The Economic Costs of Structural Separation, Line of Business Restrictions, and Common Carrier Regulation of Online Platforms and Marketplaces

A Quantitative Evaluation

Christian M. Dippon, Ph.D. and Matthew D. Hoelle, Ph.D.
NERA Economic Consulting
Washington, DC, USA

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Online Appendices A – D

APPENDIX A: GROWTH TRENDS IN CPI AND MARKET CAPITALIZATION

For revenues, Table A-1 displays the CAGRs for firm revenue for all 18 firms over the past five completed calendar years (2015–2020). As displayed in Table A-1, Facebook had the highest revenue growth with an annual growth rate of 36.8 percent, whereas Bank of America had the lowest revenue growth with an annual growth rate of 0.7 percent, and the median annual growth rate among the 18 firms was 7.5 percent.

Table A-1: Compound Annual Growth Rates for Revenues
2015–2020

Company	5-Year CAGR
Google	19.9%
Apple	6.9%
Facebook	36.8%
Amazon	29.3%
Microsoft	11.3%
AT&T	3.2%
Bank of America	0.7%
Berkshire Hathaway	3.2%
Cisco	1.4%
Comcast	6.8%
Home Depot	8.1%
JPMorgan	4.8%
Mastercard	9.6%
Netflix	29.8%
PayPal	18.8%
Visa	9.3%
Walmart	2.9%
Walt Disney	4.2%
Median	**7.5%**

Source: FactSet.

Table A-2: Compound Annual Growth Rates for Market Caps
Q3 2016 to Q3 2021

Company	5-Year CAGR
Google	26.8%
Apple	31.1%
Facebook	22.1%
Amazon	33.2%
Microsoft	36.4%
AT&T	-5.0%
Bank of America	17.7%
Berkshire Hathaway	11.7%
Cisco	7.6%
Comcast	10.1%
Home Depot	16.9%
JPMorgan	15.3%
Mastercard	25.4%
Netflix	44.9%
PayPal	44.0%
Visa	19.4%
Walmart	11.7%
Walt Disney	15.5%
Median	**18.5%**

Source: FactSet.

However, the legislative focus on market cap valuation introduces another dynamic component that the CPI adjustments are unable to handle. According to the text of the three House bills and the related Senate bill, the covered platform designation could be applied if the market cap threshold is exceeded at any instant during any trading day of the year. The market cap growth rates, as reported in Table A-2, are calculated in terms of the value at the close of the final trading day of the starting and ending quarter. However, within a one-year period from the start of the fourth quarter to the end of the following year's third quarter, firms must account for the *market volatility effect* on the market cap. For example, a firm with a market cap of $525 billion at the close of trading on September 30, 2020, and a market cap of $575 billion at the close of trading on September 30, 2021, may have experienced a market volatility effect during that intervening period that was large enough to push the firm's market cap over the $600 billion threshold (i.e., for one instant between October 1, 2020 and September 30, 2021, the company's

market cap exceeded $600 billion even though its closing value on September 30, 2021 equaled $575 billion).

We measure this market volatility effect by comparing the maximum of the daily closing values across all trading days within a one-year period to the closing value on the final day of trading in that one-year period. Each one-year period runs from the first trading day of the fourth quarter to the last trading day of the following year's third quarter. Table A-3 reports our findings for all 18 firms constrained by the covered platform regulations and for all one-year periods from beginning Q4 2016 through end Q3 2021 (a five-year period). The values reported for any given company and one-year period are the percentage by which the maximum of the daily closing values in that one-year period exceeded the closing value on the final day of trading in that one-year period. For example, if Apple's maximum market cap from beginning Q4 2020 through the end of Q3 2021 (based on daily closing values) was $2.590 trillion and its market cap on September 30, 2021 (final trading day of Q3 2021) was $2.339 trillion, then the market volatility effect over this one-year period, as reported in Table A-3, equals 10.7 percent (i.e., $2.590 trillion ÷ $2.339 trillion – 1 = 10.7 percent).

As shown in Table A-3, averaged over the five one-year periods beginning Q4 2016 through the end of Q3 2021, the volatility effect was largest for Bank of America (17.0 percent), smallest for Home Depot (3.0 percent), and the median across all 18 firms was 10.0 percent.

