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Teaching Double-Dip Recession in Macroeconomics

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ABSTRACT

This paper modifies the customary pedagogical approach to the business cycle found in many macroeconomics textbooks. A logical definition of double-dip recession, a relatively neglected yet potentially important concept, is offered. The proposed definition is then applied to real gross domestic product data for the United States from the Bureau of Economic Analysis. It is confirmed that the United States has experienced ten recessions from 1947 to the present and that three of those may be classified via our approach as double-dip recessions. We also suggest here the useful corollaries of multi-dip recessions and deepened trough recessions.

Introduction

A neglected concept in macroeconomics pedagogy is double-dip recession. Indeed, this idea is mentioned but not defined in just two of more than a dozen macroeconomic textbooks surveyed at both the principles and intermediate levels (Dornbusch et al. 2011, p. 275; Krugman and Wells 2017, p. 463). Moreover, the documentation of or empirical evidence on double-dip recession is, to our knowledge, absent with respect to the teaching of macroeconomics.[2]

There are, however, numerous, vague, and inconsistent definitions of double-dip recession within the non-academic, financial, and popular presses. For example, the *Financial Times* defines a double-dip recession as occurring "when an economy goes into recession twice without having undergone a full recovery in between." The *Oxford English Dictionary* states that a double-dip recession is "a recession during which a period of economic decline is followed by a brief period (usually one or two quarters) of growth, followed by a further period of decline." According to BusinessDictionary.com, a double-dip recession is "a second recession following a brief period of growth. A double-dip recession must come after an initial period of general economic decline. Essentially, the country's GDP slides from negative to positive and eventually back to negative." Investopedia declares that "a double-dip recession is when gross domestic product (GDP) growth slides back to negative after a quarter or two of positive growth. A double-dip recession refers to a recession followed by a short-lived recovery, followed by another recession." Finally, Wikipedia states, "In a W-shaped recession, (also known as a double-dip recession), the economy falls into recession, recovers with a short period of growth, then falls back into recession before finally recovering, giving a 'down up down up' pattern resembling the letter W."[3] From these citations, it appears that at least the non-academic world is interested in the phenomenon of double-dip recession.

The purpose of this paper is twofold. First, we extend the standard classroom approach to the business cycle and propose a rather more specific and empirically useful definition of double-dip recession. Second, we apply this definition to quarterly data on real GDP provided by the Bureau of Economic Analysis (BEA)

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[2] This is probably because academic investigations to document the occurrence of double-dip recessions in the United States are rare. Indeed, the only paper we found along those lines is that by Elwell (2011).

[3] These definitions of double-dip recession come from www.ft.com, www.oed.com, www.businessdictionary.com, www.investopedia.com, and www.wikipedia.com ("recession shapes"), respectively.

from 1947 to the present in order to chronicle the existence of double-dip recession in the United States.[4]

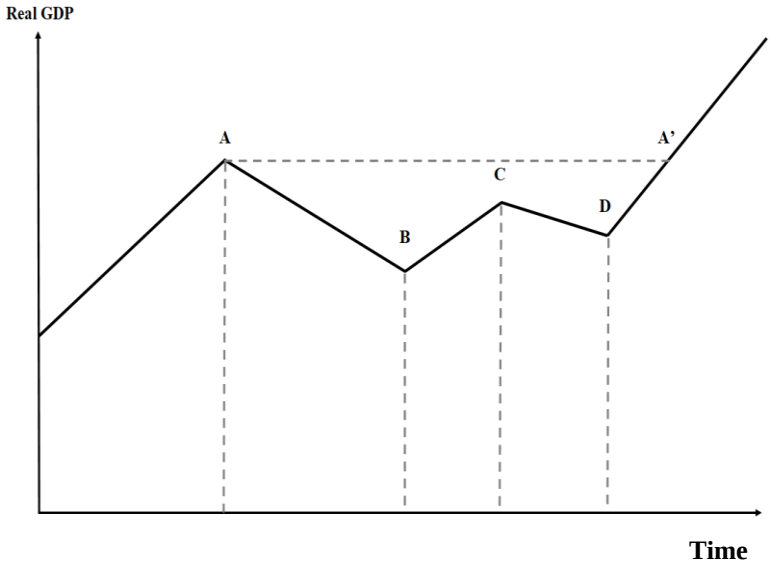
The Analysis

The usual pedagogical treatment of the business cycle[5] identifies and distinguishes between the four stages of expansion, peak, recession, and trough, with the peak and trough sometimes referred to as turning points in the cycle and the term 'recession' frequently referred to as a 'contraction.' We modify this common approach in order to arrive at a logical and uniform definition of double-dip recession which is both suitable for use in macroeconomics classrooms and applicable to real world data.

To begin, we adopt the historical academic definition of a recession as a circumstance when real GDP decreases for at least two consecutive quarters.[6] Second, we make the distinction for our students between "recovery" and "expansion," with the former being an increase of real GDP from the trough to the previous peak level of real output and the latter being an increase of real GDP beyond the previous peak level. Third, we refer to this previous peak level of real GDP as the "reversion point," or that point at which the economy has fully recovered from the recession and beyond which it reverts to net growth in aggregate real output. Fourth, we define a double-dip recession as a situation in which another decrease in real GDP takes place after the trough of an economic cycle but prior to its reversion point. In other words, and as the name itself suggests, a double-dip recession occurs when real GDP decreases for a second time and the economy returns to a recessionary condition prior to completely recovering from an initial two quarter or more decline of real GDP.

To demonstrate the aforementioned discussion and definitions, we draw Figure 1, in which a double-dip recession takes place from point A to point A', with point A' being the reversion point. The first dip or decline of real GDP is illustrated by the movement from point A to point B and the second dip is shown by the movement from point C to point D. At this juncture in the classroom discussion, we inform our students that a direct application of this suggested methodology to real GDP data for the United States reveals that ten recessions have occurred since 1947, with the three occurring shortly after World War II, in the early 1980s, and in the Great Recession of 2008 qualifying as double-dip recessions.

Figure 1: Double-Dip Recession



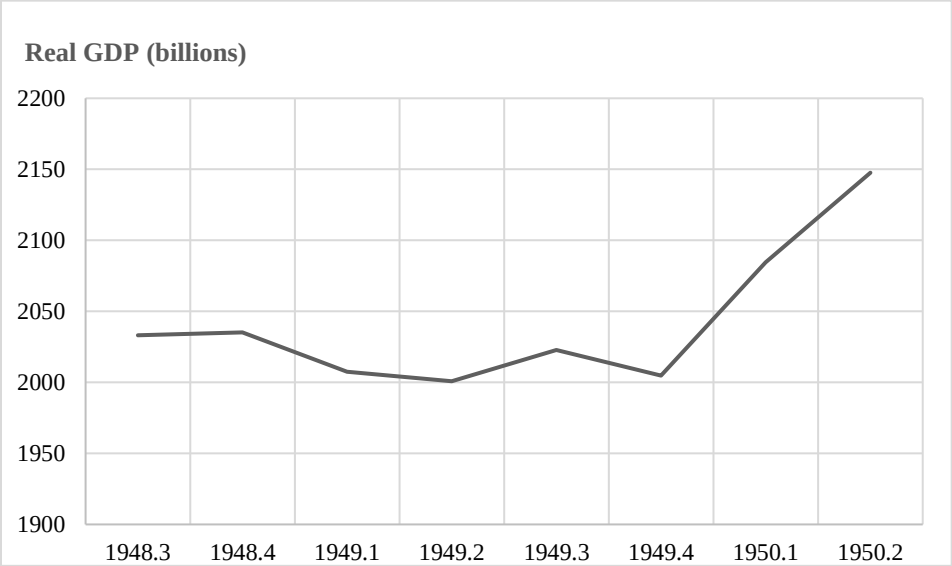
[4] Quarterly data on real GDP is available from the BEA beginning only in 1947. See www.bea.gov.

[5] We note for our classes here that we prefer the broader and more inclusive term "economic cycle," which we use through the remainder of our macroeconomics courses.

[6] We contrast for our students this "academic" definition of a recession with that employed by the NBER, that a recession is "…a significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in real GDP, real income, employment, industrial production, and wholesale-retail sales." See "Business Cycle Dates," under "Data" on the NBER website *www.nber.org/cycles/cyclesmain*.

The first double-dip recession in the United States dates to the late 1940s as real GDP reached a peak of about $2.04 trillion in the fourth quarter of 1948.[7] As shown in Figure 2, real output then decreased for two quarters and attained its trough during the second quarter of 1949. Therefore, this decline of real GDP is the first dip of this particular recession. Although real GDP then increased during the third quarter of 1949, it fell short of the previous peak or reversion point by approximately twelve billion dollars after which it experienced a second decline during the final quarter of 1949--the second dip of this double-dip recession. We note that the reversion point was exceeded during the first quarter of 1950, and then real GDP increased continuously until the next recession in the 1953-1954 timespan.

