

EXAMINATION OF US COLLEGE TEXTBOOK PRICES

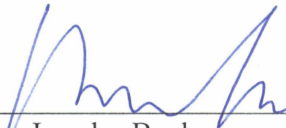
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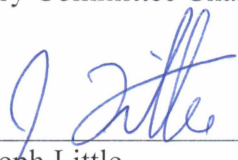
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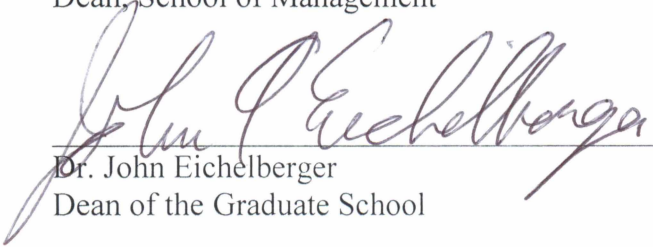
  
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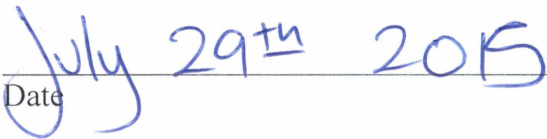
  
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EXAMINATION OF US COLLEGE TEXTBOOK PRICES

A  
THESIS

Presented to the Faculty  
of the University of Alaska Fairbanks

In Partial Fulfillment of the Requirements  
for a Degree of

MASTER OF SCIENCE

By

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## ABSTRACT

College textbook prices are investigated in detail using an Auto-Regressive Distributed Lag (ARDL) approach to cointegration. This technique allows for the examination of short and long run affects to prices brought upon by changes in personal income, college enrollment, input prices and changes in corporate profit. The 2008 economic downturn and the introduction of the 2008 Higher Education Opportunity Act have also been included in this analysis as factors affecting price. The results of my analysis show that supply factors are stronger determinants in the long run changes of textbook prices, while in the short run, both supply and demand factors are determinants of textbook prices. Both 2008 market shocks also were found to have negative effects on prices in the college textbook market.



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## 1. Introduction

In the US, there has been a sharp increase in textbook prices over the last 12 years. Figure 1 gives us a rough representation of this growth over that time period in relation to other prices. The Consumer Price Index (CPI) is the representation of how inflation and other factors have affected the price of a specific good, or an average “market basket” worth of goods. CPI of college textbooks (CTCPI) and the CPI of college tuition (TUCPI) have outgrown our other indices by almost two fold over the last 12 years (the other indices being book publisher costs [BPPPI] and the price of an all-goods inflationary index [ALCPI]). There should be some fundamental reason for this disparity, and this work aims to find reasons for this.