Table A-3: Market Volatility Effects
Q4 2016 to Q3 2021

		Volatility Effect (Max-to-End of Period)				
Company	5-Year Average	Q4 2016 to Q3 2017	Q4 2017 to Q3 2018	Q4 2018 to Q3 2019	Q4 2019 to Q3 2020	Q4 2020 to Q3 2021
Google	8.3%	2.6%	6.4%	6.0%	17.4%	9.0%
Apple	9.1%	6.4%	1.2%	9.0%	18.3%	10.7%
Facebook	15.5%	1.5%	32.3%	14.9%	16.0%	12.6%
Amazon	10.4%	9.0%	1.8%	15.9%	12.2%	13.1%
Microsoft	4.3%	1.1%	0.1%	1.8%	10.1%	8.3%
AT&T	16.0%	9.8%	4.3%	2.4%	42.5%	20.8%
Bank of America	17.0%	0.4%	14.1%	13.3%	53.6%	3.8%
Berkshire Hathaway	6.2%	0.3%	3.8%	8.1%	10.6%	8.1%
Cisco	12.1%	3.6%	1.0%	19.5%	27.0%	9.3%
Comcast	9.9%	9.8%	23.1%	4.2%	2.3%	10.4%
Home Depot	3.0%	0.0%	3.2%	0.8%	5.1%	5.9%
JPMorgan	13.5%	0.0%	8.7%	5.0%	50.8%	3.0%
Mastercard	6.3%	0.9%	0.0%	7.6%	8.3%	14.5%
Netflix	14.2%	4.3%	12.0%	43.5%	11.3%	0.0%
PayPal	10.0%	1.6%	6.0%	17.1%	7.0%	18.5%
Visa	6.0%	0.9%	0.0%	8.0%	8.3%	12.9%
Walmart	8.0%	5.4%	18.0%	0.0%	5.5%	11.2%
Walt Disney	14.7%	20.4%	0.0%	12.2%	21.9%	19.2%
Median	**10.0%**	**2.1%**	**4.1%**	**8.1%**	**11.7%**	**10.6%**

Table A-3 illustrates that the market volatility effect can be quite sizable for many firms as well as in many years. The reported effect does not even capture market cap volatility within a trading day (i.e., if the maximum market cap at any instant during the trading day exceeds the closing

value). Based on the text of the three House bills and the related Senate bill, which specifies that the covered platform designation can be applied for any instant in which the market cap threshold is exceeded, the actual market volatility effect would be even larger than what is reported in Table A-3.

Ultimately, the relevant comparison is between the CPI growth rate and the effective market cap growth rates after scaling up the final year market cap value by the average market volatility effect. The CPI growth rate is calculated over the five-year growth period from September 2016 to September 2021 and the effective market cap growth rates are calculated over the same five-year growth period from end Q3 2016 through the end of Q3 2021. Table A-4 reports the total effective market cap growth rates for all 18 firms over this five-year growth period. As displayed in Table A-4, Netflix had the highest market cap growth with an effective growth rate of 48.8 percent, AT&T had the lowest market cap growth with an effective growth rate of –2.2 percent, and the median annual growth rate among the 18 firms was 21.1 percent. Within the subset of Google, Apple, Facebook, Amazon, and Microsoft, the range for the market cap growth rate was 25.7 percent (for Facebook) to 37.6 percent (for Microsoft) with a median value of 33.4 percent (for Apple).

Table A-4: Market Cap Total Effective Growth Rates
Q3 2016 to Q3 2021

Company	5-Year CAGR
Google	28.9%
Apple	33.4%
Facebook	25.7%
Amazon	35.8%
Microsoft	37.6%
AT&T	-2.2%
Bank of America	21.4%
Berkshire Hathaway	13.0%
Cisco	10.1%
Comcast	12.2%
Home Depot	17.6%
JPMorgan	18.2%
Mastercard	27.0%
Netflix	48.8%
PayPal	46.8%
Visa	20.8%
Walmart	13.5%
Walt Disney	18.8%
Median	**21.1%**

Source: FactSet.

Calculated from the results in Table A-4, the interquartile range from the 25th percentile to the 75th percentile equals 14.5 percent to 32.3 percent with a median value of 21.1 percent. The relevant comparison is the effective growth rates for market cap to the growth rates for CPI since

the former projects how the market caps for the 18 constrained firms would grow in the future and the latter projects how the market cap threshold would grow in the future. The interquartile range for the effective market cap growth rate is between 5.6 to 12.4 times larger than the CPI growth rate. The median effective growth rate is 8.1 times larger than the CPI growth rate. This difference accounts for a growth disparity of 18.5 percent (i.e., 21.1 percent – 2.6 percent = 18.5 percent).

APPENDIX B: IDENTIFICATION STRATEGY FOR CAUSAL EFFECTS OF SCALE ON COSTS

To illustrate the distinction between cost efficiencies and revenue efficiencies, consider a simple example of a combined lemonade and brownie stand. Suppose that a lemonade and brownie stand is forced to structurally separate into a lemonade only stand and a separate brownie only stand (in different locations). Both lemonade and brownies use sugar as a material input, so if the total sugar costs for the independent stands exceeds the sugar cost for the combined stand (possibly because of separate shipping costs), then this represents a merger cost efficiency. Both products also have the possibility to generate pull-through revenue, meaning that some customers come for the lemonade and then decide to purchase a brownie and other customers come for the brownie and then decide to purchase lemonade. These pull-through revenues represent a merger revenue efficiency. To apply numbers to the lemonade and brownie stand example, assume that one out of four customers at the lemonade only stand would have purchased a brownie and one out of four customers at the brownie only stand would have purchased lemonade. Under these assumptions, the merger revenue efficiency (assuming an equal number of customers at each independent stand) is 25 percent. At the independent stands, four lemonades are sold for every four customers at the lemonade only stand and four brownies are sold for every four customers at the brownie only stand. At the combined stand, those same eight customers would purchase five lemonades and five brownies, which is 25 percent larger than the sales at the independent stands.