Figure 2: Double-Dip Recession, United States, 1948-1950



Many economists, both academic and business, characterize the behavior of the US economy during the early 1980s as evidence of a double-dip recession. In their text, Krugman and Wells (2017, p. 463) allude to "the double-dip recession of 1979-1982." Similarly, Investopedia also characterizes the early 1980s as an episode of double-dip recession, noting that the economy shrank in the first half of 1980, experienced a period of growth in late 1980 and early 1981, and then slipping back into a recession from July 1981 to November 1982.[8]

We believe that defining or considering the entire time period of the early 1980s as a double-dip recession is misguided and confusing. Following our suggested approach, it is clear the United States endured two separate recessions after the first quarter of 1980 through the second quarter of 1983, with only the latter part of this period constituting a double-dip recession.

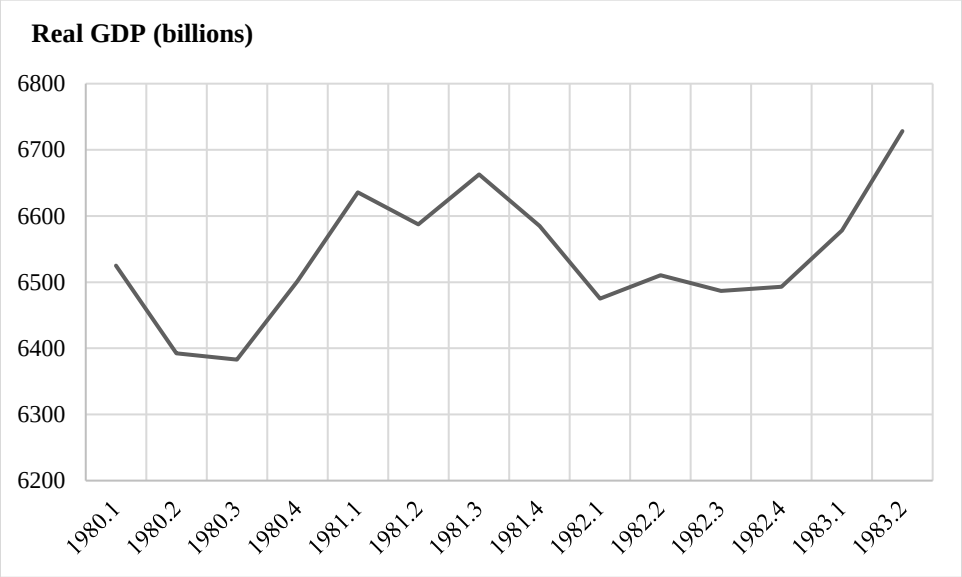
Figure 3 illustrates the movement of real GDP in the United States during this time. Following its peak in the first quarter of 1980, real GDP declined for two consecutive quarters to its trough in the third quarter of 1980. Because real output increased during the next two quarters and surpassed the reversion point by more than $100 billion in 1981.1, this episode is a traditional or single-dip recession and not a double-dip recession as often mischaracterized.

After declining slightly during only the second quarter of 1981, real GDP then peaked again at roughly $6.7 trillion in the following quarter. Real output then decreased during 1981.4 and 1982.1 by nearly $200 billion. Notably, the increase of real GDP during the second quarter of 1982 fell short of the reversion point by about $150 billion and decreased again during the third quarter of 1982. Therefore, using our definition, we characterize this recession as a double-dip recession. Beginning in the fourth quarter of 1982, real GDP then increased continuously until the onset of the next recession in during 1990.4 and 1991.1.

[7] The real GDP numbers were calculated by the BEA with chained 2009 prices.

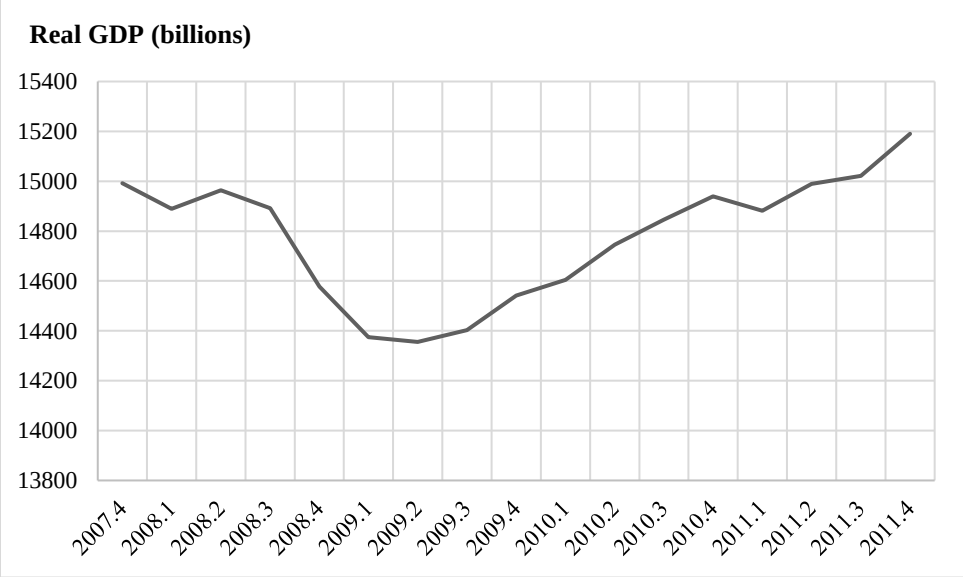
[8] See *www.investopedia.com/terms/d/doublediprecession.asp*.

Figure 3: Single-Dip and Double-Dip Recessions, United States, 1980 - 1983



The Great Recession of 2008 is now discussed in nearly all contemporary macroeconomics textbooks. While most of the elements and nuances of this event have been well-documented, such as its length, depth, amplitude, and causes, an overlooked characterization is that it may be viewed as another double-dip recession. As illustrated in Figure 4, real GDP peaked in the United States during the fourth quarter of 2007 at nearly fifteen trillion dollars. Following a one quarter decrease, real output increased again during the second quarter of 2008 but to a value below the 2007.4 level. Real GDP then decreased during the next four quarters and troughed during the second quarter of 2009. This particular decline constitutes the first dip of the Great Recession. Real GDP then increased during each of the next six quarters, rising to about $14.94 trillion in the fourth quarter of 2010 or about $53 billion less than the previous peak of 2007.4. The second dip of the Great Recession is seen during the first quarter of 2011 when real GDP declined again, by about $58 billion. Beginning in the second quarter of 2011, real output increased and surpassed the reversion point during the third quarter of 2011.

Figure 4: Double-Dip Recession, United States, 2008 - 2011



To logically extend this analysis and conclude the classroom discussion, we introduce our students to two additional ideas. First, having defined double-dip recession, it is also possible for triple-dip and quadruple-dip recessions to occur. Generalizing, the term "multi-dip recessions" may be used to accurately reference all other types of recessions. Second, one might also conceive of events such as "deepened trough recessions" where, for example, the trough of a second or subsequent dip of real GDP is lower or deeper than the initial trough or first decline in real GDP. Although neither of these has occurred in the United States since 1947, evidence of both these phenomena exists in other countries (Kyer and Maggs 2019).

Conclusion

We believe that macroeconomics courses could be enriched by extending the standard discussion of business cycles to include the phenomenon of double-dip (or multi-dip) recession. While a bare bones discussion of the business cycle is useful and reveals a considerable amount of information in characterizing an economy, in recent years, the readily available vectors of macroeconomic empirics is well suited to measure double-dip and more complex aspects nested within the business cycle. The present paper is an attempt to not only add precision to the dialogue relating to traditional and multi-dip recessions, but also to encourage follow-up research to investigate international differences with regard to these types of episodes. Specifically, previous empirical research on this topic by the present authors reveal that the frequency, depth, and general likelihood of secondary recessionary influences differ considerably between nations. This quite naturally leads to the question as to why this occurs and what determinants are most relevant in providing an adequate explanation of these features of recessions for the United States and other countries.

References

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Considerations for the Organization of the Introductory Financial Derivatives Course

Robert B. Burney[1]

ABSTRACT

In this paper, we discuss the two dominant approaches to ordering the presentation of the material in the introductory financial derivatives course. We begin by reviewing the basic payoff similarities and practical differences among the various types of derivative securities. Then a review of several popular derivative securities textbooks is presented, demonstrating the two dominant pedagogical approaches. We then contrast the two dominant approaches and discuss the merits of each. The paper concludes with recommendations for faculty selecting between the two approaches.

Overview of the Pedagogical Issue

Derivative securities involve transactions for which the establishment of terms and the actual execution are displaced in time. This means that the value of the associated contract can change through time dependent on market conditions. From a fundamental economic perspective, the value of the derivative security depends simply upon the relationship between the contract price (fixed at the outset) and the spot market price (which changes through time). However, when one takes into account differences in the operational details for different types of derivative securities, the basic similarities are shrouded somewhat.

If one considers the "plain vanilla" derivative securities (forward contracts, futures contracts, and options contracts), the essential differences between the types can be seen as depending on specific additional features. Relative to forward contracts, for which both parties are obligated to transact, exchange traded futures contracts are merely a standardized version. Relative to forward contracts and futures contracts, options contracts have an additional feature which allows the holder to choose not to transact when doing so would be disadvantageous.

Alternatively, one might consider options contracts to be the most basic of the three because combinations of options can be used to construct payoffs identical to forward contracts and futures contracts, while the reverse is not true. From this perspective as well, futures contracts could be seen to be just standardized forward contracts.