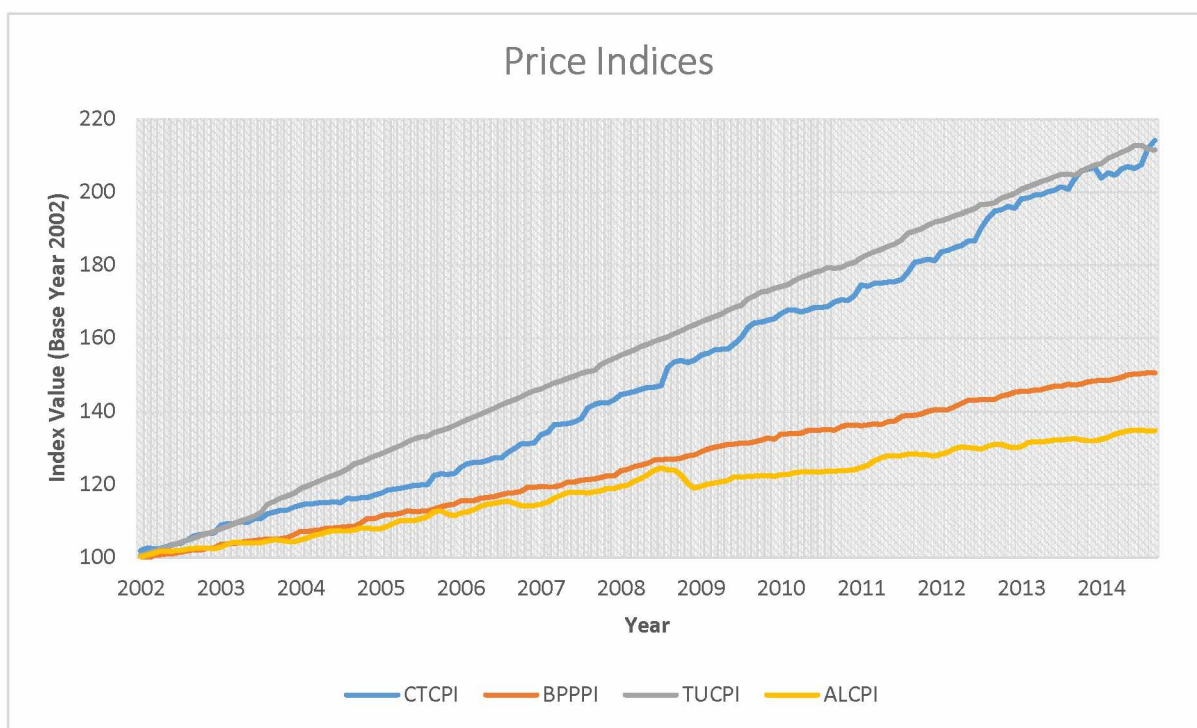


Figure 1: Growth rates of textbooks and textbook related products.

One explanation may be found by looking at the competition level for college textbooks in an effort to find rent seeking behavior. Rent seeking is roughly defined as a market structure allowing firms to receive economic gains artificially and without

reciprocal benefit to consumers. Selling to a relatively captive audience, these publishers have the potential to artificially drive prices (and therefore profits) up via non-competitive mechanisms. However, there has been some discussion that textbook publishers operate on the same premises that competitive firms do, and are bound to the same restrictions. The argument usually presented is that when multiple books are available that cover similar content, they are often found to be competitive with each other. These prices naturally come to a competitive equilibrium, and are not set as in a non-competitive case. If this is the case then other factors need to be examined to determine the source of the price increases. A cursory look at the relationship between CTCPI and BPPPI points away from this conclusion, but will still require analysis to see if there is any empirical weight behind it.

The passage of the 2008 Higher Education Opportunity Act senate bill created federal regulations to provide some stability to the college textbook market. On a theoretical level, it assumes some market inefficiencies, such as a lack of consumer information. In practice, it centered on providing this information to students and instructors as a method to keep the competition for textbook sellers high. It did this through a number of channels. The first was that it provided students with the ability to buy individual components of textbook bundles so the student didn't buy materials they didn't want or need. The second was forcing publishers to disclose pricing information to the teachers and institutions that choose the class materials. While one could make the argument that textbook quality is king, non-disclosure created an environment where text book prices did not reflect marginal quality changes that you would normally expect. The politicians who passed the bill thought these were major factors in the rising costs of college textbooks. For this analysis, I created a variable to mark the required introduction of the regulations in all US colleges starting in 2010.

This study thus sets out to empirically examine the factors that contribute to the ever-changing pattern of the US college textbook market in a cointegration framework. The empirical focus is on determining how the 2008 Higher Education Opportunity Act, demand factors, and supply factors have affected the US college textbook price in the short

and long run over the past decade. To achieve this goal, I adopt an autoregressive distributed lag (ARDL) approach to cointegration proposed by Pesaran et al. (2001). Since the ARDL approach enables us to conveniently derive an error-correction model (ECM) via a simple linear transformation, it is well suited to estimate both the short and long run parameters of the model simultaneously. I hope that this dynamic approach should lead to a better understanding of factors driving up the recent textbook prices in the US

## 2. Background Information

### 2.1 Literature Review

Sigfried and Latta (1998) examined the competition in the textbook market by looking at 16 specific textbooks being sold at 130 colleges and universities. Specifically looking at the retail side of the problem, they compared the sales of these textbooks at bookstores where there was a wide range of retail competition. They found that virtually no distinction exists between the prices in retail centers based on competition. Clay et al. (2001) looked at how competitive the online textbook market is in an attempt to find the role competition plays in textbook sales. The models they used had prices dependent on type of textbook and position on a bestseller list. They found that advertising and the amount of competition were the biggest drivers of price. They also found that firms differentiated products in order to move away from perfect competition, and therefore increase profits. Pecorino (2006) frames textbook sales in the broadest terms, and in doing so, describes textbook publishers as purely monopolistic and rent seekers. He describes publishers as participants in a theoretical rent seeking game. The article properly defines the traditional mentality towards the textbook market even if it's not based on case studies. He also found that there was always a degree of monopolistic power once a textbook has been selected for a course and that is why number of participants in the market was a poor indicator of market competition. Jimenez and Campos (2010) looked at the different models of textbook markets in Europe and examined which market factors were most price effective. They used a model of horizontal differentiation between bookstores, and vertical relationships between publishers and bookstores to see how these relationships created price changes. They find

that the more price liberal state policies favored large retail outlets over small bookstores. While citing the need to potentially keep these small retailers, they say that larger retail outlets have the potential to provide more consumer welfare via lower prices.