Although revenue efficiencies conceptually only impact a merged firm's revenues, it is useful for economists to project these merger revenue efficiencies onto cost to have a common basis of comparison for both the cost and revenue efficiencies. The mathematical exercise of projecting revenues onto costs requires the introduction of shadow cost efficiencies to identify the cost effects specific to the revenue efficiencies. Shadow cost efficiencies are calculated by determining how much additional costs the independent firms would need to incur to generate the same revenues as the merged firm.

$$Defining\ (revenue_{A*} + revenue_{B*}) = revenue_{A+B},\ then \quad (1)$$

$$(cost_A + cost_B) = (1 - shadow\_cost\_efficiency) * (cost_A(revenue_{A*}) + cost_B(revenue_{B*})) \quad (2)$$

The notation A* and B* refer to the hypothetical revenue levels for Firms A and B premerger that are required to achieve the same total revenue as the merged firm A + B.

The shadow cost efficiency is separate and distinct from the cost efficiency. The sum of both represents the total effect from both merger cost efficiencies and merger revenue efficiencies. The calculation of shadow cost efficiencies proceeds in two steps. First, the hypothetical revenues for Firms A and B, denoted A* and B*, are determined such that the revenues A* and B* summed together equal the revenue of the merged firm. If revenue efficiencies are present, then either A* exceeds A or B* exceeds B, and typically both occur. Second, the costs for the independent firms to produce A* and B* are computed and compared to the original costs to produce A and B. If A* exceeds A, then the costs to produce A* exceed those for A, and similarly if B* exceeds B. The shadow cost efficiency measures the percentage by which the costs for A* and B* exceed the original costs for A and B.

A simple example using the lemonade and brownie stand illustrates the shadow cost efficiency calculation. At the brownie only stand, suppose four customers arrive over a period of 40 minutes. In that time, four brownies are sold. At the lemonade only stand, suppose four customers arrive over a period of 40 minutes and in that time four lemonades are sold. At the combined lemonade and brownie stand, the combined eight customers would arrive over a period of 40 minutes. During that time, five brownies and five lemonades are sold.

The merger revenue efficiency was previously calculated as 25 percent. To calculate the shadow cost efficiency equivalent to this revenue efficiency, we project the revenue effect onto cost by addressing the following questions.

(1) How many minutes must the brownie only stand employee work without the pull-through revenue to sell the same number of brownies (5) as sold at the combined stand in only 40 minutes time?

(2) How many minutes must the lemonade only stand employee work without the pull-through revenue to sell the same number of lemonades (5) as sold at the combined stand in only 40 minutes time?

(3) Are there any additional costs at either the brownie only stand or the lemonade only stand that must be incurred to boost output from four to five units that would otherwise not be incurred at the combined stand?

If customers arrive at the stands evenly over time, then the brownie only stand employee would need to work 50 minutes to sell five brownies and the lemonade only stand employee would need to work 50 minutes to sell five lemonades.[1] The minutes worked is 25 percent higher at the independent stands (50 minutes ÷ 40 minutes less 1 equals 25 percent). Thus, the shadow cost efficiency is 25 percent of the labor costs. We then account for other costs incurred in the lemonade and brownie production. If there are no further costs required to increase revenue by 25 percent and we determine that labor costs account for half of the total costs of production, then the shadow cost efficiency is 12.5 percent (i.e., one-half of the 25 percent shadow cost efficiency on labor costs).

The cost efficiencies from historical mergers can be measured directly from merged firms' income statements by identifying cost accounting line items and applying time series empirical methods to compare changes in costs over time. However, shadow cost efficiencies represent an economic mechanism that cannot be measured directly from changes in costs over time. Rather, shadow cost efficiencies are realized when a firm gains a new revenue stream or a new ability to profitably sell certain products or services in the market. Economists observe the presence of shadow cost efficiencies from the expanded choice and variety of product and service offerings available to consumers in the marketplace. Our empirical methodology incorporates reported revenues into the time series analysis of reported costs to estimate the imputed shadow cost efficiencies specific to the revenue efficiencies. Specifically, we apply a growth model to both

[1] On the extensive margin, we assume that total employment remains unchanged with the merger (i.e., if the lemonade only stand has one employee and brownie stand only has one employee, the combined lemonade and brownie stand would have two employees). The cost effects are observed on the intensive margin.

revenue and cost to estimate the shadow cost efficiencies (owing to changes in revenue) independent of the cost efficiencies (owing to changes in cost).

A simple example, as illustrated in the following three tables, describes our empirical identification strategy. Table B-1 illustrates revenue and cost accounting for an example firm over three quarters. The growth rates for both revenue and cost equal 10 percent in both Quarter 2 and Quarter 3.