These two perspectives seem to evidence themselves in two distinct organizational approaches used in various textbooks on the topic offered in the U.S. market. The first starts with forward contracts, then progresses to futures contracts as simply standardized forward contracts, then progresses to options by introducing the "right, but not the obligation to transact" dimension of options. This order of presentation lends itself well to a pedagogical approach stressing the similarities of the payoffs to the three basic derivatives.

The second approach starts out with options without much more than a mention of futures and forward contracts. Then, later in the course, futures contracts are introduced. Pedagogically, then, this presentation has futures as similar to options but with both "the right and the obligation to transact." Thus futures are essentially presented as options with fewer features.

It is possible that one of the motivations for the second of these two approaches is that basis risk, the chance that the relationship between the spot price and futures price may change, causes the futures contracts payoffs to be non-linear when portrayed graphically as a function of the spot price of the underlying asset. This situation arises whenever a futures trader closes out the position by taking an equal but opposite position

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in the contract – which is much more common than actual delivery.[2] Thus, the payoff to the futures contract is a linear function of the futures price – not the spot price. This detail considerably diminishes the ease with which one first encountering options contracts and futures contracts can grasp the underlying similarities in payoffs.

If the literature on student learning styles is incorporated, the relative merits of the two approaches become yet more difficult to weigh. For, these two approaches can also be seen as suggesting "from the specific to the general" versus "from the general to the specific" ways of thinking. Past studies of prevalent personality types of business students and business faculty suggest that the majority of students may naturally prefer the first of these, while faculty members may naturally prefer the latter.

The issues which arise with respect to the pricing (valuing) of these three different types of derivative securities will not be addressed in detail in this paper, since the various pedagogical sequencings do not imply any differences in the pricing process. That is, all of the major textbooks use the same technical approach to the pricing of the three types of derivative securities, so it is the order of presentation which is at issue.

Review of Basic Derivative Securities

We begin by reviewing the basic payoff similarities and practical differences between forward contracts, futures contracts, and options contracts. To streamline the terminology, we will alternately refer to these as forwards, futures, and options in the following discussion.

All of the three basic types of derivative securities contracts which we will discuss have values which are driven by the price of the asset upon which the contract is written. The contract value relationships are the same regardless of which "underlying" asset the contract covers. And, in each case, it is the relationship between the contract price and the spot market price (spot price) which determines the contract holder's gain or loss. The various derivative securities pricing models in addition account for the impact of variability in the price of the underlying asset and the time value of money. However, since our focus in this paper is not derivative security pricing per se, our consideration of derivative security pricing will be limited.

In considering the "payoffs" to the various derivative securities, it is important to keep in mind that the contract price is established and fixed at the outset of the contract. The spot price, in contrast, can potentially vary throughout the life of the contract as market conditions change. Depending on whether the trader has a long (buying) or short (selling) position relative to the underlying asset, the potential payoff to the contract will rise and fall as the spot price changes.

The value of a derivatives contract, held by itself, is driven by the relationship between the contract price and spot price. These generic payoffs are presented in Table 1. It should be noted that the presentation order in this table follows one of the two alternative presentation orders discussed in the paper.

Table 1: Payoffs and Characteristics of Financial Derivatives

Contracts to Buy (S-K)	**Contracts to Sell (K-S)**
Forward Contract to Buy	Forward Contract to Sell
Long Futures - Adds Standardization	Short Futures - Adds Standardization
Call Option - Adds right to walk away	Put Option - Adds right to walk away

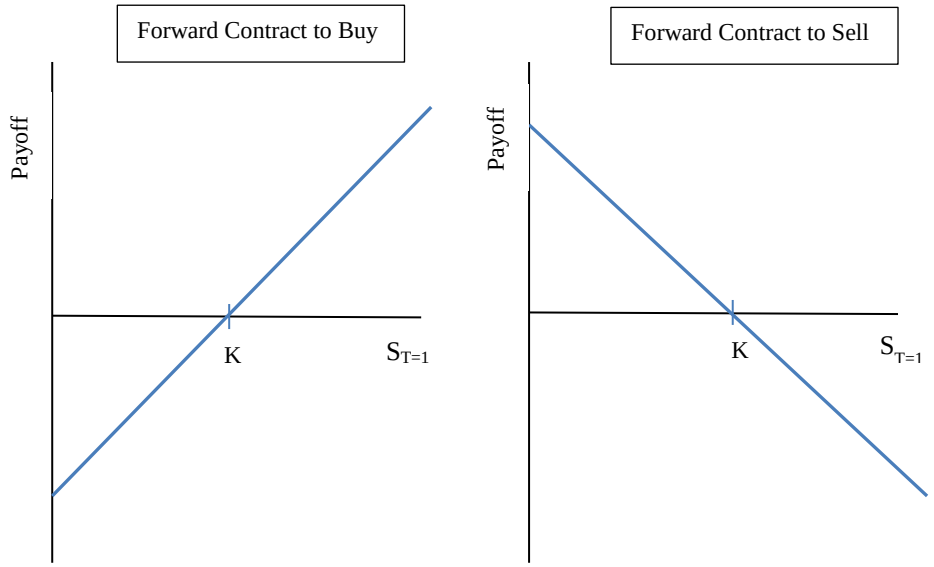
S = spot price at future transaction date (uncertain)
K = contract price (certain)

In Figure 1, the payoffs for the forward contract positions are presented in graphical format. It should be noted that the payoffs change in a one-to-one fashion with respect to the spot price of the underlying assets, so the slopes are +1.0 and -1.0, respectively. At spot prices equal to the contract price, both contract positions have a payoff of zero. At any spot price different from the contract price, each contract will have a positive or negative payoff depending on whether the spot price is above or below the contract price.

If a futures contract position were to be held to the contract's maturity, then the graphs in Figure 1 also describe the payoffs to long and short futures contract positions. This is because if futures are held to maturity, the futures contract price will converge to the spot price. However, if the futures contract position is closed out prior to the contract's maturity, the issue of "basis" risk arises. We will return to this issue later.

[2] The futures price must converge to the spot price as the contract's maturity approaches. But, for futures contracts the first potential delivery is up to one month prior to contract maturity. Therefore traders not wishing to take or make deliver will typically not remain in the contract until the maturity date when the futures price converges to the spot price, rendering a basis of zero.

Figure 1: Payoffs to Forward Contract Positions



S = spot price at future transaction date (uncertain)
K = contract price (certain)

Since options contracts also give the holder the right to transact at the contract price, their payoffs are similar to forward contracts. However, the option holder has the right, but not the obligation, to transact. This means that an option holder may elect to "walk away" from a potentially losing contract position by choosing not to exercise the option. Therefore, the option contract payoff will not include the negative payoffs which the forward contract or futures contract holder must accept as long as he or she remains in the contract.

Figure 2 presents these payoffs in graphical format. In these graphs, the dotted lines indicate the potential negative payoffs which the option holder will choose not to accept. The resulting payoffs are the so called "hockey stick" patterns. These are presented in the graph in blue functions.

However, because the option holder has the opportunity to walk away from negative outcomes, the grantor (writer) of the option receives a payment from the holder. This payment is referred to as the "premium" and is essentially the cost of the option. The resulting net payoffs are presented in Figure 2 as the green functions. Strictly speaking, the graphs in Figure 2 suggest a European style option which may only be exercised at maturity since the horizontal axis is labeled to indicate the spot price at maturity (T=1).[3]

Considering these payoffs, it is clear how an instructor might choose to begin with forward contracts and then progress to options contracts. One would begin with the simplest linear function, then explain how the right for the option holder to choose whether to exercise the option leads to the well-known option payoffs. Then by explaining the unequal exposure faced by the grantor and the holder of the option, the concept of the premium could be introduced.

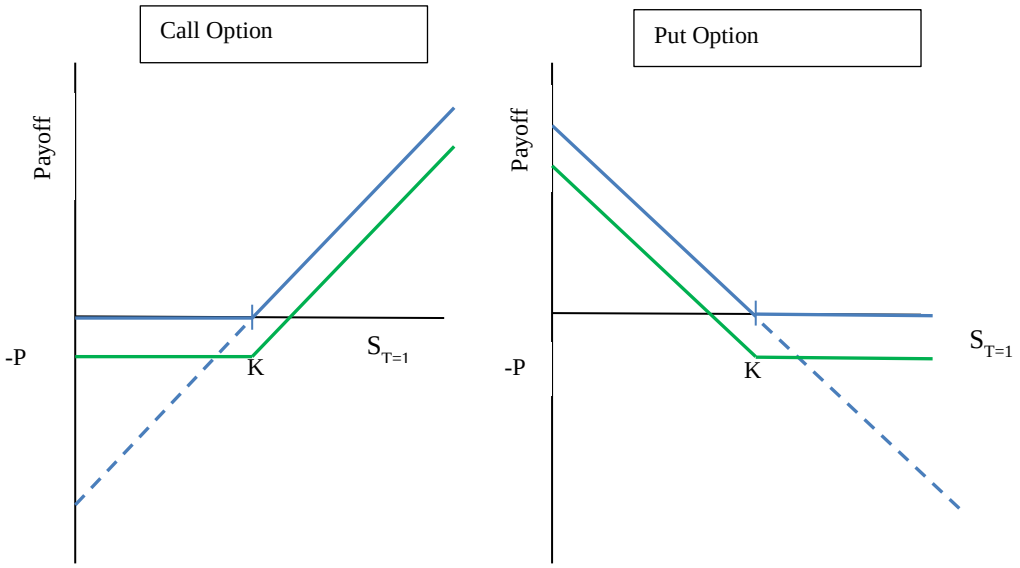
Mathematically, the payoffs to the long and short forward contracts would be $(S_T\text{-}K)$ and $(K\text{-}S_T)$. The payoff to the call and put would be $Max[(S_T\text{-}K),0]$ and $Max[(K\text{-}S_T),0]$. If the premium is considered, the option payoffs become $Max[(S_T\text{-}K),0]\text{-}P$ and $Max[(K\text{-}S_T),0]\text{-}P$. So, the exposition using mathematical functions allows for the same progressive levels of complexity as using the graphical presentation.

