Amazon “effect” on Sears:
An analysis of Amazon e-commerce and its effects on Sears

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I.Introduction

Since the advent of the internet, there were global interests as to what kind of uses and options people could achieve with the internet. Amazon revolutionized how commerce could function with the internet.

Conventional methods of how consumers purchased goods prior to e-commerce would be to go to physical stores, view the goods and services, and make purchases decisions based on price and selection. E-commerce was a new method of commercially purchasing goods for consumers by purchasing goods online. E-commerce has many advantages compared to conventional commerce such as bigger selection, unambiguous prices, and circumventing trips to physical stores. However, there are some drawbacks for e-commerce such has shipping costs of goods, duration of time from point of purchase to arrival to consumers, and loss of knowledgeable sales people.

Amazon currently has the bulk of sales in the e-commerce sector. Amazon started with 6.92 billion sales in 2004 and was able to exponentially grow to 107.01 billion sales in 2015. Amazon became a forerunner by utilizing revolutionary ideas that could not be emulated by physical stores. Amazon was able to sell any type of good on its site due to no limitations of physically holding the goods in a store. Along with the wide range of selections, Amazon was able to have competitive prices that were comparable if not cheaper to many of the physical stores. The biggest factor to Amazon’s success was their shipping methodology. From 2004, shipping costs were high and took an average of 8.7 days to deliver goods, but Amazon continually optimized how shipping operated. In 2015, Amazon’s shipping duration decreased to an average of 3.4 days, beating the national shipping average of 5.4 days. Not only that, Amazon often offers free shipping and programs such as Amazon PRIME to offer faster free shipping to its customers. With all these factors and smart business decision-making, Amazon became and is the biggest e-commerce company.

Prior to the internet, brick and mortar commerce stores was main method of how consumers purchased goods. Back in its prime, Sears was considered a major seller of all types of goods. Much like Amazon, Sears had a wide selection of multiple types of goods such as apparel, home improvement goods, furniture, and other goods needed in households. In 2005, Sears had a significant amount of sales, sitting around 48.911 billion dollars. But as time progress, in 2015, Sears lost half their sales, sitting around 25.146 billion dollars. In one decade, Sears lost half their business.

Table 1-Total sales of goods/services of Amazon and Sears

Year	Sear(mil)	Amazon(mil)
2004	19843	6923
2005	48911	8496
2006	53012	10711
2007	50703	14841
2008	46770	19172
2009	44043	24513
2010	43326	34304
2011	41567	48080
2012	39854	61091
2013	36188	74452
2014	31198	88999
2015	25146	107006

In current times, there are multiple methods for consumers to purchase goods such as physical stores and on the internet. Due to different purchasing decisions, this paper will do a regression analysis between Amazon's and Sears' sales to investigate if there are any correlations between the rise of e-commerce and the drop in sales in brick and mortar companies. Amazon was chosen to represent e-commerce sales due their sales leading the e-commerce sector. Sears was chosen to represent brick and mortar sales due to its wide variety of goods, comparable to Amazon's, and its underdeveloped online sales.

II.Dataset

In this analysis, the years in observation will be between 2004-2015. 2004 will be the starting year for this investigation because 2004 is when Amazon had significant amount of sales and was the start of when Amazon sales began to grow exponentially.

From 2005 to 2015, Sears dropped 48.59% in sales (Used 2005 instead of 2004 due to 2004 having an odd year of sales) (Table 1). Whereas, Amazon had a 1160.42% increase in sales between 2005-2015 (Table 1). This increase in Amazon sales and decrease in Sears should have some relationship due to both Sears and Amazon selling roughly the same variety of goods.

A simple regression between these two variables with Sears' sales as the dependent variable and Amazon's sales as the independent variable can be observed in Figure 1. The equation derived from Figure 1 comes out to Sears sales = 53242.38 – 0.249633*Amazon sales. Amazon sales is negatively correlated with Sears' sales, meaning as Amazon sales increase, Sears'

Figure 1: Simple regression model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	53242.38	1102.467	48.29386	0.0000
AMAZON_S_SALES	-0.249633	0.019065	-13.09357	0.0000

R-squared	0.955417	Mean dependent var	41180.90
Adjusted R-squared	0.949844	S.D. dependent var	8552.543
S.E. of regression	1915.380	Akaike info criterion	18.13008
Sum squared resid	29349445	Schwarz criterion	18.19059
Log likelihood	-88.65038	Hannan-Quinn criter.	18.06369
F-statistic	171.4416	Durbin-Watson stat	0.826074
Prob(F-statistic)	0.000001		

sales decrease. Although the coefficient for Amazon sales of - 0.249633 is relatively small, the sale values are in the millions so there will be significant impact on Sears' sales. The variable Amazon sales has a t-statistic of -13.09357 and when tested for significance, the variable does have significance. The standard error of the Amazon's sales is also relatively low, another indicator of the model's accuracy.