Table B-1: Cost and Revenue Accounting without a Merger

	Changes over time		
Variable	**Quarter 1**	**Quarter 2**	**Quarter 3**
Revenue	$200.00	$220.00	$242.00
Growth		(10%)	(10%)
Cost	$140.00	$154.00	$169.40
Growth		(10%)	(10%)
Predicted Cost			$169.40
Cost Effect			0.0%

Source: NERA.

There is no merger recorded in Quarter 3, but this table of example financial values can be used to illustrate the algebraic calculations for *predicted cost* and *cost effect* in Quarter 3. The predicted cost in Quarter 3 is defined by applying the revenue growth rate for Quarter 3 to the cost value from Quarter 2. In this example, since revenue grows at the rate of 10 percent for Quarter 3 and the cost equals $154 in Quarter 2, then the predicted cost equals $169.40 (i.e., $154 * (1 + 10 percent) = $169.40). The cost effect is simply the relative difference, measured as a percent, between the predicted cost and the actual cost. In this example, the cost effect equals zero as both the predicted cost and the actual cost equal $169.40.

The second stage of the example, as displayed in Table B-2, considers a similar income statement for the example firm but now with a merger observed in Quarter 3. The merger's effect on cost is a reduction in the growth rate for cost from 10 percent in Quarter 2 to only 6 percent in Quarter 3. The merger does not affect the growth rate for revenue.

Table B-2: Cost and Revenue Accounting with a Merger in Quarter 3
Cost Efficiencies

	Changes over time		
Variable	**Quarter 1**	**Quarter 2**	**Quarter 3**
Revenue	$200.00	$220.00	$242.00
Growth		(10%)	(10%)
Cost	$140.00	$154.00	$163.24
Growth		(10%)	(6%)
Predicted Cost			$169.40
Cost Effect			3.6%

Source: NERA.

With such a merger, we would anticipate positive cost efficiencies and zero revenue efficiencies (and by extension zero shadow cost efficiencies), and our empirical identification strategy bears this out. The predicted cost in Quarter 3 is defined by applying the revenue growth rate in Quarter 3 to the cost value from Quarter 2. In this example, since revenue grows at the rate of 10 percent in Quarter 3 and the cost equals $154 in Quarter 2, then the predicted cost equals $169.40 (i.e., $154 * (1 + 10 percent) = $169.40). The cost effect is the relative difference, measured as a percent, between the predicted cost and the actual cost. In this example, the actual cost is only $163.24, which is 3.6 percent smaller than the predicted cost of $169.40. This percentage cost reduction of 3.6 percent represents the merger cost efficiency.

The third stage of the example, as displayed in Table B-3, considers a similar income statement for the example firm but now with an alternative merger observed in Quarter 3. This alternative merger does not have any effect on the growth rate for cost. However. it does affect the growth rate for revenue, which increases from 10 percent in Quarter 2 to 14 percent in Quarter 3.

Table B-3: Cost and Revenue Accounting with a Merger in Quarter 3
Shadow Cost Efficiencies

	Changes over time		
Variable	**Quarter 1**	**Quarter 2**	**Quarter 3**
Revenue	$200.00	$220.00	$250.80
Growth		(10%)	(14%)
Cost	$140.00	$154.00	$169.40
Growth		(10%)	(10%)
Predicted Cost			$175.56
Cost Effect			3.5%

Source: NERA.

Under this alternative merger, we would anticipate zero cost efficiencies and positive revenue efficiencies (and by extension positive shadow cost efficiencies), and our empirical identification strategy bears this out. The predicted cost in Quarter 3 is defined by applying the revenue growth rate in Quarter 3 to the cost value from Quarter 2. In this example, since revenue grows at the

rate of 14 percent in Quarter 3 and the cost equals $154 in Quarter 2, then the predicted cost equals $175.56 (i.e., $154 * (1 + 14 percent) = $175.56). The cost effect is the relative difference, measured as a percent between the predicted cost and the actual cost. In this example, the actual cost is only $169.40, which is 3.5 percent smaller than the predicted cost of $175.56. This percentage cost reduction of 3.5 percent represents the merger shadow cost efficiency.

The prior stages of the example illustrate two potential mergers, the former with only cost efficiencies and the latter with only shadow cost efficiencies. In practice, mergers that we observe in our sample may contain both cost efficiencies and shadow cost efficiencies. Our empirical methodology allows us to numerically estimate the sum of the two types of efficiencies but stops short of independently estimating the cost efficiencies and the shadow cost efficiencies. For the purposes of our predictive model, namely how the proposed legislation would affect cost, we only need to estimate the sum of the two types of efficiencies. In principle, our empirical approach could be extended to independently estimate the cost efficiencies and the shadow cost efficiencies, but at the cost of statistical power.