This would seem a workable approach. However, if the instructor presents futures contracts between forward contracts and options, one is still left with how the complication of the normal market practice in the futures market impacts these basic payoffs.

The conditions concerning delivery set forth in a futures contract's specification vary considerably from one underlying asset to the next. Very few contracts specify that delivery must be made or taken on the actual single maturity date. And, some contracts have a wide delivery window which can be up to the entire month prior to the contract maturity. In addition, the typical futures contract has a limited number of potentially inconvenient geographical delivery points.

[3] In the derivatives literature it is common to use the notation S_T for the spot price at maturity and the notation S_t for the spot price at any particular time. In a payoff graph for an American style option, the horizontal axis could be labeled with the latter indicating exercise of the option could occur at any point during its life.

Figure 2: Payoffs to Options Contract Positions



S = spot price at future transaction date (uncertain)
K = contract price (certain)
P = premium

The precise conditions for delivery of the underlying asset in futures contracts means that taking or making delivery of the underlying asset may be expensive or burdensome. Consequently, the typical hedger in the futures market would close out the futures position, accept the gain or loss on the futures position, and then transact in a more geographically workable (physical) spot market. In addition, speculators[4] in the futures market would generally not be expected to wish to take or make delivery if it could be avoided.

When the futures trader closes out his or her position prior to the contract's maturity, the payoff is no longer determined by the relationship between the underlying asset's spot price and the original contract price, but rather between the futures price at the time the position is opened and the futures price at the time the position is closed out. If we let F_1 be the futures price at the time the futures position is entered into, and F_2 be the futures price at the time the futures position is closed out, the payoff to a long position would be $(F_2 - F_1)$ instead of the generic (S_T-K) described above. Likewise, the payoff to a short futures position would be $(F_1 - F_2)$ instead of the generic $(K-S_T)$ described earlier. Figure 3 shows how the graphical presentation of the payoffs would be modified. (This issue is discussed in more detail in the appendix.)

With respect to using payoff similarities to aid in student understanding, this means that the instructor must either initially impose strong simplifying assumptions to force clear similarities in both mathematical function and graphical presentations across all three types of derivatives, or risk student confusion. Specifically, in order to have the forward and options payoffs shown in Figures 1 and 2 have precisely the same horizontal axis, the instructor must assume European options are being discussed (so that exercise would only occur at S_T). And, in order for the horizontal axis in the payoff graphs for futures contracts to conform, the instructor must further assume that the futures contract would be held until maturity (when F_1 converges to S_T).

For a strictly mathematical function based presentation, this essentially requires assumptions that set $S_T=S_t=F_2$. Further, full comparability requires the additional assumption that $F_1=K$.[5]

As mentioned earlier, an alternative pedagogical perspective holds that options should be presented first since they are the most fundamental building blocks in terms of constructing other positions by holding multiple contracts. In order to demonstrate this, we must consider the grantor's (writer's) position in the

[4] Speculators are those market participants who do not need to buy or sell the underlying asset as a business input or output. Rather, speculators are motivated by a desire for gains from price movements and are not interested in acquiring or disposing of the asset.

[5] Without such assumptions we could have a temporal order of K, F_1, F_2, and S_T even if we were not to introduce American style options.

options described above. Because the grantor must accept the holder's exercise decision, the grantor's payoff is the negative of the holder's payoff.

Figure 3: Payoffs to Futures Contract Positions

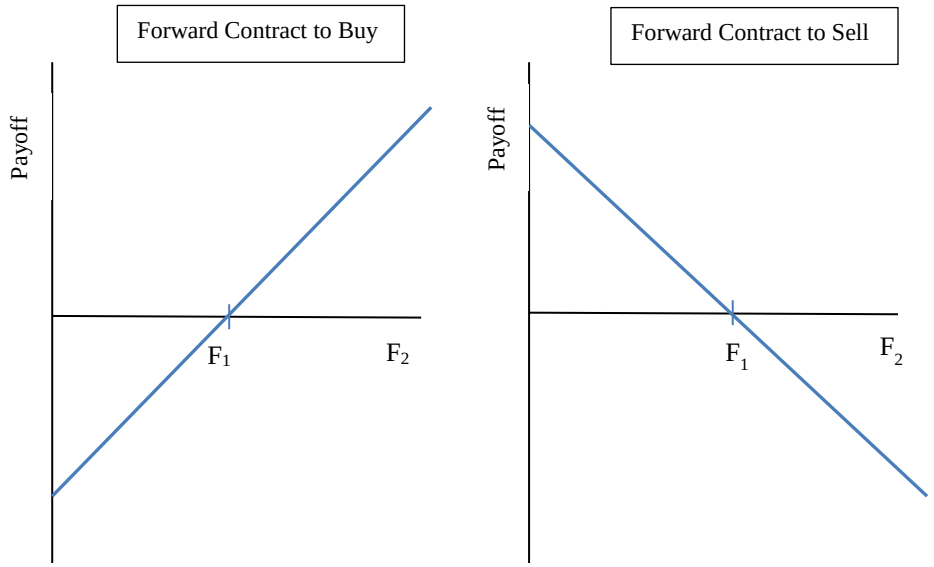
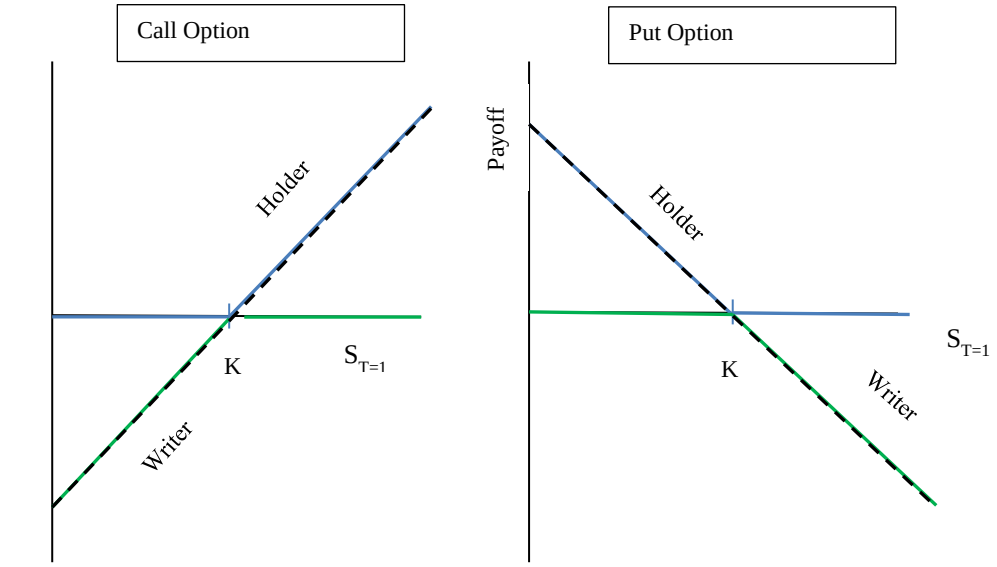


Figure 4 shows the results from holding the combined position of being the grantor of an option while simultaneously being the holder of another identical option. In both panels the holder's position is depicted in blue while the writer's position is depicted in green. As can be seen from the graphs, the two contracts' payoffs together create a payoff identical to the related forward contract. That is, one who plays the role of the grantor in one options contract, and is the holder in another identical options contract, ends up with a net combined position which has exactly the same payoffs as the associated forward contract. Simultaneously writing and holding two of the same call options creates a combined position equivalent to a forward buy contract. Simultaneously writing and holding two of the same put options creates a combined position equivalent to a forward sell contract. In Figure 4, the dotted black line shows the resulting combination.

Figure 4: Payoffs to Options Contract Positions



S = spot price at future transaction date (uncertain)
K = contract price (certain)

In Figure 4, we do not show the premium on the options for clarity of presentation. However, because the premium paid by the holder is the premium received by the writer, the effect on the combined position is zero. The alternative presentation would include the premiums for both with the holders payoff displaced below the horizontal axis by the amount of the premium as is demonstrated in Figure 2 above. Likewise the writer's payoff would be displaced above the horizontal axis by the amount of the premium.

As mentioned above, some advocates of the earlier presentation of options have pointed out that options are theoretically more basic contracts. An interesting side question would be whether it was the more theoretically basic options or the more operationally simple forwards which emerged earlier in human society. While numerous sources describe the organized use of futures and forward type contracts from the Middle Ages onward in parts of both Asia and Europe, the oldest historical records may be of derivative-like contracts in Ancient Mesopotamia. The Code of Hammurabi, which dates to 1750 BC, contains a law which gives farmers the right to forego payments to creditors in the event of climate related crop failures (Kummer and Pauletto 2012).

