle its sale, from storing and delivering and customer service to a possible return of the products, and (ii) fulfilled by Merchant (FBM)—independent third-party sellers who sell on Amazon without using the company's logistics. Amazon designates its products and those of FBA sellers as Amazon Prime, whereas the products of FBM sellers are undesignated as Amazon Prime.

Data

Our data consist of ground coffee and black tea attributes collected from the public websites of Amazon.com and Amazon.co.ca through the Amazon database Keepa. Our goal is to estimate the effect of a product's Amazon Prime status on its sales. However, we could not access their ground coffee and black tea sales data because Amazon is a non-governmental enterprise. Thus, we relied on the sales ranks reported on Amazon's websites in the United States and Canada. We used the sales ranks as they are in our analysis without attempting to approximate or derive ground coffee and black tea sales from them. We collected data on all ground coffee and black tea products on Keepa because the entire population of ground coffee and black tea products sold on Amazon's websites in the United States and Canada was less than 10,000, the maximum allowable number of products on Keepa's product finder.

We collected the ground coffee and black tea products on October 5, 2022, and October 5, 2023. We also obtained each product's current price, grocery and product level sales ranks, average star rating, the number of ratings, stockout rate, and seller type. We created an Amazon Prime variable using the seller type (Amazon, FBA, and FBM). In addition, we merged the datasets that appeared in the two periods for each country and product, creating panel datasets. In the United States, our panels comprise 5,931 products (1,1862 observations) for ground coffee and 5,355 products (10,710 observations) for black tea. In Canada, our panel samples comprise 1,014 products (2,028 observations) for ground coffee and 1,550 products (3,100 observations) for black tea. We attribute the significant differences in sample size across the two countries to at least three reasons. First, Amazon was founded in the United States in 1994 and in Canada in 2002. The lag between starting Amazon and establishing the Canadian branch correlates with how the company expends its resources, such as labor, marketing, and research and development. These factors bolster the success of Amazon United States compared to Amazon Canada. Second, the population of the United States (333 million) is almost 9 times more than the population of Canada (39 million), which implies that the market size of Amazon products in the United States, holding other factors constant, can be assumed to be 9 times the market size in Canada. With a higher beverage demand due to the U.S. population size, Amazon and its third-party sellers meet this demand by providing more products. Finally, the level of competition among sellers in the United States appears fiercer

than in Canada. With more than 1 million third-party sellers competing for market share in the United States compared to about 58,000 in Canada, the number of sellers in each country reflects the number of products available (Chevalier, 2022; Keepa, 2024).

Tables 2 and 3 present the summary statistics of the main variables. The tables also compare the means of the variables and indicate whether or not they are Amazon Prime eligible. In Table 2 (United States), 67% of the ground coffee products and 46% of the black tea products are Amazon Prime eligible. However, in Table 3, 45% of the ground coffee products and 36% of the black tea products are Amazon Prime eligible. Aside from these percentages, comparing eligible and ineligible products reveals at least four relevant differences to our study.

First, the sales ranks of eligible products are significantly less than those of ineligible products. These differences suggest that the Amazon Prime products have better sales performance than the ineligible products. However, aside from the influence of the free and fast shipping enjoyed by Amazon Prime products, other factors, such as price, consumer ratings, and stockout rates, could also play a role in determining the differences in sales ranks. Second, the prices of Amazon Prime-eligible products are lower than those of Amazon Prime-ineligible products. Although these prices do not control for package size, they do reflect the law of demand, which suggests that the lower prices of Amazon Prime-eligible products command higher demand (sales) than those of the ineligible products. Third, the average rating and the number of ratings indicate that Amazon Prime-eligible products have better consumer-perceived quality and popularity in Amazon's marketplaces.[1] Finally, the stockout rates of Amazon Prime-eligible products are much lower than those of ineligible products, which suggests that eligible products may have higher sales because stockouts on Amazon's marketplaces are correlated with sales (Etumnu, Jaenicke, and Cheranades, 2024).

[1]This observation seems true for all products except ground coffee in Canada.