As described in the three tables that illustrate the example, the predicted cost in Quarter 3 is defined only in terms of Quarter 2 and Quarter 3 reported values. This type of econometric model is an AR(1) model because both the revenue and cost values for the "merger quarter" (Quarter 3) and the prior quarter are required. The econometric variables include current-quarter values and 1-quarter lagged values. To separately identify the cost efficiencies and the shadow cost efficiencies, we would require a richer history of revenue and cost growth in order (1) to identify if the 6 percent growth rate for costs between Quarter 2 and Quarter 3 in Table is at, above, or below trend; and (2) to identify if the 14 percent growth rate for revenue between Quarter 2 and Quarter 3 in Table B-3 is at, above, or below trend. The requisite model is an AR(2) model, which requires an expanded set of econometric variables, including current-quarter values, 1-quarter lagged values, and 2-quarter lagged values. The inclusion of additional explanatory variables comes at the cost of statistical power in our empirical regression.

APPENDIX C: ADDITIONAL REGRESSION RESULTS

Table C-1: OpEx Regression Results, Sensitivities for Sample Period

DEPENDENT VARIABLE: LN CURRENT COSTS						
VARIABLES	(1) Regression 1	(2) Regression 2	(3) Regression 3	(4) Regression 4	(5) Regression 5	(6) Regression 6
Lagged CSM	-0.008***	-0.007***	-0.007***	-0.007***	-0.007***	-0.007***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Ln Lagged Costs	0.568***	0.596***	0.547***	0.498***	0.490***	0.428***
	(0.034)	(0.034)	(0.035)	(0.037)	(0.038)	(0.043)
Ln Current Sales	0.869***	0.862***	0.885***	0.871***	0.880***	0.874***
	(0.031)	(0.031)	(0.031)	(0.032)	(0.035)	(0.039)
Ln Lagged Sales	-0.443***	-0.465***	-0.435***	-0.370***	-0.373***	-0.317***
	(0.044)	(0.044)	(0.044)	(0.047)	(0.050)	(0.055)
Constant	-0.014	-0.012	-0.018	-0.020	-0.008	0.034
	(0.013)	(0.012)	(0.013)	(0.016)	(0.022)	(0.029)
Observations	333	346	318	273	225	193
R-squared	0.997	0.997	0.997	0.997	0.997	0.997
Company Fixed Effects	YES	YES	YES	YES	YES	YES
Quarter of Year Fixed Effects	YES	YES	YES	YES	YES	YES
Sample Period	2002:Q4-2021:Q3	2001:Q3-2021:Q3	2004:Q1-2021:Q3	2007:Q1-2021:Q3	2010:Q1-2021:Q3	2012:Q1-2021:Q3

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table C-2: SG&A Regression Results

DEPENDENT VARIABLE: LN CURRENT COSTS			
VARIABLES	(1) Regression 1	(2) Regression 2	(3) Regression 3
Lagged CSM	-0.009**	-0.009***	-0.010***
	(0.004)	(0.004)	(0.003)
Ln Lagged Costs	0.965***	0.870***	0.879***
	(0.011)	(0.022)	(0.021)
Ln Current Sales	0.450***	0.474***	0.390***
	(0.029)	(0.028)	(0.044)
Ln Lagged Sales	-0.417***	-0.343***	-0.269***
	(0.030)	(0.032)	(0.046)
Constant	-0.014	-0.146***	-0.156***
	(0.020)	(0.035)	(0.036)
Observations	333	333	333
R-squared	0.993	0.994	0.994
Company Fixed Effects	NO	YES	YES
Quarter of Year Fixed Effects	NO	NO	YES
Sample Period	2002:Q4-2021:Q3	2002:Q4-2021:Q3	2002:Q4-2021:Q3

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table C-3: COGS Regression Results

DEPENDENT VARIABLE: LN CURRENT COSTS			
	(1)	(2)	(3)
VARIABLES	Regression 1	Regression 2	Regression 3
Lagged CSM	-0.006*	-0.004	-0.005
	(0.004)	(0.004)	(0.004)
Ln Lagged Costs	0.975***	0.834***	0.848***
	(0.010)	(0.029)	(0.028)
Ln Current Sales	1.061***	1.057***	0.861***
	(0.029)	(0.028)	(0.045)
Ln Lagged Sales	-1.033***	-0.892***	-0.711***
	(0.030)	(0.040)	(0.051)
Constant	-0.034**	-0.063***	-0.106***
	(0.017)	(0.018)	(0.020)
Observations	333	333	333
R-squared	0.994	0.995	0.995
Company Fixed Effects	NO	YES	YES
Quarter of Year Fixed Effects	NO	NO	YES
Sample Period	2002:Q4-2021:Q3	2002:Q4-2021:Q3	2002:Q4-2021:Q3

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table C-4: OpEx Regression Results, Sensitivities using Fixed-Effects Estimation Model