Such an arrangement is sometimes referred to as a state contingent claim, which is a contract which would provide a specified payment only if a certain state of nature should occur. From a modern perspective, this arrangement would likely be seen as a put option – albeit one whose exercise condition is not specified in terms of price.

As ancient as that example is, there are cuneiform clay contract tablets from approximately the same era (ex. 1809 BC) giving examples of forward contracts and also contracts with embedded repayment options (Weber 2008). Thus it would seem that both state contingent claims and temporally displaced commercial transactions (as antecedents for modern options and forward/futures) likely both date back to the ancient era in which record keeping became possible.[6] So, the historical date of emergence cannot be seen as a potential justification of any particular pedagogical order of presentation of forwards, futures, and options.

Approaches Used in Various Textbooks and Justification of Specific Approaches

As noted earlier, the derivatives securities textbooks available in the U.S. are divided in terms of the order of presentation discussed above. Even those textbooks which are dominant do not all use the same order of presentation. Table 2 lists a collection of available textbooks and the order of presentation which they use.

Table 2: U.S. Market Textbooks for the Financial Derivatives Course

Authors	Title	Order of Presentation	Publisher
Chance and Brooks	An Introduction to Derivatives and Risk Management	Options, then Forwards and Futures	Cengage
Hull	Fundaments of Futures and Options Markets	Forwards and Futures, then Options	Pearson
Hull*	Options, Futures, and Other Derivative Securities	Forwards and Futures, then Options	Pearson
Kolb and Overdahl	Futures, Options and Swaps	Forwards and Futures, then Options	Wiley
Sundaram and Das	Derivatives: Principles and Practice	Forwards and Futures, then Options	McGraw-Hill/Irwin
Strong	Derivatives: An Introduction	Options, then Forwards and Futures	Thompson
Goldenberg	Derivatives Markets	Forwards, then Futures, then Options	Routledge

*Hull offers a full textbook and a "fundamentals" version.

As can be seen from the table, the majority of the sample of textbooks uses an order of presentation which begins with forward contracts and/or futures contracts, and then presents options later. It should be noted that the table contains two entries for Hull which represent his main textbook and the "fundamentals" version. However, the order of presentation is the same in both textbooks.

[6] Weber (2008) notes that reliable record keeping made possible by the invention of writing is a likely precursor to the development of derivatives type contract which are essentially human promises.

In an attempt to gain additional insight, we contacted the authors of all these textbooks via e-mail. After explaining our interest in the textbook layout, each author was asked why the particular order of presentation had been selected for their particular books. Nearly all of those contacted were kind enough to respond, for which we are deeply appreciative. The authors' responses confirmed some of the issues we had considered ourselves, but introduced multiple new factors. The textbook authors' key comments are summarized in Table 3.

Table 3: Textbook Authors' Key Comments on Presentation Order

Author	Textbook Order	Comments
Chance	Options First	Options are theoretically more fundamental securities, alternative order provides complication for futures options
Brooks	Options First	More complex options material is better presented earlier in the semester
Hull	Forwards/Futures First	Linear payoff derivatives are simpler and thus should be presented first, alternative order puts coverage of futures and forwards at risk of being left out
Kolb	Futures First	Conceptually simpler material first as pedagogical preference.
Sundaram	Forwards/Futures First	Linear payoff derivatives are better for presenting arbitrage-based pricing arguments since they don't require an assumption concerning price evolution,
Das	Forwards/Futures First	The presentation order used provides an incremental exposure to complexity
Strong	Options First	Numerous real world examples of option type arrangements aids student understanding
Goldenberg	Forward First	Begin with less nuanced securities

Professor Chance responded that options are technically more fundamental since they can be held in combinations which provide the same payoffs as futures and forwards, while the reverse is not the case. He also noted that the most basic securities are the Arrow-Debreu securities from economic theory – which are essentially option-like. Professor Chance did point out that one could likely present futures and forwards before options, but this would require the instructor to defer any coverage of futures options (options on futures contracts) until later in the course.

Professor Brooks (Chance's co-author) points out that, as a practical matter, many students in this particular course are last semester seniors. The course organization which covers options first has the advantage that the most challenging material (mathematically) is covered earlier in the semester when the (graduating) seniors are still fully engaged.[7]

Professor Hull stressed that linear products (forwards and futures) are simpler than non-linear products (options) and thus are best presented first. He also pointed out that the former are in some respects more important – pointing out that swaps are essentially comprised of a series of forward contracts, and that swaps are the most important over-the-counter derivatives contracts. Professor Hull also suggested that if options are presented first, then the linear products "tend to get tucked at the end of the course or are not covered at all."[8] He also noted that if futures and forwards are covered earlier, then contrasts can be made concerning hedging with these versus options.

Professor Kolb framed his choice to present futures before options in the context of his overall preference for "moving from simple to more complex in pedagogical matters."[9] Further, he referenced a parallel pedagogical progression in the context of market structure in which initial presentations are typically made

[7] The author has noticed this same issue with late semester presentation of complex option pricing material.

[8] Email from John Hull, January 27, 2018.

[9] Email from Robert Kolb, November 4, 2018.

with no market imperfections, and then the later presentations are extended to include market imperfections (e.g., transaction costs).

Professor Sundaram stated that "Linear derivatives are a simpler place to introduce the pricing by replication/no-arbitrage principle since there is no model-dependence."[10] He further pointed out that option pricing – even if arbitrage based – requires the additional complexity of some assumption of price evolution. So, from this perspective, presenting forwards and futures first prepares a better foundation for student comprehension of more complex option pricing relationships.

Professor Das (Sundaram's co-author) provided a perspective in full agreement with that of Professor Sundaram. The futures and forwards first order of organization is to be preferred because it provides for the introduction of "incremental concepts and techniques."[11]

Professor Strong stressed that real world analogies with options are "easy to find and easy for students to understand" and thus provide an effective entry point into the discussion of derivatives.[12] He states that discussions of these types of examples (ex. a ticket to a sporting event as a call option) lead easily to the presentation of option pricing concepts using the binomial option pricing model. In Professor Strong's view, futures, forwards, and swaps are more difficult for a student to grasp and understanding is enhanced with earlier exposure to options.

Professor Goldenberg stated that he chooses to start with forwards because they "are nice linear instruments."[13] After the introductory chapter, his textbook dedicates three chapters to forward contracts before moving into futures with their "added institutional complexity" and options. He suggests that a firm footing with the forward contracts prepares students well for later exposure to futures and options. He also noted that payoff profit profiles can be very effectively introduced with forward contracts.

As discussed earlier, there is a potential problem in attempting to use payoff diagrams as a basis for explaining the similarities between different types of derivatives. Specifically, the tendency for futures contracts to be closed out prior to maturity means that the payoff diagram for futures contracts should have the horizontal axis labeled as the futures price at close out – not the spot price of the underlying asset. (As noted earlier, this issue is further explored in the appendix.)

The sample textbooks were scanned for the use of payoff diagrams specifically for futures contracts. The results of this scan are presented in Table 4. While all of the textbooks presented payoff diagrams for options, and most presented payoff diagrams for forwards, only a single example of a payoff diagram for futures contracts was found in all of the texts. And, this single example, which suggested equivalence for futures and forward contracts, had an axis which was not precisely defined.

The authors of the textbooks were not asked specifically why they did not choose to use payoff diagrams for future contracts. However, given the common usage of payoff diagrams for both forwards and options, it seems likely that the virtual absence of payoff diagrams for futures must be associated with the complication discussed above – that is, the futures contract payoff depends on ending futures price instead of spot price.

The textbooks were also reviewed for their overview of the range of basic derivatives types in the introductory chapter. These findings are also presented in Table 4. With the exception of Goldenberg, whose text has no overview introductory chapter, each of the textbooks uses the same order of presentation in the initial overview as in the textbook overall.

Summary of Issues Considered

The issues raised in this paper should be considered when selecting a course layout or textbook for the introductory financial derivatives course. While an instructor can choose to cover chapters in an order different from the sequence presented in the textbook, care should be given to ensure that the any resulting gaps in the logic of presentation are accounted for in the in-class presentation.

The key issues raised involve the preferred order of presentation and the use of payoff diagrams and payoff functions to enforce the basic similarities between the various types of derivatives. Arguments can be

[10] Email from Raguh Sundaram, January 27, 2018.

[11] Email from Sanjiv Das, January 27, 2018.

[12] Email from Robert Strong, November 6, 2018.

[13] Email from David Goldenberg, November 4, 2018.

made that, theoretically, options may be more fundamental securities. But, it seems clear that in terms of student learning, the presentation of arbitrage pricing arguments is less difficult if done using forwards and/or futures. From this perspective, the earlier presentation of forwards and futures can actually support the later presentation of options. In addition, from a mathematical perspective, forwards and futures have more straightforward payoffs.

However, both graphical presentations and payoff functions are potentially problematic for futures due to their common early close-out. Because the basis (difference between spot and futures) is subject to change, the payoffs to futures contracts cannot be a strictly linear function of the spot price. This complicates any attempt to present futures as merely standardized, exchange traded forwards. And, this in turn complicates a presentation progressing from forwards, to futures, and then to options using the payoff for the three in either graphical or mathematical function terms.