Although the simple regression in Figure 1 shows that there is statistical significance between the two variables, there are many variables unaccounted for in the simple model that could diminish the significance of Amazon sales to the point where Amazon sales are negligible. The six other variables in question are number of Sears stores, average GDP per capita in the United States, a time trend variable, annual average opening Sears' stock price, annual COGS (cost of goods sold), and real disposable income per capita.

Within these key variables, Sears' performance as a business appears to dwindle. The number of Sears stores and Sears' stock opening prices continually falls from 2006 to 2015. Particularly the stock prices, falling 74.16% from 2006 to 2015. This huge fall in stock price is concerning because stock prices usually indicate company performance, market forces, and confidence in future projections. Further analysis on the company may render Amazon's effect on Sears negligible. The cost of goods sold also decreases as Sears' sales decreases. It is important to note that the percentage change in COGS from 2006 to 2015 is 48.8% and the sales percentage change was 52.57%, meaning that COGS dropped at almost the same percentage change with the sales. This could indicate that COGS was not a major factor as to why Sears' performance deteriorated over time.

A time trend variable was inserted into the data chart to strengthen the regressional analysis to account for time. Annual GDP per capita in the United States and real disposable income per capita were

Table 2: Key variables in question

Year	Sears' sales (mill)	Amazon's sales (mill)	Number of Sears Stores	GDP/Capita	Year	Sears stock opening	COGS	Disposible Income
2006	53012	10711	935	46437	2006	117.96	37820	35461
2007	50703	14841	935	49919	2007	64.02	36638	35870
2008	46772	19172	929	49364	2008	64.08	34118	36082
2009	44043	24512	908	47575	2009	46.515	31374	35620
2010	43326	34304	894	48374	2010	64.89	31000	35684
2011	41567	48080	867	48774	2011	55.33	30966	36305
2012	39854	61091	798	49381	2012	42.16	29340	37177
2013	36188	74452	778	49941	2013	40.72	27433	36414
2014	31198	88999	709	50727	2014	35.67	24049	37414
2015	25146	107006	708	51638	2015	30.48	19336	38431

also included as key variable in order to account for consumers' purchasing power and ability to afford to purchase retail goods that both Amazon and Sears sell. GDP per capita increased 11.2% over the 2006-2015 period and real disposable income per capita increased 8.38%, meaning consumer have more income to spend on goods and services.

In our complete regression model in Figure 2, Sears' performance can be seen to be influenced negatively by Amazon sales, time, GDP per capita, and stock opening prices and positively by number of stores COGS, and real disposable income per capita. The impact of Amazon sales on Sears' sales has decreased significantly from the simple model in Figure 1. In the simple model, for every one million dollars that Amazon sells, Sears' sales would decrease by 249,633 dollars; whereas, in the complete regression model, for every one million dollars that Amazon sells, Sears' sales would decrease by 32,771 dollars. Although the amount that Amazon affects Sears' decrease, Amazon's significance can be relevant and analyzed in the next section.

Stores having a positive coefficient of 6.875731 makes logical sense because as Sears increases the number of stores, the more Sears should have the opportunity to sell more goods and services. COGS also has a positive coefficient of 1.24397, but this variable appears to have correlation but not causation due to the fact that COGS was

Figure 2: Complete regression model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6255.968	1436047.	0.004356	0.9969
AMAZON_SALES	-0.032771	0.091933	-0.356473	0.7556
STORES	6.875731	18.25859	0.376575	0.7427
TIME	-4.889720	706.2838	-0.006923	0.9951
GDP_CAPITA	-0.395800	0.389104	-1.017209	0.4161
STOCK_OPENING	-0.400761	29.20044	-0.013724	0.9903
COGS	1.243970	0.208864	5.955890	0.0271
DISPOSIBLE_INCOME	0.617554	0.640294	0.964485	0.4366

R-squared	0.998851	Mean dependent var	41180.90
Adjusted R-squared	0.994829	S.D. dependent var	8552.543
S.E. of regression	615.0210	Akaike info criterion	15.67175
Sum squared resid	756501.7	Schwarz criterion	15.91382
Log likelihood	-70.35876	Hannan-Quinn criter.	15.40620
F-statistic	248.3452	Durbin-Watson stat	2.936172
Prob(F-statistic)	0.004016		

at higher values when sales were at higher values. Real disposable income per capita also has a positive coefficient of 0.617554. As consumers, have more disposable income, the basket of goods consumers can consume will increase, including Sears' goods and services.