## 2.2. Trends in College Tuition and Textbooks

As seen in the Introduction, the price indices for college textbooks and tuition have been increasing very quickly over the past 12 years. It is important to then note how these increases compare to the rate of change in tuition in previous years. This study can then also begin to explore possible reasons behind these changes and formulate possible solutions to the issue.

Referring again to the Bureau of Labor Statistics (BLS) data, but widening the date range, Figure 2 shows how tuition has changed since 1978.

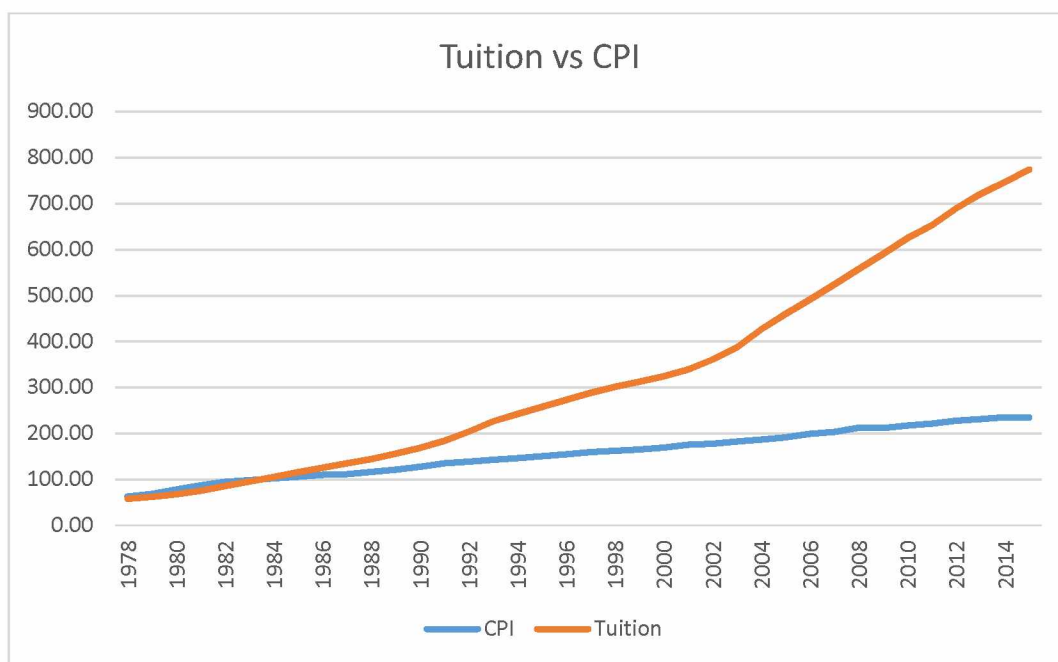


Figure 2: College Tuition CPI vs All-Goods CPI

If I roughly divide the series into three time spans, you can begin to see interesting trends. From 1978 to 1990 College tuition increased similarly to inflation.

However, starting after that, I began to see a shift in tuition away from normal inflation. From 1990 until about 2002 there is almost a 16 point average yearly increases in tuition, versus 4.2 point average yearly increases in the all-goods CPI. This represents a growth four times faster than inflation. This rate increases in the next time period. From roughly 2002 until the start of 2015 there is almost a 32 point average yearly increases in tuition, versus 4.4 point average yearly increases in the all-goods CPI. This represents a growth seven times greater than inflation.

Let us now compare these values with the prices of educational books and supplies over a similar time span (1967-2015).