If the instructor uses a graphical approach for comparisons, care must be given to either emphasize the assumption that the futures are held to maturity (when spot and futures converge) or to use the ending futures price in graphical presentations. The same care must be taken in strictly formulaic presentations as well.

Attention must also be given to the fact that options payoffs and pricing are considerably more complex than that for forwards and futures. Thus, they may require additional class time and higher level of student engagement. If options are presented later in the course after forwards and futures, then care must be taken that the main options pricing material is presented early enough in the course so as to avoid the end-of-semester bustle and resulting student distractions.

Finally, it should be noted that this discussion has focused on the introductory financial derivatives course. These recommendations do not necessarily hold for a more advanced course in which students already have significant exposure, and where the strictly theoretical considerations might be given more weight. In that particular setting, an options first presentation order could be justified – particularly if the discussion were to be taken to a detail level which would involve basic market theory (e.g., Arrow-Debreu securities).

Table 4: Textbook Introductory Chapter Coverage of Derivatives and Use of Payoff Graphs

Author	Overview Chapter	Derivatives Presented in Order	Payoff Graphs Presented in Order	Horizontal Axis Labels in Order	Use of Futures Payoff Graph in Futures Chapters
Chance & Brooks	1	Options, Forwards, Futures, Swaps	None	NA	No
Hull (Fundamentals)	1	Futures, Forwards, Options	Options	"Stock Price"	Yes*
Hull (Main)	1	Forwards, Futures, Options	Forwards, Options	S_T, "Stock Price"	No
Kolb & Overdahl	1	Forwards, Futures, Options, Futures Options, Swaps	None	NA	No
Sundaram & Das	1	Forwards & Futures, Options, Swaps	Forwards	S_T,	No
Strong	1	Options, Futures, Swaps	None	NA	No
Goldenberg	None	NA	NA	NA	No

* A single payoff graph equating forwards and futures payoffs with horizontal axis labeled "exchange rate" on p. 43

Concluding Recommendations for Instructors

This paper has discussed the order of presentation of material in the introductory derivative securities course. While at first glance, a particular presentation order might seem logically obvious, attention to certain real-world market details leads to pedagogical caveats. Further considerations arise from prevalent patterns of student engagement levels at different points in the typical one-semester course. And, significant differences in the overall complexity of different types of derivatives should be considered.

Given the factors discussed, it seems that a stronger case can be made for the presentation of forwards and futures prior to covering options than for the reverse order. Adhering to the pedagogical convention of moving from the simple to the more complex seems a stronger argument than either strictly theoretical development basis for ordering material or practical flow-of-semester considerations.

The finer detail of whether to comingle forwards and futures or to present them sequentially requires additional consideration. All but one of the textbooks in our sample comingles their discussions of forwards and futures.[14] This is particularly prevalent in terms of the pricing of forward and futures contracts due to the technical similarities in the pricing of the two.

Finally, we see great potential value in using payoff diagrams to visually emphasize the underlying similarities of the three major types of derivative contracts – at least in the initial, overview presentation. However, to avoid inadvertently establishing the grounds for later student confusion, the instructor must carefully consider the details of the payoff graphs used. In particular, certain assumptions[15] must be introduced in order for a direct comparison or overlay type presentation to be used. Then, in later more detailed presentations the assumptions made to support initial comparisons can be revisited and relaxed.

References

Chance, Don M., and Robert Brooks. 2016. *An Introduction to Derivatives and Risk Management*. Boston: Cengage.

Goldenberg, David H. 2016. *Derivatives Markets*. New York: Routledge.

Hull, John C. 2017. *Fundamentals of Futures and Options Markets*. Boston: Pearson.

Hull, John C. 2018. *Options, Futures, and Other Derivatives*. Boston: Pearson.

Kolb, Robert W., and James A. Overdahl. 2007. *Futures, Options, and Swaps*. Hoboken: Blackwell.

Kummer, Steve, and Chirstian Pauletto. 2012. "The History of Derivatives: A Few Milestones." *EFTA Seminar of Regulation of Derivatives Markets* 431-466.

Strong, Robert A. 2005. *Derivatives: An Introduction*. Boston: Thompson.

Sundaram, Rangarajan K., and Sanjiv R. Das. 2016. *Derivatives: Principles and Practice*. New York: McGraw-Hill/Irwin.

Weber, Ernst Juerg. 2008. "A Short History of Derivative Security Markets." University of Western Australia.

[14] Goldenberg alone dedicates multiple chapters to forward contracts before moving on to futures contracts.

[15] From earlier discussions, these assumptions are that the options in question are European style options and that the futures contracts are held until their maturity.

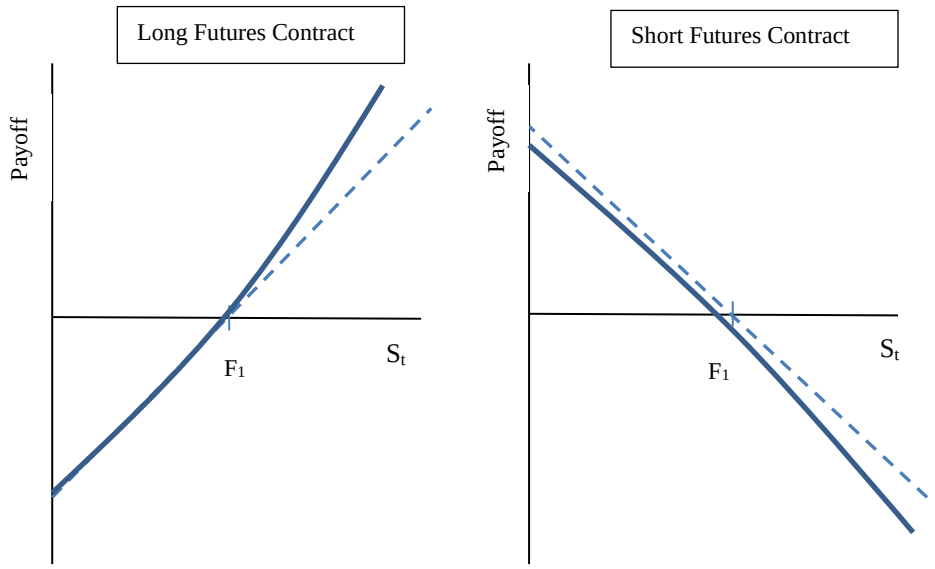
Appendix: Futures Basis Risk and Graphical Presentations

Because the typical futures market participant would close out his or her position prior to the earliest delivery window means that "basis risk" is an issue. The basis is the difference between the spot price and the futures price at any point in time. Because the futures price must converge to the spot price at the moment of maturity, the basis changes through time. It is this variability in basis which causes the payoffs to futures contracts to deviate from a linear function of the spot price of the underlying asset whenever a futures position is closed out prior to maturity. In effect, from a pedagogical perspective, the payoff is no longer a predictably straight linear function of the spot price. And, thus, the pedagogical progression of explanation is broken.

Because the basis ($S_t - F_t$) is subject to change, there is no constant proportion between the two prices (the spot price and futures price). Thus, it is not possible to describe the payoff to a futures position as a linear function of the spot price except at the very end of the contract. A simple two axis graph cannot properly describe the relationship, so the presentation must be more complex. If this issue is included in the initial introductory presentation, the student is likely to become confused rather than enlightened by a reference to the similarity of the fundamental payoffs.

Figure 5 depicts some potential relationships as a function of spot price assuming a changeable basis. The payoff (F_2 - F_1) would be a linear function of F_2. But since the basis is subject to both widening and narrowing, the payoff as a function of S_t could be quite variable and almost certainly would not be linear. This complicates the presentation and could largely destroy the value of stressing that futures and forwards are essentially the same.

Figure 5: Payoffs to Futures Contracts with Changing Basis



F_2 = ending futures price at position closeout date (uncertain)
F_1 = starting futures price (certain)
S = spot price at position closeout date (uncertain)
P = premium

Although there are recognized historical and seasonal patterns in the basis for a particular commodity, it is difficult to reliably describe the basis as a function of the spot price at any particular point in time – except at contract maturity (when the basis will be zero). Keeping in mind that graphs such as those presented in Figure 1 for forward contracts typically use the spot price at contract maturity, the complication for futures contracts closed out prior to contract maturity is readily apparent. In those situations the "ending" spot price would not be the end-of-contract spot price, but rather the spot price on the day on which the futures contract was closed out. Even if one could reliably model basis, a full presentation would require a three-axis graph.

At any point prior to maturity the basis is subject to a high degree of variability driven by seasonal changes in supply and demand along with various shocks and overall market conditions. These are in addition to the

relatively straightforward changes associated with the time value aspects as maturity approaches. The basis can either widen or narrow before maturity. Consequently, the basis could have a wide range of "functional" relationships to the then current level of the spot price. So, the payoff functions to the futures position could have a wide range of departure from the strictly linear presentation in a two-axis graph. These are the hypothetically representative non-linear functions presented in Figure 5.