Table 2. Summary Statistics (United States)

	Ground Coffee				Black Tea			
	All	**Eligible**	**Ineligible**	***p*-value**	**All**	**Eligible**	**Ineligible**	***p*-value**
Amazon Prime	0.67	1	0	0.0000	0.46	1	0	0.0000
Grocery sales ranks	90,286	73,930	123,176	0.0000	249,713	144,195	339,816	0.0000
Coffee sales ranks	1,462	1,181	2,027	0.0000	2,808	1,604	3,835	0.0000
BuyBox price	$27.26	$23.96	$33.89	0.0000	$25.77	$22.02	$28.96	0.0000
Average rating	4.14	4.19	4.03	0.0000	3.17	3.86	2.58	0.0000
Number of ratings	1,993	2,187	1,603	0.0000	1,501	2,549	606	0.0000
Stockout rate	0.14	0.05	0.32	0.0000	0.12	0.04	0.19	0.0000
Number of products	5,931			5,355				
Observations	11,862			10,710				

Table 3. Summary Statistics (Canada)

	Ground Coffee				Black Tea			
	All	**Eligible**	**Ineligible**	***p*-value**	**All**	**Eligible**	**Ineligible**	***p*-value**
Amazon Prime	0.45	1	0	0.0000	0.36	1	0	0.0000
Grocery sales ranks	30,238	14,334	43,183	0.0000	30,317	16,505	38,216	0.0000
Tea sales ranks	1,109	446	1,649	0.0000	1,932	635	2,674	0.0779
BuyBox price	CA$50.56	CA$33.00	CA$64.85	0.0000	CA$40.02	CA$25.39	CA$48.40	0.0000
Average rating	3.98	4.12	3.86	0.0000	3.02	3.49	2.75	0.0000
Number of ratings	2,484	2,300	2,634	0.3293	1,457	2,353	944	0.0000
Stockout rate	0.19	0.82	0.28	0.0000	0.17	0.06	0.23	0.0000
Number of products			1,014				1,550	
Observations			2,028				3,100	

Although the comparison of means suggests that being Amazon Prime eligible has a causal impact, regression analysis is necessary to disentangle the effects of Amazon Prime status from the effects of any confounding factors. Thus, in the next section, we present the fixed-effects regressions used in the causal analysis.

Empirical Strategy

This section presents the fixed effects model that we employ to estimate the effects of Amazon Prime on grocery and product-level sales ranks. Consider the following fixed effects model:

$$y_{it} = \alpha + \beta Prime_{it} + \gamma \boldsymbol{X_{it}} + \rho_t + \sigma_i + \varepsilon_{it} \quad (1)$$

where i could be a ground coffee or black tea product in the United States or Canada. t is the period for data collection, with $t = 1$ representing October 2022, and $t = 2$ representing October 2023. y_{it} is the natural logarithm of the grocery sales ranks or the product-level (ground coffee or black tea) sales ranks of product i in period t. We prefer a log-transformed dependent variable for two reasons. First, the sales rank is an ordinal variable with an extensive range. For example, the grocery sales ranks range from 1 to hundreds of thousands. Thus, a log transformation of the sales ranks increases our chances of normalizing the distribution of the variable. Second, we enhance the interpretability of the effect of Amazon Prime as percentage change through the log transformation. Given the range and ordinal nature of sales ranks, this method of interpreting the effects seems much more intuitive. $Prime_{it}$ is a dummy variable indicating whether product i is eligible for Amazon Prime status in period t. We hypothesize that β is negative, suggesting that being eligible for Amazon Prime lowers (improves) the sales ranks. To ensure that the effects of Amazon Prime are disentangled from cofounding factors, we also control for other factors in the vector, $\boldsymbol{X_{it}}$. The variables in the vector include price, consumer ratings, and stockout rate. We hypothesize that increasing prices and stockout rates hurt sales ranks, whereas increasing consumer ratings improves sales ranks. ρ_t, σ_i, and ε_{it} are the time-fixed effects, product-fixed effects, and error terms, respectively.

Our specification in equation (1) has several advantages that enable us to identify the causal effects of Amazon Prime. However, it also has limitations, which we cannot address in this study. We first present the advantages and then the limitations. The most significant advantage of our model is that it includes time and product-fixed effects. Thus, we assume that our estimated Amazon Prime effects are causal conditional on the fixed effects. The time-fixed effects control for macroeconomic and weather-related issues that could influence the sales ranks (Ebbes, Papies, and van Heerde, 2021). Additionally, product-fixed effects control for omitted time-invariant attributes that could affect sales ranks (Ebbes, Papies, and van Heerde, 2021). Another advantage of our model is that it includes relevant control variables in Amazon's marketplaces. These variables include price, average rating, number of ratings, and stockout rate. Previous studies on Amazon have shown these variables to be relevant (Chevalier and Mayzlin, 2006; Sun, 2012; Etumnu, Jaenicke, and Cheranades, 2024). Hence, not controlling them in our model will lead to omitted variable bias.