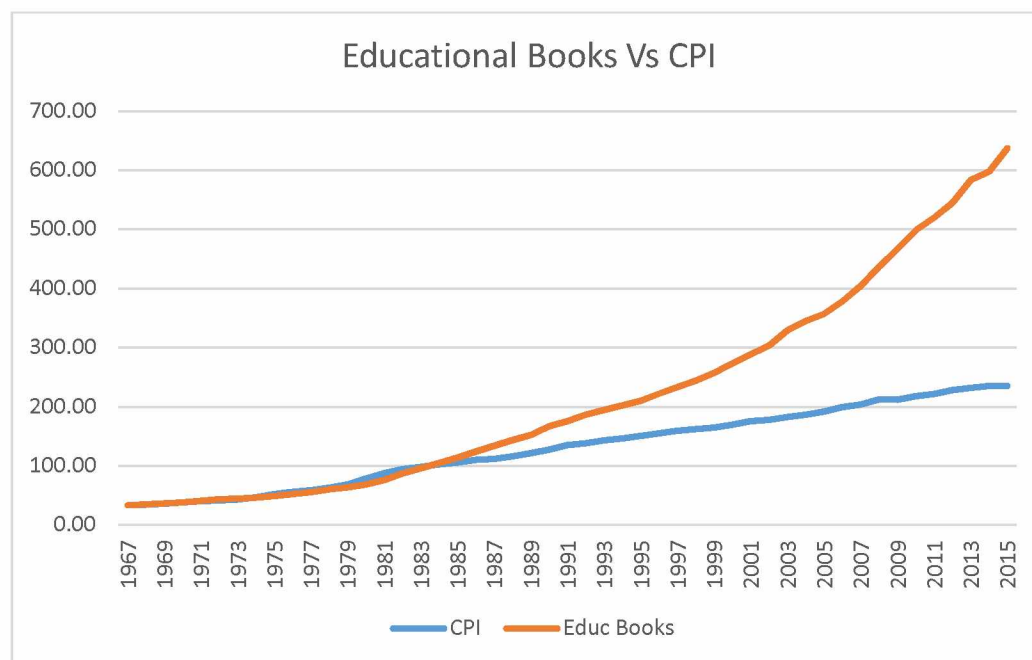


Figure 3: Educational Books CPI vs All-Goods CPI (Base Year 1984)

With the exception of a small inflationary spike in the early 1980's, the period from 1967 until 1984 is fairly benign in terms of variation from educational book costs. Those prices do not seem to have any real departure from inflation. Since 1984 is our base year, I can construct time periods starting there to describe some of the changes. From 1987 until about 2001 there is an 11 point average yearly increase in educational book

prices, versus a 4.6 point average yearly increase in the all-goods CPI. This represents a growth two times faster than inflation. This rate increases in the next time period. From roughly 2001 until the start of 2015 there is an almost 25 point average yearly increases in tuition, versus 4.6 point average yearly increases in the all-goods CPI. This represents a growth five times greater than inflation.

In both cases there are large, non-inflationary price changes that increase at an increasing rate. While educational books and supplies may not be just college textbooks, it gives some description of price changes with related products.

### 2.3. The Higher Education Opportunity Act of 2008

The Higher Education Opportunity Act (HEOA) of 2008 was enacted on August 14<sup>th</sup> 2008. It also reauthorized the Higher Education Act (HEA) of 1965 while making changes to the programs it initiated. Much of the Act consisted of ways to improve current student lending programs and fixing some of those programs that were introduced in 1965. These include the Federal Perkins Loan, Federal Family Education Loan, and the William D. Ford Federal Direct Loan.

There were also a large number of textbook provisions that were introduced by the 2008 bill. Sections 112 and 133 create regulations that universities must adhere to if they are the recipients of financial federal assistance. The purpose and intent section is especially pertinent and is included here in its full form:

*“20 USC 1015b. Sec. 133 Textbook Information. (a) PURPOSE AND INTENT.—The purpose of this section is to ensure that students have access to affordable course materials by decreasing costs to students and enhancing transparency and disclosure with respect to the selection, purchase, sale, and use of course materials. It is the intent of this section to encourage all of the involved parties, including faculty, students, administrators, institutions of higher education, bookstores, distributors, and publishers, to work together to identify ways to decrease the cost of college textbooks and supplemental materials for students while supporting the academic freedom of faculty members to select high quality course materials for students.”*

They began to address this by creating publisher and university requirements. Publisher requirements were focused on increasing information given to people in charge of selecting course materials. These include the non-retail prices of materials that will be sold to the bookstore, copyright dates of the last three editions, content changes from the previous edition and other formats the materials are offered. There has been criticism of the way instructors often choose textbooks. Marginal changes in quality are not often reflected in prices if the quality of the textbook is paramount. While textbook quality is incredibly important, instructors lose the normal consumer tradeoffs with quality and price if price information is not given. When the prices are given, the people who choose course materials can make these tradeoffs for their students. There has also been criticism of textbook publishers of artificially increasing prices by introducing unnecessary revisions to create new editions. This practice is discouraged by the added transparency included in these requirements. If publishers are required to be more forthcoming with the changes included between editions, they are less likely to use that as a means to increase revenue at the expense of the consumer. Beyond increased information, publishers are also required to unbundle supplementary materials from required textbooks. This discourages publishers from forcing consumers from purchasing materials they do not need or could get elsewhere for a better price.

The regulations for universities and bookstores are more focused on providing as much information and time to the students that will be required to purchase course materials. Universities are now required to provide the ISBN and retail prices for all required and recommended course materials. While the timing of this information is not specified, it is implied that this information should be made available as soon as the course decisions have been made. This allows the consumers to better shop around and get the best value for their purchases. These institutions are also encouraged to provide information on textbook rentals, buyback programs, alternative content delivery, and any other cost-saving strategies. The clear focus here is to empower the textbook consumers with as much information and choice as possible to more closely mimic a traditional competitive market purchase.