DEPENDENT VARIABLE: LN CURRENT COSTS		
	(1)	(2)
VARIABLES	Regression 1	Regression 2
Lagged CSM	-0.007***	-0.007***
	(0.002)	(0.001)
Ln Lagged Costs	0.557***	0.557**
	(0.035)	(0.153)
Ln Current Sales	0.927***	0.927***
	(0.019)	(0.043)
Ln Lagged Sales	-0.491***	-0.491**
	(0.038)	(0.154)
Constant	-0.112***	-0.112
	(0.013)	(0.056)
Observations	333	333
R-squared	0.997	0.997
Number of Groups	5	5
Standard Errors	Asymptotic	Robust
Sample Period	2002:Q4-2021:Q3	2002:Q4-2021:Q3

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table C-5: OpEx Regression Results, Sensitivities using Fixed-Effects Estimation Model, Focused Regression Results for Lagged CSM

	Coefficient (Lagged CSM)				
Regression	**Coefficient Value**	**SE**	**Z-score**	**P-Value**	**Scale-Cost (%)**
1	-0.007	0.002	-2.91	0.39%	-0.72%
2	-0.007	0.001	-4.80	0.86%	-0.72%

Table C-6: OpEx Regression Results, Sensitivities using Arellano-Bond Linear Dynamic Panel Data Estimation Model, Output Table 1

	DEPENDENT VARIABLE: LN CURRENT COSTS							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Regression 1	Regression 2	Regression 3	Regression 4	Regression 5	Regression 6	Regression 7	Regression 8
Ln 1-Period Lagged Costs	0.569***	0.569***	0.483***	0.483**	0.394***	0.394***	0.420***	0.420***
	(0.036)	(0.138)	(0.048)	(0.193)	(0.053)	(0.134)	(0.052)	(0.130)
Ln 2-Period Lagged Costs			0.264***	0.264	0.410***	0.410***	0.367***	0.367***
			(0.041)	(0.182)	(0.051)	(0.158)	(0.052)	(0.085)
Ln 3-Period Lagged Costs					-0.007	-0.007	-0.155***	-0.155***
					(0.040)	(0.036)	(0.052)	(0.031)
Ln 4-Period Lagged Costs							0.139***	0.139***
							(0.038)	(0.037)
CSM	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.003)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
1-Period Lagged CSM	-0.007***	-0.007***	-0.004*	-0.004***	-0.004**	-0.004***	-0.004*	-0.004***
	(0.003)	(0.001)	(0.002)	(0.000)	(0.002)	(0.001)	(0.002)	(0.001)
Ln Current Sales	0.926***	0.926***	0.898***	0.898***	0.893***	0.893***	0.841***	0.841***
	(0.020)	(0.039)	(0.018)	(0.042)	(0.018)	(0.042)	(0.025)	(0.050)
Ln 1-Period Lagged Sales	-0.501***	-0.501***	-0.458***	-0.458***	-0.378***	-0.378***	-0.394***	-0.394***
	(0.039)	(0.140)	(0.049)	(0.163)	(0.051)	(0.116)	(0.051)	(0.116)
Ln 2-Period Lagged Sales			-0.192***	-0.192	-0.334***	-0.334**	-0.301***	-0.301***
			(0.041)	(0.159)	(0.051)	(0.130)	(0.051)	(0.067)
Ln 3-Period Lagged Sales					0.019	0.019	0.138***	0.138***
					(0.040)	(0.019)	(0.051)	(0.039)
Ln 4-Period Lagged Sales							-0.061	-0.061
							(0.040)	(0.054)
Constant	-0.109***	-0.109	-0.056***	-0.056	-0.038***	-0.038	-0.030**	-0.030
	(0.013)	(0.067)	(0.013)	(0.040)	(0.012)	(0.026)	(0.013)	(0.028)
Observations	331	331	326	326	321	321	319	319
Number of Groups	5	5	5	5	5	5	5	5
Standard Errors	GMM	Robust	GMM	Robust	GMM	Robust	GMM	Robust
Sample Period	2002:Q4-2021:Q3	2002:Q4-2021:Q3	2003:Q1-2021:Q3	2003:Q1-2021:Q3	2003:Q2-2021:Q3	2003:Q2-2021:Q3	2003:Q3-2021:Q3	2003:Q3-2021:Q

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table C-7: OpEx Regression Results, Sensitivities using Arellano-Bond Linear Dynamic Panel Data Estimation Model, Output Table 2