Despite these advantages, we made one assumption in our fixed effects model that may be too optimistic. That is, we assumed that Amazon Prime is an exogenous variable. However, in a few situations Amazon Prime could be endogenous. For example, the probability of becoming Amazon Prime eligible may be due to observed product sales, while Amazon Prime impacts sales, leading to a reverse causality. Another example could be due to omitted variable bias, whereby unobserved attributes determine third-party seller enrollment in the FBA program. To correct this potential endogeneity challenge, the literature suggests using instrumental variables regressions (Angrist and Pischke, 2009; Cunningham, 2021; Ebbes, Papies, and van Heerde, 2021). However, we are cautious of using instrumental variables in this study as they may produce worse outcomes than our proposed fixed effects model for two reasons. The first is meeting the relevance criterion of an instrumental variable, and the second is meeting the validity criterion of an instrumental variable. Because of these challenges, we focused on our panel fixed effects regressions despite acknowledging the potential caveats of the model.

Results and Discussions

This section presents the study's results. Table 4 presents the effects of Amazon Prime in the United States, whereas Table 5 presents the effects of Amazon Prime in Canada. We also made two decisions that increased the generalizability of our findings. First, we estimated the effects of Amazon Prime in both the United States and Canada. Finding similar results in both countries suggests that Amazon Prime's effects may be universal. Second, we estimate the effect of Amazon Prime not only on the grocery sales ranks, but also on the product-level (ground coffee and black tea) sales ranks in the United States and Canada. If the results of the effects of Amazon Prime on the grocery sales ranks are like the effects of Amazon Prime on the product-level sales ranks, the validity of our findings will be enhanced. We present the specific results next, starting with the United States and then Canada.

Table 4 shows results in the United States. The first column presents the effect of Amazon Prime and the control variables on grocery sales ranks of ground coffee. We find that being Amazon Prime eligible reduces (improves) grocery sales ranks by about 20%. The second column presents the effect of Amazon Prime and control variables on ground coffee sales ranks. We find that Amazon Prime improves ground coffee sales ranks by about 15%. The third and fourth columns focus on black tea, presenting the effects of Amazon Prime on grocery sales ranks and black tea sales ranks, respectively. The results show that grocery sales ranks improved by about 17%, whereas black tea sales ranks improved by about 14%. The results found in each column confirm the positive effects of Amazon Prime on sales ranks and, thus, sales.

Aside from Amazon Prime, the effects of the control variables also have the expected signs. For example, the impact of price on sales ranks is positive, although with different effect sizes for each column. These results indicate (i) the positive relationship between price and sales ranks suggests an increase in price hurt sales ranks, leading to a downward-sloping demand curve. This also confirms the law of demand; and (ii) the price-sales ranks relationship suggests that the demand for ground coffee and black tea is inelastic because the elasticities range from 0.37 to 0.46. The second set of control variables are consumer ratings—average rating and number of ratings. As

hypothesized, an increase in each consumer rating variable improves sales ranks.[2] The positive impacts occur because consumer ratings address information asymmetry. The average rating informs consumers of the perceived quality of the products as well as their associated services, such as delivery time, returns, and customer service. The number of ratings addresses information asymmetry by indicating which products are popular, thus increasing their visibility to other consumers. Both variables also reduce the possibility of omitted variable bias given how important consumer ratings are in online marketplaces, especially Amazon. The last control variable is the stockout rate, which also has the expected sign. An increase in the stockout rate hurts sales ranks of ground coffee and black tea products with a range of 24%–49%. This finding is also consistent with previous studies that show that stockout rates are crucial for the success of retailers, including Amazon and its third-party sellers.

Table 5 presents four columns that show the effects of Amazon Prime and control variables on ground coffee and black tea products in Canada. The effect of Amazon Prime on the columns ranges from 8%–21%. Specifically, in column 1, Amazon Prime improves grocery sales ranks for ground coffee by 8%, although insignificantly. In column 2, which also focuses on ground coffee, the effect is 8%, again insignificant. However, for black tea products, the effect of Amazon Prime on grocery sales ranks and black tea sales ranks are 17% and 21%, respectively. Both are statistically significant at $p < 0.01$. Each of these results confirms that Amazon Prime improves sales ranks, and thus, sales.

Furthermore, like the results found in the United States, the effect of each of the control variables has the expected signs. First, the price elasticity ranges from 0.37 to 0.46. Second, the effect of average rating on ground coffee ranges from 5%–7%, but is insignificant for black tea products. Third, the number of ratings improves sales ranks, with a range of 32%–40%. Finally, an increase in the stockout rate hurts sales ranks by 24%–49%. These control variables are crucial to addressing omitted variable biases.