### 3. The Model and the Method

#### 3.1. A Price Model of US College Textbooks

Our model requires a classical view towards supply and demand functions to be molded into one equation. I start by defining an aggregate demand function for all US college textbooks based on certain variables.

$$D = f(p, x_1, x_2 \dots x_n) \quad (1)$$

Equation 1 includes D as demand, p as price, and  $x_1, x_2 \dots x_n$  are n other variables influencing demand. With n non-price variables I could run into the problem of over specifying the demand function. For the purposes of this analysis I will settle on only a few non-price variables, including college enrollment (ce), and aggregate consumer income (ci). All of the variables used in the model can be found explicitly in Table #1. Our new demand function will then look like this:

$$D = f(p, ce, ci) \quad (2)$$

Equation 2 now explicitly describes demand (D) a function of price (p), college enrollment (ce) and consumer income (ci). On the supply side of the issue, I will construct a similar supply function using the same format with n non-price variables.

$$S = f(p, x_1, x_2 \dots x_n) \quad (3)$$

Equation 3 includes S as supply, p as price, and  $x_1, x_2 \dots x_n$  are n other variables influencing supply. I again focus only on a few variables affecting supply, including production costs (pc) and corporate profits (cp), forming the following supply function.

$$S = f(p, pc, cp) \quad (4)$$

Equation 4 now explicitly describes supply (S) a function of price (p), production costs (pc) and corporate profits (cp). Classical economic theory says that these two functions intersect and an equilibrium price. This price is identical in both functions and will become our new independent variable. When combined, price becomes a function of both demand and supply variables.

$$p = f(ce, ci, pc, cp) \quad (5)$$

This model neglects shifts due to binary variables such as the introduction of the 2008 Higher Education Opportunity Act (heoa) and the 2008 housing crisis (hc). With the addition of these binary variables, I finally land on the model specification shown in equation 6.

$$p = f(ce, ci, pc, cp, heoa, hc) \quad (6)$$

This model states that college textbook prices are affected by college enrollment, consumer income, production costs, number of sellers in the market, the 2008 HEOA and the 2008 housing crisis.

### 3.2. The ARDL Modelling

Using Eq. (6), I can make explicit assumptions about the model in log-linear form

$$\begin{aligned} \ln p_t = & \beta_0 + \beta_1 \ln ce_t + \beta_2 \ln ci_t + \beta_3 \ln pc_t + \beta_4 \ln cp_t \\ & + \beta_5 HEOA + \beta_6 hc + u_t \end{aligned} \quad (7)$$

In order to properly examine the long and short run dynamics, I will be estimating equation 7 in the following way:

$$\begin{aligned} \Delta \ln p_t = & \beta'_0 + \sum_{k=1}^n \beta'_1 \Delta \ln p_{t-k} + \sum_{k=0}^n \beta'_2 \Delta \ln ci_{t-k} + \sum_{k=0}^n \beta'_3 \Delta \ln pc_{t-k} \\ & + \sum_{k=0}^n \beta'_4 \Delta \ln ce_{t-k} + \sum_{k=0}^n \beta'_5 \Delta \ln cp_{t-k} + \beta'_6 HEOA + \beta'_7 hc \\ & + \theta_0 \ln p_{t-1} + \theta_1 \ln ci_{t-1} + \theta_2 \ln pc_{t-1} + \theta_3 \ln ce_{t-1} + \theta_4 \ln cp_{t-1} + \varepsilon_t \end{aligned} \quad (8)$$

This is the error correction model presented by Pesaran where  $\Delta$  is the difference operator;  $n$  is number of lags. Pesaran et al. (2001) recommend applying an  $F$ -test to Equation (8) to establish joint significance of lagged level variables – the null hypothesis of nonexistence of a long run relationship, namely,  $H_0: \theta_0 = \theta_1 = \theta_2 = \theta_3 = \theta_4 = 0$  - as a sign of cointegration. For this purpose, they tabulate new two sets of critical values (upper and lower critical values) that account for order of integration of the variables. An upper and lower critical

values, for example, assume that all variables are  $I(1)$  and  $I(0)$ , respectively. Once Equation (6) is estimated, coefficient estimates of first-differenced variables – that is, coefficient estimates of the summation signs ( $\Sigma$ ) - reflect the short run relationships. The long run effects are obtained by the estimates of  $\theta_1$ ,  $\theta_2$ ,  $\theta_3$  and  $\theta_4$  that are normalized on  $\theta_0$ .