	DEPENDENT VARIABLE: LN CURRENT COSTS					
VARIABLES	(9) Regression 9	(10) Regression 10	(11) Regression 11	(12) Regression 12	(13) Regression 13	(14) Regression 14
Ln 1-Period Lagged Costs	0.479***	0.479**	0.394***	0.394***	0.422***	0.422***
	(0.048)	(0.195)	(0.053)	(0.136)	(0.053)	(0.131)
Ln 2-Period Lagged Costs	0.268***	0.268	0.410***	0.410***	0.367***	0.367***
	(0.041)	(0.184)	(0.051)	(0.159)	(0.053)	(0.086)
Ln 3-Period Lagged Costs			-0.007	-0.007	-0.155***	-0.155***
			(0.040)	(0.036)	(0.052)	(0.031)
Ln 4-Period Lagged Costs					0.139***	0.139***
					(0.038)	(0.037)
CSM	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
1-Period Lagged CSM	-0.004*	-0.004***	-0.004**	-0.004***	-0.004*	-0.004***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
2-Period Lagged CSM	-0.001	-0.001	0.000	0.000	0.000	0.000
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.000)
Ln Current Sales	0.898***	0.898***	0.893***	0.893***	0.841***	0.841***
	(0.018)	(0.042)	(0.018)	(0.042)	(0.025)	(0.050)
Ln 1-Period Lagged Sales	-0.454***	-0.454***	-0.379***	-0.379***	-0.395***	-0.395***
	(0.049)	(0.165)	(0.052)	(0.117)	(0.051)	(0.117)
Ln 2-Period Lagged Sales	-0.195***	-0.195	-0.334***	-0.334**	-0.300***	-0.300***
	(0.041)	(0.161)	(0.051)	(0.131)	(0.051)	(0.068)
Ln 3-Period Lagged Sales			0.019	0.019	0.138***	0.138***
			(0.040)	(0.019)	(0.051)	(0.038)
Ln 4-Period Lagged Sales					-0.061	-0.061
					(0.041)	(0.054)
Constant	-0.056***	-0.056	-0.038***	-0.038	-0.030**	-0.030
	(0.013)	(0.039)	(0.012)	(0.026)	(0.013)	(0.028)
Observations	326	326	321	321	319	319
Number of Groups	5	5	5	5	5	5
Standard Errors	GMM	Robust	GMM	Robust	GMM	Robust
Sample Period	2003:Q1-2021:Q3	2003:Q1-2021:Q3	2003:Q2-2021:Q3	2003:Q2-2021:Q3	2003:Q3-2021:Q3	2003:Q3-2021:Q3

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table C-8: OpEx Regression Results, Sensitivities using Arellano-Bond Linear Dynamic Panel Data Estimation Model, Output Table 3

	DEPENDENT VARIABLE: LN CURRENT COSTS					
VARIABLES	(15) Regression 15	(16) Regression 16	(17) Regression 17	(18) Regression 18	(19) Regression 19	(20) Regression 20
Ln 1-Period Lagged Costs	0.403***	0.403***	0.420***	0.420***	0.361***	0.361***
	(0.052)	(0.129)	(0.052)	(0.127)	(0.052)	(0.109)
Ln 2-Period Lagged Costs	0.443***	0.443***	0.391***	0.391***	0.418***	0.418***
	(0.050)	(0.129)	(0.052)	(0.068)	(0.050)	(0.057)
Ln 3-Period Lagged Costs	-0.044	-0.044**	-0.168***	-0.168***	-0.122**	-0.122***
	(0.040)	(0.019)	(0.052)	(0.041)	(0.051)	(0.023)
Ln 4-Period Lagged Costs			0.139***	0.139***	0.116***	0.116***
			(0.038)	(0.030)	(0.037)	(0.036)
CSM	0.000	0.000	0.000	0.000	0.000	0.000
	(0.002)	(0.001)	(0.002)	(0.001)	(0.002)	(0.001)
1-Period Lagged CSM	-0.004*	-0.004***	-0.003*	-0.003***	-0.003*	-0.003***
	(0.002)	(0.001)	(0.002)	(0.000)	(0.002)	(0.001)
2-Period Lagged CSM	0.000	0.000	0.001	0.001***	0.001	0.001***
	(0.002)	(0.000)	(0.002)	(0.000)	(0.002)	(0.000)
3-Period Lagged CSM,	0.011***	0.011***	0.011***	0.011***	0.011***	0.011***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
4-Period Lagged CSM					0.007***	0.007***
					(0.002)	(0.001)
Ln Current Sales	0.889***	0.889***	0.837***	0.837***	0.836***	0.836***
	(0.018)	(0.044)	(0.025)	(0.050)	(0.024)	(0.048)
Ln 1-Period Lagged Sales	-0.384***	-0.384***	-0.392***	-0.392***	-0.340***	-0.340***
	(0.051)	(0.111)	(0.050)	(0.111)	(0.050)	(0.098)
Ln 2-Period Lagged Sales	-0.365***	-0.365***	-0.323***	-0.323***	-0.348***	-0.348***
	(0.051)	(0.103)	(0.051)	(0.049)	(0.049)	(0.037)
Ln 3-Period Lagged Sales	0.054	0.054***	0.152***	0.152***	0.112**	0.112***
	(0.040)	(0.006)	(0.050)	(0.052)	(0.049)	(0.038)
Ln 4-Period Lagged Sales			-0.061	-0.061	-0.037	-0.037
			(0.040)	(0.054)	(0.039)	(0.058)
Constant	-0.042***	-0.042	-0.031**	-0.031	-0.036***	-0.036
	(0.012)	(0.028)	(0.013)	(0.028)	(0.012)	(0.031)
Observations	321	321	319	319	319	319
Number of Groups	5	5	5	5	5	5
Standard Errors	GMM	Robust	GMM	Robust	GMM	Robust
Sample Period	2003:Q2-2021:Q3	2003:Q2-2021:Q3	2003:Q3-2021:Q3	2003:Q3-2021:Q3	2003:Q3-2021:Q3	2003:Q3-2021:Q3