Because no-arbitrage pricing relationships for futures prices imply constraints on the size of the basis, some general observations can be made. If we assume the no-arbitrage pricing relationship used for a no-income "investment asset" ($F_0 = S_0e^{rT}$), then the actual relationship would be curvilinear as is depicted in the long futures contract panel of Figure 5. If we consider the no-arbitrage relationship for a "consumption asset" with storage costs [$F_0 \leq (S+U)_0e^{rT}$], then the curvilinear relationship would be displaced by an amount equal to the present value of the storage costs "U" as is depicted in the short futures contract panel of Figure 5.[16] Including a "convenience yield," y, further elucidates the variability of the relationship [$F_0e^{yT} = (S+U)_0e^{rT}$]. Of course, if the no-arbitrage conditions do not hold, then an even wider range of relationships is possible.

[16] Investment assets are those which are held primarily for investment purchases by at least some market participants, whereas consumption assets are those held primarily for consumptions purposes. See Hull (2017, pp. 125-128) for a discussion of pricing differences.

The View from 30,000 Feet: Using Paper Airplanes to Understand Economic Modeling

Wayne Geerling, G. Dirk Mateer, and Brian O'Roark[1]

These airplanes we have today are no more than a perfection of a child's toy made of paper.
Henri Coanda

ABSTRACT

This paper describes an active-learning technique for teaching how models evolve over time. Models lie at the heart of economic analysis, yet many students struggle because they lack the spatial skills to interpret the models. We expand on the work of Geerling and Mateer (2014), who showed that using a paper airplane experiment in class was a great way of showing principles-level students how we build simple, yet effective models. What is less intuitive is that a paper plane experiment is also an ideal starting point to discuss how economic models evolve over time in an intermediate macroeconomics class.

Introduction

In this paper, we utilize paper airplanes to help learners understand how we create simple, yet effective models in principles-level classes, before extending this analysis to show how models evolve over time in intermediate macroeconomics. The activity can be completed in less than ten minutes and leaves a powerful impression in both small and large classes. Understanding how economic models are designed, the limitations of each model, and how well models work in the real world are some of the most important objectives in any economics course. This activity provides instructors with a simple and fun technique to ensure that learners understand the fundamentals of model building, and then extends the analysis by introducing more complex ideas and robustness suitable for an intermediate level macroeconomics class. We begin by surveying the literature before providing a brief summary of how this activity first evolved at the principles level. We then extend the analysis to the intermediate macroeconomics classroom. Finally, we provide some closing thoughts.

Literature Review

Becker et al.'s (2006) seminal work encourages instructors to drop "chalk and talk." Acchiardo and Mateer (2015) note that class activities create positive impressions about economic concepts that last far beyond the life of a course. Recent papers by Roach (2014), Balaban et al. (2016), and Wozny et al. (2018) suggest that in-class activities in a flipped classroom setting raise student performance on exams. These results provide evidence that learning by doing increases the efficacy of teaching.

More germane to the current paper, deploying paper airplanes as a learning tool is an example of active learning. According to Prince (2004, p. 223): "Active learning is generally defined as any instructional method that engages students in the learning process. In short, active learning requires students to do meaningful learning activities and think about what they are doing." Freeman et al. (2014) reported results

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from 225 studies across STEM disciplines, comparing results in classes that rely upon traditional lectures to those employing active learning. In general, students' average exam scores were shown to improve by around 6% in active learning classes. Additionally, students involved in a traditional lecture setting were 1.5 times more likely to fail as compared to those in classes with significant active learning.

The use of paper airplanes to teach basic physics is relatively commonplace. Educators have used different paper airplane designs to illustrate drag, gravity, thrust, and lift to teach aerodynamics.[2] Hello Learning (n.d.) prepared an especially useful guide that describes the scientific method by means of paper airplanes. Wild Child Designs (n.d.) created an extended mathematics lesson that uses paper airplanes to help students learn measurement and graphing. Each of these resources help learners understand the importance of model building in a science, technology, engineering, and mathematics (STEM) setting.

Economics is conducive to a STEM approach, but paper airplanes are rarely used to teach economics. Steiner and Fackler (n.d.) created an assembly line game to manufacture paper airplanes that is appropriate in K-12. While this activity focuses on specialization, division of labor, and marginal productivity, the airplane itself is not instrumental to learning the concepts. Geerling and Mateer (2014) directly apply the use of paper airplanes in their work, *The Ultimate Guide to Teaching Microeconomics*, a resource with over 500 teaching tips for creating an engaged classroom. The authors show how a paper plane activity can help illustrate the difference between endogenous and exogenous factors and why the concept of ceteris paribus is important in determining causation. Similar to work by Rutkowski et al. (2004), whose curriculum is designed for K-12 educators interested in teaching engineering, Geerling and Mateer's work highlights how iterative design helps model builders learn from the mistakes of early designs. Unfortunately, Geerling and Mateer's work is tied to a publisher's ancillary package, limiting its availability to most faculty. Our work takes this novel idea, expands upon it, and extends it to intermediate macroeconomics.

Principles of Economics

Geerling and Mateer's (2014) paper airplane experiment was first developed for a principles-level class to help provide students with an intuitive way of understanding how models work. When designing airplanes, engineers often build small-scale models to test how they fly without building full-size aircraft. Similarly, paper airplanes were used to illustrate the basics of model building in economics. Students design their own plane and try to hit a target, such as a trash can at the front of the room. This activity helps students who struggle to distinguish between: (i) endogenous and exogenous variables; (ii) causation and correlation. The design of a paper plane is endogenous – or built into the model. Example of endogenous factors include: wingspan, the type of paper used and the method of folding the paper. Exogenous factors affect how a plane flies, but lie outside the model itself. If the experiment is run inside the classroom, an example of an exogenous factor would be air traffic. A well-constructed plane will not hit the target if there are too many planes in the same air space. If flown outside, wind or precipitation would also affect the flight of a plane. The instructor can ask students to write an endogenous variable on the inside of their plane and an exogenous variable on the outside upon completion.

A classroom provides an ideal setting for a controlled environment, which will be used to determine the best model. In its simplest form, the experiment works as follows. Start by breaking the class into three groups: group one (the right-hand side of the classroom), group two (the center), and group three (the left-hand side of the classroom). Students in group one will stand up simultaneously and attempt to hit the target (trash can) with their plane. The instructor will then ask students in group two to make one change to their plane: folding back part of the left wing. The instructor might need to model this in front of the class with a plane flown by group one to ensure that the same change is made. This is introducing the concept of ceteris paribus: by altering one characteristic of each airplane, while holding everything else constant, an economist has the ability to determine how changes to basic model design impact performance. Ask for predictions on how the planes will fly before getting the center group to simultaneously fly their planes at the target. We now have a basis for testing whether the change to the model improved performance. Finally, with group three, the concept of ceteris paribus should be intentionally violated. Ask students to make three changes to the original design: fold back part of the left wing (like group two), bend down the front tip and tear off part of the right wing. When predictions on how the plane will fly are requested, there will be a range of weird answers, all negative. Students know their planes won't fly, which is inevitably true. What they can't explain

[2] http://www.greatpaperairplane.org/wp-content/uploads/Lesson-Plan.pdf

is what effect each of the individual changes had on how these model airplanes performed. There is no way of separating causation from correlation. This reinforces the idea that in economics, the objective is to build simple, yet effective models, and then change one variable at a time in order to understand what the model predicts will happen as a result.

Intermediate Macroeconomics

Paper airplanes do not only appeal to principles students. At the intermediate level, students will typically need to be reminded of the basics of modelling and the types of variables that will be utilized in a theory-based class; however, once the review is complete, the airplane analogy can be extended to more complex ideas, thereby increasing the robustness of the activity.

One of the most noticeable distinctions between macroeconomics and microeconomics is the diversity of opinion that has prevailed over time as schools of thought have arisen to explain macroeconomic phenomena. As a result, macroeconomic models have been particularly prone to falling out of favor as economic events overwhelm an acclaimed model's predictive power. While instructors of intermediate level material realize that models are updated as more data become available, as new insights arise, and as modelling techniques improve, students are likely to begin a class with the expectation that they will learn how the various macroeconomic pieces fit together for now and always. The extension that follows will help to allay that belief.

To begin, split the class into three groups, as described in the principles version of this exercise. As before, each student should be provided with a piece of paper from which to build a plane. This time however, two things should be different. First, begin with a less sturdy type of paper (paper towels work particularly well). Second, set the target very close to group one. Of course, this gives a decided advantage to that group. Most of the planes constructed by that group should have no problem hitting the target despite their flimsy construction. This means the target must be very, very close. Have the group choose its best plane which becomes the representative plane for the group. Unfortunately for the other groups, they are likely to have absolutely no luck in reaching the target.

At this point the grumbling from groups two and three is likely to be palpable, so take a minute to explain what this represents. In the development of macroeconomic theory, issues were initially answered by what has since been labelled the classical school of thought. The belief that government intervention was unnecessary, even detrimental, to the health of the economy, and that any economic malady would reverse itself *sans* policy, was the way of the world prior to the Great Depression (Smith 1776; Say 1803). In the exercise as constructed, group one is the classical school. They have hit the target with the policy airplane and while there are voices on the periphery, what they have to say about the health of the economy, in terms of their theories, are essentially irrelevant. However, the Great Depression is coming, and things are about to change.