#### 4. Variables and Data Sources

The variables discussed in the previous chapter cannot be measured explicitly. This requires the use of proxy variables to act in place of these measures. The US Consumer Price Index for college textbooks is used as a proxy for the price of US college textbooks during the time period starting in 2002 and ending in 2012. This data were collected from the US Bureau of Labor Statistics (BLS). The US Producer Price Index for textbook publishers is also used as a proxy for the producer input prices and was also sourced from the BLS. The US personal disposable income value is used as a proxy for US aggregate income and is obtained from the US Bureau of Economic Analysis (BEA). The “all-goods” consumer price index taken from the BLS is used to derive the real disposable income by factoring in inflationary responses to price. The dataset contains quarterly observations for the fourth quarter of 2002 to the fourth quarter of 2012 (2002:Q4-2012:Q4). This time span has been dictated by availability of the data for all the series. For example, the US consumer price index for college textbooks could only be traced back to 2002, while the college enrollment could be collected only to 2012. Finally, since all variables are in natural logarithms, the estimated coefficients are interpreted as elasticities.

It is important to emphasize here that the ARDL approach has been known to perform better for finite and small sample sizes (Pesaran et al.1999) and hence makes it a good choice for our sample of 41 observations than standard cointegration methods (i.e., Johansen, 1988). In addition, the ARDL can be applicable irrespective of whether the regressors are  $I(0)$  or  $I(1)$  and does not require pre-testing for unit roots.

#### 5. Empirical Results

Table 2 shows our results for the long run effects from our statistical analysis. I can break up the estimated coefficients into three groupings: supply side (pc, cp), demand side (ci, ce), and the market shocks (heoa, hc), all as seen in the introduction and formally defined in Table 1.

The supply side coefficients are all statistically significant up to the 5% level. This includes prices changes due to input prices and market competition. I can see that the supply side input costs increase US college textbook prices by noting the positive sign

on the input price coefficient. The opposite happens with the corporate profits. I initially assumed that the amount of corporate profits made by textbook firms were a proxy for the amount of competition in that market. If that is the case, the corporate profits coefficient suggests that as profits go up, college textbook prices go down. One explanation would be that when more firms enter the market (due to the increase in firm profits), it forces firms already in the market to drop prices to stay competitive with the new market entrants. This strengthens our classical economic assumption of a relatively competitive market, and the negative value for this coefficient suggests that it is the case. It is also important to note that supply side input prices are the largest long run influencer of US college textbook prices. A 1% increase in input prices causes textbook prices to increase by approximately 3.04%. This result dwarfs our changes due to a change in corporate profits, which only decreases prices by approximately 0.09% for every 1% increase in profits.

The demand side coefficients do not share the same traits as the supply side in the long run analysis. Neither per capita income nor college enrollment have any effect on US college textbook prices. Neither coefficient was statistically significant at the 10% level, suggesting that in the long run, neither had any real effect on the price changes of US college textbooks. Even if they were statistically significant, the coefficients on both demand side coefficients were small, providing 0.5% changes in price for 1% changes in the variables. One explanation would be that the market for college textbooks is fairly captive. This would make the long run demand factors be relatively small when it comes to affecting price since these factors are assumed.

Lastly, there are the effects that the 2008 economic downturn and the 2008 HEOA had on US college textbook prices. Both were found to be statistically significant at the 10%, and both decreased prices of US college textbooks. The 2008 economic downturn reduced prices to college textbooks by 9%. Since this downturn had affected virtually every part of the US economy, it isn't too surprising. However, this does strengthen the argument that college textbooks are not immune to classical economic intuition, and that college textbook prices are not immobile or forcibly set. The implementation of the 2008

HEOA also reduces college textbook prices in the long run by approximately 7%. This result validates the legislation brought by the US government to reduce the steady increase in prices. It would seem that they were correct in their assertion that a lack of information played a significant role in textbook pricing and purchasing.

I now turn your attention to Table 3 and discuss the results of short run coefficient estimates of the model. The results show that, as seen in the long run results, both input prices and firm profits are the significant factors affecting textbook prices in the short run. It is also found that enrollment is statistically significant at the 5% level, indicating that, unlike the long run results, enrollment is an important determinant of textbook prices in the short run. As seen in the long run results, however, income is found to be statistically insignificant even at the 10% level, showing lack of significant short run relation between income and textbook prices. Finally, the two market shocks are found to have significantly negative short run effects on textbook prices.

In order for our estimation to be statistically meaningful, I must provide evidence of the existence of a long run (cointegration) relationship among the selected variables using an  $F$ -test. If the calculated  $F$ -statistic is greater than the upper critical value, the null hypothesis of no long run relationship ( $H_0: \theta_0 = \theta_1 = \theta_2 = \theta_3 = \theta_4 = 0$ ) in Equation (6) can be rejected, supporting cointegration. The results show that the calculated  $F$ -statistic is 4.66 and falls above the upper critical value of 3.52 (4.01) at the 10% (5%) level. As a result, the null hypothesis can be rejected, indicating the existence of a stable long run relationship among the five variables. Further, the coefficient of the error-correction term ( $ec_{t-1}$ ) is found to be negative and statistically significant at the 5% level, providing further evidence of the long run relationship among variables (Kremers et al., 1992; Banerjee et al., 1998). The coefficient of  $ec_{t-1}$  in our model is -0.25, suggesting that deviation from the long run equilibrium is corrected by 25% in one quarter; in other words, it takes almost 4 quarters (e.g.,  $1/0.25=4$  quarters) in order to fully correct disequilibria.