III. Analysis

The simple regression model lays the foundation to correlate the two main variables, Sears' sales and Amazon's sales. Statistically, Amazon's sales has a significant t-test value to come to the conclusion that the simple regression model is significant. The fact that Amazon's sales coefficient is negatively correlated with Sears' sales alludes to multiple reasons as to how Amazon is affecting Sears.

Amazon and Sears can be seen to have similar variety of goods sold in their respective methodologies. Therefore, assuming consumers' basket of goods do not change drastically, there is a fixed demand for the type of goods that both these companies carry. So, if one company such as Amazon were to increase in sales, those sales would essentially be taken from Sears' current and potential sales.

In the complete regression model, Amazon's sales continues to affect Sears' sales but a much smaller scale, going from a coefficient of -.249633 in the simple model to a -.032771. This decrease in the coefficient could imply a multitude of factors. Sears as a company is performing worse overall, and the major factor as to why Sears is not performing well could be beyond Amazon. However, Amazon sales have been growing exponentially. Using 2015 sales values, Amazon is decreasing Sears' sales by 3506.7 (in millions) dollars.

This is quite a significant part of Sears' sales, considering that in 2015, Sears sold only 25,146 (in millions) dollars. Amazon will continue to become more worrisome and detrimental to Sears' sales if Amazon continues to grow at their continual exponential rate.

Some other factors are influencing Sears' performance. The amount of stores from 2006 to 2015 decreased by 24.3%. The bulk of Sears' sales come from physical stores. And as stores began to close down due to poor sales, having less stores lowers the opportunity for consumers to purchase Sears' goods, further decreasing Sears' sales. Therefore, having the store coefficient positive would mean more stores, more sales. Sears' stock prices drastically fell 74.16% over the time span due to poor sale performance and lack in confidence in Sears. However, there are some concerns due to stock price coefficient being negative. Since stock prices indicate company performance, if stock prices were to rise, so should Sears' sales, but the complete regression model does not indicate that. It raises concerns that the model itself is endogenous.

There are some other concerns as to why Sears' sales are declining beyond the key variables chosen. Concerns are raised towards competitive pricing, meaning prices of goods are not competitive with other retails including Amazon. Due to Sears downsizing stores, the range of Sears' selection could have decreased, dissuading consumers to shop at Sears. The public image of Sears and its marketing strategy could drastically affect Sears' sales but was not quantified in the complete regression model. All these negative factors influencing Sears' sales could further diminish Amazon's effect on Sears.

Some basic concerns were met due to lack of data such as sales data on a single uniform good such as a plain white T-shirt in order to remove problems of each business selling some goods that the other business is not selling. For example, Amazon is currently having its biggest growth in sales in technology goods; however, Sears might not have all the types of electronics Amazon might have. This would further weaken the correlation between Sears and Amazon. The idea that Amazon is able to ship globally also arose as a problem. Due to the physical limitations of Sears' brick and mortar stores, Amazon has an additional market to sell to consumers: the foreign consumers. This would also further weaken the correlation between Amazon and Sears. However, it should be noted that a lot Amazon's shipping methodology is not implemented at the global scale. Only the domestic consumers receive Amazon's shipping, and therefore is the bulk of Amazon sales.

Overall, Sears as a company is performing poorly and being significantly impacted by Amazon taking away its potential sales. Sears would have to restructure their business in order to improve its sales. One policy that Sears could undertake is to completely shift the whole business to the internet. This would remove a lot of the costs of maintaining physical stores, improve selection of goods, and drive down COGS. This could also be ineffective due to the fact that if Sears were to shift their business online, it would have to compete with Amazon, the biggest online retailer. Another policy Sears can take would be to increase their store numbers,

improve their selection, customer care, and prices. This policy would involve cause Sears in the short run; however, this policy would attempt differentiating Sears from Amazon by having actual physical stores and high customer service, things Amazon lacks by being an online retailer. This policy in the long run could have the possibility to create more customer loyal, who will rather shop at Sears than other stores, even if prices are not competitive. The drawback to this policy would be the huge financial burden in the short-run. Sears would have to request for loans due to the financial situation Sears is in currently. With either policy, Sears is encouraged to act quickly in order to reduce further sales loss.

Citations:

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