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table C-9: OpEx Regression Results, Sensitivities using Arellano-Bond Linear Dynamic Panel Data Estimation Model, Focused Regression Results for 1-Period Lagged CSM

	Coefficient (1-Period Lagged CSM)						
Regression	Coefficient Value	SE	Z-score	Scale-Cost (%)	Sargan Test	Autocorr Order 1 Test	Autocorr Order 2 Test
1	-0.007	0.0026	**-2.7**	-0.70%	**0.53**	-	-
2	-0.007	0.0014	**-5.0**	-0.70%	-	0.22	**0.30**
3	-0.004	0.0022	-1.7	-0.38%	**0.72**	-	-
4	-0.004	0.0005	**-8.0**	-0.38%	-	0.10	0.19
5	-0.004	0.0020	**-2.0**	-0.40%	**0.23**	-	-
6	-0.004	0.0006	**-6.7**	-0.40%	-	**0.09**	**0.73**
7	-0.004	0.0019	-1.9	-0.37%	0.08	-	-
8	-0.004	0.0005	**-7.3**	-0.37%	-	**0.09**	0.13
9	-0.004	0.0022	-1.7	-0.38%	**0.67**	-	-
10	-0.004	0.0005	**-7.6**	-0.38%	-	**0.09**	0.19
11	-0.004	0.0020	**-2.0**	-0.40%	**0.23**	-	-
12	-0.004	0.0006	**-6.6**	-0.40%	-	**0.09**	**0.73**
13	-0.004	0.0019	-1.9	-0.37%	0.09	-	-
14	-0.004	0.0005	**-7.3**	-0.37%	-	**0.09**	0.13
15	-0.004	0.0020	-1.8	-0.36%	**0.56**	-	-
16	-0.004	0.0006	**-6.0**	-0.36%	-	**0.09**	**0.42**
17	-0.003	0.0019	-1.8	-0.34%	**0.29**	-	-
18	-0.003	0.0005	**-6.8**	-0.34%	-	**0.09**	0.15
19	-0.003	0.0018	-1.7	-0.31%	**0.11**	-	-
20	-0.003	0.0005	**-6.1**	-0.31%	-	0.11	0.11

APPENDIX D: CONSUMER SURVEY ADDITIONAL TABLES

Table D-1: Amazon Prime Membership Attribute Matrix

Monthly Subscription Price	Delivery Options for Free Delivery	Products Eligible for Free Delivery	Gaming	Video	Music	Reading
$4.99	Same day ($35 minimum order), 1 Day Otherwise	Only Products Sold by Amazon	Yes	Yes	Yes	Yes
$8.99	Same day ($35 minimum order), 2 Day Otherwise	Only Third-Party Products Delivered by Amazon	No	No	No	No
$12.99	1-Day Shipping	Both Products Sold by Amazon and Third-Party Products Delivered by Amazon				
$16.99	2-Day Shipping					
$20.99	No Rush Shipping (4-5 Day Shipping)					
$24.99						

Source: NERA survey.

Table D-2: Database Summary, Amazon Prime Membership Survey

Survey Sample	
Valid survey respondents	847
Conjoint observations	9,317
Average age	46
Minimum age	19
Maximum age	89
Purchased from Amazon in the past year	847
Active Amazon Prime members	683
Former Amazon Prime members	85
Prospective Amazon Prime members	164

Payment Frequency	
Annually	48.5 %
Monthly	48.8
Don’t know / unsure	2.8

Source: NERA survey.

Table D-3: Sample Demographics Comparison, Amazon Prime Membership Survey

	Survey Respondents		Full-Country Data	
Gender	**All Respondents**	**Amazon Prime Members**	**US Population**	**Amazon Prime Members**
Female	55.0 %	54.2 %	51.3 %	- %
Male	45.0	45.8	48.7	-
Age				
18-34	33.3 %	34.8 %	29.7 %	34.9 %
35-54	38.0	39.1	32.5	32.1
55+	28.7	26.1	37.9	33.0
Gender - Age				
Female - 18-34	18.3 %	19.0 %	14.6 %	- %
Female - 35-54	21.6	21.8	16.4	-
Female - 55+	15.1	13.3	20.4	-
Male - 18-34	15.0	15.8	15.1	-
Male - 35-54	16.4	17.3	16.1	-
Male - 55+	13.6	12.7	17.5	-
Region				
Northeast	19.6 %	19.8 %	20.2 %	- %
South	36.6	37.0	33.6	-
Midwest	23.0	21.2	22.6	-
West	20.8	22.0	23.6	-

Note: The Gender, Gender-Age, and Region "Full-Country Data" statistics are limited to individuals with age 18+.