## 6. Conclusions and Policy Implications

Thus far I have examined both the short and long run dynamics of US college textbook prices. The effects of the input prices, the firm profits, the income, the

enrollment and the market shocks (i.e., 2008 Higher Education Opportunity Act) on the US textbook price are investigated in the cointegration framework. To this end, the ARDL approach to cointegration is adopted. The results show that the supply factors such as input prices and firm profits play key roles in determining the US college textbook price in both the short and long run. I also find that the demand factors (i.e., income) appear to have significant effects on the US college textbook price in the short run, but not in the long run. These findings explain why it is crucial to incorporate both the short and long run dynamics in a textbook price model. From policy perspective, these findings suggest that any policy decision made by the federal government directed at textbook producers has impacts on the US college textbook market in both the short and long run. In other words, government policies implemented by overlooking the supply side of the textbook market could lead to undesirable outcomes in the long run. Finally, it is found that the market shocks such as the 2008 Higher Education Opportunity Act and the Great Recession have a beneficial effect on reduction in textbook prices in both the short and long run. From these findings, I conclude that the required disclosure of textbook prices, unbundling of college textbooks from supplemental materials, and development and provision of custom textbooks are set in such a way that the 2008 HEOA indeed effectively regulates the rate of textbook price increases. As such, as long as the US textbook market is regulated under the legislation, textbook prices are expected to remain stable in the future. However, the full recovery of the US economy from the Great Recession in the foreseeable future is likely to increase pressure on US textbook prices.

## 7. Appendix

One criticism of the analysis presented in the main paper is that there were not enough data points to support our conclusions. While the ARDL approach is perfect for smaller data sets, I would like to see similar results with a larger dataset. One way to remedy this would be to use monthly data instead of quarterly data to increase the total number of data points while still using the same time frame. This increases our total number of data points from 48 to 124. The monthly data set was created from the same sources referenced in the data section. Identical methods and explanations were implemented. These results are also shown here as a supplemental empirical results.

Table A-1 shows my long run results using a monthly data set. I again see that the supply side coefficients are all statistically significant up to the 5% level. A 1% increase in production costs causes textbook prices to increase by approximately 2.06%. Changes due to market competition are similar as well; a 1% increase in market sellers decreases textbook prices by 0.03%. The demand side coefficients are similar to the quarterly, but differ in one important way. There was no statistical significance in these variables at all using monthly data. There is no longer any significance from college enrolment. This is not terribly surprising, since I don't expect to see much change in college enrolment on a monthly basis, but on a quarterly/biannually basis. I also see that our binary variables are both statistically significant once again. The 2008 HEOA dropped prices by 2.8% while the 2008 housing crisis reduced prices by 2.7%.

Table A-2 shows our short run results using our monthly data. With the short run results, I not only focus on the demand and supply variables, but how many time lags are significant as well. I see statistical significance with all variables with the exception of college enrollment. When I looked at the short run coefficients using the quarterly data, I also had a single holdout; consumer income. The common thread here is that these are both demand variables, which again suggests that the demand side of the model does not affect prices as much as the supply side variables. The only demand coefficient that was statistically significant was the 1 lag consumer income. For every 1% increase in consumer income there was an increase in prices of 0.192% after one month. The supply



side coefficients are all statistically significant including the 1 lag (t-1) production cost and the 2 lag (t-2) corporate profit. For every 1% increase in production costs there was a drop in prices of 0.529% after one month. Again, since this is only the short run, I will not make the same inferences I made in the long run regarding economic theory. Also, for every 1% increase in corporate profits, there was an increase in prices of 0.016% after 2 months.

These short run changes are rectified in the long run. The coefficient for the error correction is -0.186 and is statistically significant at the 5% level. Our coefficient means that 18.6% of our disequilibria is reduced per month. So it will take a little more than 5 months for these short run changes to be brought back into equilibrium.