[2]The effects of average rating on black tea are insignificant.

Table 4. Effect of Amazon Prime on Sales Ranks in the United States

	Ground Coffee		**Black Tea**	
	Grocery Sales Ranks	**Coffee Sales Ranks**	**Grocery Sales Ranks**	**Tea Sales Ranks**
	(1)	**(2)**	**(3)**	**(4)**
Amazon Prime	-0.1998***	-0.1543***	-0.1652***	-0.1390***
	(0.0350)	(0.0311)	(0.0257)	(0.0282)
Log price	0.6799***	0.6233***	0.0949**	0.0821
	(0.0654)	(0.0581)	(0.0480)	(0.0525)
Average rating	-0.0457***	-0.0454***	-0.0096*	-0.0146***
	(0.0106)	(0.0094)	(0.0050)	(0.0055)
Number of ratings	-2.0314***	-1.6667***	-2.1183***	-1.7189***
	(0.0359)	(0.0319)	(0.0477)	(0.0522)
Stockout rate	0.5774***	0.5360***	0.3106***	0.2957***
	(0.0532)	(0.0473)	(0.0344)	(0.0377)
Constant	8.9033***	5.0398***	11.6624***	7.1556***
	(0.2112)	(0.1876)	(0.1486)	(0.1626)
N	1,1862	1,1862	10,710	1,0710
R_2	0.9043	0.8922	0.9491	0.9316
Fixed effects	Yes	Yes	Yes	Yes

Note: Standard errors in parentheses. Single, double, and triple asterisks (*, **, ***) indicate statistical significance at the 10%, 5%, and 1% levels.

Table 5. Effect of Amazon Prime on Sales Ranks in Canada

	Ground Coffee		Black Tea	
	Grocery Sales Ranks	**Coffee Sales Ranks**	**Grocery Sales Ranks**	**Tea Sales Ranks**
	(1)	**(2)**	**(3)**	**(4)**
Amazon Prime	-0.0808	-0.0800	-0.1680***	-0.2062***
	(0.0678)	(0.0679)	(0.0413)	(0.0553)
Log price	0.4561***	0.3749***	0.3808***	0.4046***
	(0.1032)	(0.1034)	(0.0480)	(0.0642)
Average rating	-0.0711***	-0.0470**	0.0001	-0.0167
	(0.0219)	(0.0220)	(0.0079)	(0.0106)
Number of ratings	-0.3971***	-0.3228***	-0.3591***	-0.3322***
	(0.0667)	(0.0668)	(0.0749)	(0.1002)
Stockout rate	0.4898***	0.3577***	0.2373***	0.2903***
	(0.0832)	(0.0834)	(0.0489)	(0.0654)
Constant	8.1116***	4.7642***	8.4974***	5.1188***
	(0.3946)	(0.3954)	(0.1712)	(0.2288)
N	2,028	2,028	3,100	3,100
R_2	0.9163	0.8909	0.9303	0.9004
Fixed effects	Yes	Yes	Yes	Yes

Note: Standard errors in parentheses. Single, double, and triple asterisks (*, **, ***) indicate statistical significance at the 10%, 5%, and 1% levels.

Based on the existing economic and marketing literature, there are at least three reasons why Amazon Prime improves product sales performance. First, online shoppers long for convenience to save time and to reduce their search costs, and Amazon Prime provides them with these benefits through its free shipping and free returns programs (Shehu, Papies, and Neslin, 2020; Patel et al., 2021; Etumnu, 2022a). Although the free shipping and free returns offered through Amazon Prime are not actually free—Amazon Prime members pay subscription fees—the benefits of the programs seem to outweigh the costs of the subscription fees. These benefits thus translate to more sales for products that have the Amazon Prime label. Second, Amazon has succeeded in building a solid reputation in retail (Marcotte, 2022). For example, in 2023, Amazon was ranked as the best place to work by LinkedIn and the second most admired company in the world by Fortune (Fortune, 2023; LinkedIn, 2023). Amazon's solid reputation, particularly its brand equity, brand visibility, and brand trust, significantly boosts sales. Third, Amazon Prime might be boosting sales because Amazon practices self-preference for its brand (European Commission, 2022; Farronato, Fradkin, and MacKay, 2023). Self-preferencing has been highlighted as one way through which digital platforms could stifle competition in the marketplace. Whether this is the case for Amazon Prime was raised by the European Commission (2022), a case which was eventually settled when Amazon made some commitments, including how to utilize seller data, "featured offer," and Amazon Prime. Self-preferencing has also been highlighted in terms of rankings of search results (Farronato, Fradkin, and MacKay, 2023). However, it is beyond the scope of this work to investigate whether Amazon self-prefers the Amazon Prime program in its platform and the reasons why the company might be involved in such practice.