## References

- Banerjee, A., Dolado, J.J., and Mestre, R. (1998). Error-correction mechanism tests for cointegration in a single-equation framework. *Journal of Time Series Analysis*, 19, 267-84.
- Clay, K., Krishnan, R., and Wolff, E. (2001). Prices and price dispersion on the web: evidence from the online book industry. *The Journal of Industrial Economics*, 49(4), 521-539.
- Higher Education Opportunity Act. 1 USC. 1015b. Sec. 133. 2008. Print.
- Jiménez, J. L., and Campos, J. (2010). Modelling competition in the textbook market: some lessons still to learn. *Journal of Industry, Competition and Trade*, 10(1), 71-85.
- Johansen, S. (1988) Statistical analysis of cointegration vector, *Journal of Economic Dynamics and Control*, 12, 231-254.
- Kremers, J.J.M, Ericson, N.R., and Dolado, J.J. (1992). The Power of cointegration tests. *Oxford Bulletin of Economics and Statistics*, 54, 325-48.
- Pecorino, P. (2006). Rent seeking: a textbook example. *The Journal of Economic Education*, 37(3), 331-339.
- Pesaran, M. H., Shin, Y., & Smith, R. P. (1999). Pooled mean group estimation of dynamic heterogeneous panels. *Journal of the American Statistical Association*, 94(446), 621-634.
- Pesaran, M.H., Shin, Y., and Smith, R.J. (2001) Bounds testing approaches to the analysis of level relationships, *Journal of Applied Econometrics*, 16, 289-326.
- Siegfried, J. J., and Latta, C. (1998). Competition in the retail college textbook market. *Economics of Education Review*, 17(1), 105-115.

**Table 1:** Summary Statistics of Data

Variable	Description	Mean	Std Dev	Min	Max
p	indexed prices of US college textbooks	151.3	34.0	102.4	214.1
pc	indexed prices of book publishers production costs	125.5	15.6	100.8	150.5
ci	personal income estimates for US consumers	10026.7	602.3	8952.0	11253.7
ce	number of people enrolled in a US college or university	14959.7	1135.2	13375.0	16602.0
cp	amount of profit made by US book publishers	65.9	31.1	-15.6	105.9
hc	binary variable for the 2008 Housing Crisis	-	-	-	-
HEOA	binary Variable for the 2008 Higher Education Opportunity Act	-	-	-	-

**Table 2:** Estimations of long run effects of stated variables on US College textbook prices (Quarterly)

Variable	Coefficient	Standard Error	t-ratio
ln(ci)	0.13	0.26	0.49
ln(ce)	-0.57	0.36	-1.56
ln(pc)	3.04	0.58	5.20**
ln(cp)	-0.09	0.03	-2.94**
constant	-4.48	3.66	-1.22**
hc	-0.09	0.04	-2.16**
heoa	-0.07	0.04	-1.82*

**Notes:** \*\* and \* denote statistical significance at the 5% and 10% levels respectively.

**Table 3:** Estimations of short run effects of stated variables on US College textbook prices (Quarterly)

Variable	Coefficient	Standard Error	t-ratio
$\Delta \ln(p)_{t-1}$	-0.71	0.12	-6.00**
$\Delta \ln(ci)_t$	0.03	0.06	0.51
$\Delta \ln(ce)_t$	-0.14	0.06	-2.39**
$\Delta \ln(pc)_t$	-0.83	0.25	-3.40**
$\Delta \ln(pc)_{t-1}$	-0.68	0.28	-2.48**
$\Delta \ln(cp)_t$	-0.02	0.01	-5.68**
hc	-0.02	0.01	-3.99**
heoa	-0.02	0.01	-3.91**
$ec_{t-1}$	-0.25	0.10	-2.52**

**Notes:** \*\* and \* denote statistical significance at the 5% and 10% levels respectively.

**Table A-1.** Estimated long run coefficients of the price model of US College textbooks (Monthly)

Variable	Coefficient	t-ratio
ln(ci)	-0.17	-0.74
ln(ce)	0.09	0.53
ln(pc)	2.06	10.55**
ln(cp)	-0.03	-4.55**
constant	-3.91	-1.84*
hc	-0.03	1.86*
heoa	-0.03	-2.35**

**Notes:** \*\* and \* denote statistical significance at the 5% and 10% levels respectively.

**Table A-2.** Estimated short run coefficients of the price model of US College textbooks (Monthly)

Variable	Coefficient	t-ratio
$\Delta \ln(ci)_t$	-0.07	-1.24
$\Delta \ln(ci)_{t-1}$	0.19	3.08**
$\Delta \ln(ci)_{t-2}$	0.10	1.64
$\Delta \ln(ce)_t$	0.02	0.52
$\Delta \ln(pc)_t$	-0.25	-1.43
$\Delta \ln(pc)_{t-1}$	-0.53	-2.95**
$\Delta \ln(cp)_t$	-0.00	-0.15
$\Delta \ln(cp)_{t-1}$	-0.01	-1.28
$\Delta \ln(cp)_{t-2}$	0.02	3.05**
hc	-0.01	-2.09**
heoa	-0.01	-2.39**
$ec_{t-1}$	-0.19	-4.18**

**Notes:** \*\* and \* denote statistical significance at the 5% and 10% levels respectively.