Overall, our results suggest that every serious third-party seller on Amazon should strongly consider the Amazon Prime label. As we show, Amazon Prime improves sales across countries and products and appears to outweigh the program's costs.

Conclusions and Implications

Although several media reports have ascertained that Amazon Prime is economically successful, there has been a limited empirical investigation of the subscription program. Using a fixed-effects approach, this study quantifies the effect of Amazon Prime on the sales ranks of ground coffee and black tea products in the United States and Canada. We first show that Amazon Prime improves grocery sales ranks of ground coffee and black tea by 20% and 17% in the United States and by 8% and 17% in Canada, respectively. We also confirmed the validity of these results using product-level sales ranks. These findings suggest that the economic success of Amazon Prime reported in the mass media is observed at the product level on Amazon's marketplaces.

This study is potentially useful to Amazon, third-party sellers that operate on its online marketplaces, and policy makers and regulators who promulgate and execute innovation and competition laws. For Amazon, the results indicate that their iconic subscription program creates value for them as well as third-party sellers that adopt the Amazon Prime program. The results indicate that these third-party sellers are obtaining the value they pay for, which gives their products the privilege to become Amazon Prime-eligible and an advantage over Prime-ineligible products. This study could spur other sellers operating on Amazon's marketplace (Fulfilled by

Merchant—FBM) to contemplate adopting the FBA sales strategy (Lai, Liu, and Xiao, 2018; Etumnu, 2022b). But deciding whether to adopt the FBA sales strategy should entail a case-by-case analysis to weigh its potential costs and benefits.

For policy makers and regulators, there remains a question of whether the Amazon Prime business strategy is anticompetitive (Zhu and Liu, 2018; Hagiu, Teh, and Wright, 2020; Competitions and Market Authority [CMA], 2022), because products that are Amazon Prime eligible have an advantage over other products on Amazon's marketplaces. Whether this advantage is unfair is debatable. In addition, questions have been raised about how Amazon sets the eligibility criteria for third-party sellers to use the Amazon Prime label (CMA, 2022). But it is worth noting that Amazon Inc. defeated the Attorney General (AG) of Washington DC in court regarding a complaint that accused Amazon of stifling competition through its business strategies including Amazon Prime (Lamm, 2022). However, Amazon's victory over the AG has been short-lived as a U.S. anti-competition bill (the American Innovation and Online Choice Act) and the United Kingdom's Competition and Market Authority have recently targeted Amazon again (Baer, 2022; CMA, 2022; Huseman, 2022). Thus, this study contributes to an important and active debate on Amazon's dominance as a dual player (retailer and marketplace) in the growing e-commerce market.

Despite the usefulness of estimating the effect of Amazon Prime eligibility on sales ranks, e-commerce managers should be aware of the shortcomings of our approach. First, the valuation of Amazon Prime in terms of sales ranks is only one aspect of the entire valuation of Amazon Prime. Amazon Prime allows for subscriptions to e-books and videos, and the value Prime provides in those avenues was not included in this analysis (see Table 1). Thus, the estimate of the value of Prime, which is enormous but still incomplete, should only be interpreted for the products markets. Another shortcoming of this analysis for e-commerce managers is that valuing Amazon Prime in terms of sales ranks does not provide subjective reasons for diagnosing a brand. These reasons might include customer loyalty, pre-commitment, awareness, and attitudes toward Amazon Prime, which might be better captured through surveys, focus group discussions, in-depth interviews, and experiments (Ailawadi, Lehmann, and Neslin, 2003; Aaker, 2009; Bronnenberg, Dube, and Moorthy, 2019). Therefore, we recommend that e-commerce managers value Amazon Prime in terms of sales ranks and other metrics to create a more comprehensive picture of consumer behavior.

Furthermore, no financial value was assigned to capture the value of Amazon Prime. Corporations like financial values, which they can include in their financial statements, balance sheets, and reports to reflect the contribution of Amazon Prime and justify its use at the product level. Therefore, future research can focus on assigning a financial value (like changes in revenues or profits) to the Amazon Prime brand. Such value could be used to assess the current and future health of Amazon Prime. Future research can also extend this study to other e-commerce brands and subscription programs, such as Walmart+. As major e-commerce giants continue to compete and be dual players as a retailer and marketplace, assessing the viability and longevity of their most successful brands becomes even more crucial.

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