To reflect this disruption to the status quo, move the target closer to one of the other groups. This simulates the inability of the dominant models to explain and address the macroeconomic upheaval. First, have group one throw its plane and see how close it comes. The target should be far enough away so that group one can't make it, but close enough to group two that it is relatively easy for them to hit. Before group two throws, however, allow them to redesign their planes based on what they have seen work from group one. This illustrates that economists build their models based on those that have gone before. The new theories, in this analogy the Keynesian theory, builds upon the classical school and attempts to correct the failures of that model. Permit everyone in group two to throw a plane and choose the best of the lot to be group two's proxy. Now groups one and two should have a plane, while group three is still trying to determine which is best.

Now, it's group three's turn. Move the target once more. Place it far enough from groups one and two so that they will have an incredibly difficult time hitting the target, but not so close to group three that its members can easily hit it. Group three may see this as unfair at first but insist that they try anyway. Like the other groups, have them throw their planes and determine which is the best. Once that is done, provide them with a sheet of printer paper. They should replicate their design and try again. It should be much easier for them to hit the target even though it is a little further away. This change in paper illustrates how models not only improve and advance over time as we build upon what has come before, but it also shows that models become better as modelling ability progresses. Analogize the original model as a pre-macroeconomic data world, and the new plane as the post-macroeconomic data world. A model that predicts the health of an economy will be much more accurate with data as there is something to compare states of the world to, and

tangible targets to hit. Classical and early Keynesian models had no significant macroeconomic data against which to gauge their models; GDP in its modern form wasn't really invented until the mid-1930s, and the first U.S. GDP statistics weren't published until 1942 (Coyle 2014, p. 15). Even then, the data being collected was skewed by the dire economic conditions of the Great Depression and World War II. Allegorically, group three's model should be better because, as time has progressed, they have more tools to test and refine their models.

Now, provide all teams with the same paper, and allow them to add new "technology" to their models. Make paperclips, markers, and other weights of paper (for instance, construction paper, oak tag, or tissue paper) available to all teams. Allow them to choose only one item, but make sure there is enough of each item for every team to choose whatever they want.

After they have modified their planes, move the target equidistant from all teams and see who gets closest. Once a clear winner is determined, allow the other two teams to make a change to their planes. They can redesign the plane and trade in their "technology" for something else. Now, ask the losing teams to throw again. See how long it takes for the various teams to converge on a model idea. This is demonstrated when everyone chooses the same "technology" and basic plane design. This reflects how macroeconomic models take what works from other models to improve their own; yet, it also echoes the missive of Milton Friedman (1968, p. 15), who claimed "in one sense, we are all Keynesians now." However, even when a model becomes the dominant way of thinking, there will eventually be an economic event the model does not or cannot predict. Friedman (1968, p. 15) goes on to suggest that "in another [sense], no one is a Keynesian any longer. We all use the Keynesians language and apparatus; none of us any longer accepts the initial Keynesian conclusions." While one generation of macroeconomists might believe that a model has the answers to all the world's ills, the next may find it lacking.

The point of this advanced version of the paper airplane experiment is to show intermediate macroeconomics level students how models evolve over time. Whether it is the Solow model, which adds components to the list of explanatory variables to improve its predictive power, models of inflation that are impacted by the application of expectations, or the generalized equilibrium models of the classical, Keynesian and monetarist schools of thought, models change based on the successes of others, and the failures of one's own. Additionally, it is worth noting that correcting models during a shock is particularly difficult. Models evolve over time, and when a model fails to offer solutions to a problem, the transition to a better model does not occur overnight.

The groups in this exercise represent the schools of thoughts that the instructor will likely be addressing during the course. Sometimes those schools of thought seem to have it all figured out, but then the economy changes, a shock occurs – the target moves – and the models that had successfully explained economic changes are no longer able to do so.

Practical Application

After running through the exercise, randomly provide the following scenarios and policy reactions to see if students can determine the order of events. Do not tell them the name of the recession until they have them in the correct order. These historical economic episodes were all dealt with in very different ways even though they were all recessions. Based on the brief synopsis, ask students to talk about the different approaches to policy during these recessions, and what their reactions are. Do the policies make sense to them? As the observations are made, ask students if they have any insights as to which schools of thought fit with each situation. If this is done at the beginning of the term, students probably will not know much about different approaches to policy or the names of schools of thought. If necessary, offer some historical context and explain why these scenarios are answered by different schools (see Table 1). At the end of the exercise, be sure that students capture the relationship between the schools of thought and policy. These recessions can be described as follows:

- Policy during the Panic of 1893 was hands-off, as there were no real policy tools available. The classical school of economic thought advocated for minimalist intervention at the time, not to mention there was no sense of what a national policy could achieve.

- By the Great Depression, economic theory was beginning to evolve as governments adopted more activist policies. The slow pace of recovery and the severity of the downturn opened the door for new

ideas. The Keynesian school stepped into the void with its suggestions of counter-cyclical budgets and deficit spending.

- The economic malaise of the 1970s was not corrected by Keynesian policy in large part because the source of the downturn was not based on aggregate demand, which the Keynesian models were built to address. Monetarist policy-making initiated a more significant role for the Federal Reserve.

- The Great Recession was described by many economists as the worst economic catastrophe since the Great Depression. Keynesian models of deficit spending were once again on display as fiscal stimulus was adopted. However, the Fed also added to the stimulus following the monetarist playbook of flooding the economy with liquidity. This crisis is a little trickier to identify as being addressed by one of the prominent schools of thought, which is yet another illustration of how models, and the policy that results from those models, change over time.

Table 1: Historical Episodes

Name /Date	Scenario	Policy Reaction	School of Thought
Panic of 1893	After years of slowing growth accompanied by the bankruptcy of the Reading Rail Road, a run on the banks occurred. Unemployment rose to over 10%.	No monetary policy could be conducted because there was no central bank, and the federal government lacked the power to tax income, so no policy was adopted.	Classical
The Great Depression	A massive run up in stock prices combined with terrible trade policy, weak monetary policy, and other economic maladies resulted in a cataclysmic failure felt around the world.	After a number of years, the federal government began spending like it never had before.	Keynesian
Early 1980s recession	Stubbornly high inflation and high unemployment (known as stagflation) left policy makers scratching their heads. The Iranian Revolution led to a decrease in oil supplies; the Fed, now an accepted institution, attempted to rein in inflation, but was not taken seriously. Standard policy had no effect.	Strident contractionary monetary policy was adopted to slow the rate of inflation.	Monetarist
The Great Recession	Exuberant lending, sketchy financial instruments, and regulatory mismanagement caused the housing bubble to burst. This resulted in the near collapse of the financial sector. Unemployment skyrocketed and GDP plummeted.	Massive fiscal and monetary stimulus was adopted in an attempt to prevent what was predicted to be an economic catastrophe.	Keynesian/ Monetarist

These episodes, and their admittedly brief explanations, provide an introduction to schools of thought and tie the paper airplane exercise to some actual events which illustrate why new models rose to prominence, while others faded into the background, waiting for a reboot.

Post-Script

Students have found that this exercise provides them with a reference to modelling when, later in the term, models become more complex. While the exercise is never replayed for lack of time, it does provide a helpful reference point. Students certainly appreciate the illustration and recall it fondly on end-of-term evaluations. Depending on the weather and size of the classroom, this exercise has been conducted outside (the weather variable being a clear illustration of an exogenous variable) and in the halls. Students on their way to other classes have stopped to watch. Intermediate macroeconomics isn't the most sought-after class on campus, but when paper airplanes are being thrown, passersby become curious. They have even been heard to say "I wish we did this in class." Anecdotally, students have commented on it many semesters later. They certainly do not recall every point about the exercise, but they do seem to remember that building paper airplanes and macroeconomics go together.

Conclusion

Students often miss the big picture. Modeling with airplanes helps students understand how models are designed (the on-the-ground view) and how they are deployed during times of recession (the view from 30,000 feet). Models are the basic tool of economic analysis, yet students can find themselves lost in the jargon we take for granted. One way around this is to use teaching aids that are familiar to students (O'Roark 2017; O'Roark and Grant 2018). This puts students in a setting where they are tethered to something recognizable. From the earliest days in school, students have had at least a passing familiarity with paper airplanes, making them a perfect starting point to discuss models. Paper airplanes are certainly not the real thing, but they approximate something real, just like our economic models. As we have shown, paper airplanes and variations of paper airplane construction allow us to demonstrate basic model building along with more esoteric notions about the progression of models over time. We hope that by adopting an interactive exercise such as this, teachers may yet see the value in allowing paper airplanes to fly around their rooms.

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The Second-Generation Theory of Fiscal Federalism: A Research Lesson from the Classroom

***Giampaolo Garzarelli*[1]**

ABSTRACT

The second-generation theory of fiscal federalism (SGT) ought to more explicitly consider intergovernmental grants in order to continue to be a progressive research program. This proposition, which emanates from scope economies between teaching and research, implies that at present: (1) first-generation theory of fiscal federalism (FGT) and SGT concern two different organizational phases of a federation; (2) we analytically need both phases; and (3) FGT and SGT are also both still needed, at least as much as they still need each other. Taken together, (1), (2) and (3) outline a promising research path – a positive heuristic – for the SGT.

Introduction

A classic question in the economics of education concerns the existence of scope economies between teaching and research (e.g., De Witte et al. 2013). Is there a teaching-research learning nexus?

In terms of novel knowledge from research making its way to the classroom, matters are fairly trite. The opposite – having new research ideas or intuitions from teaching – less so. This article reports one instance of scope economies between teaching and research directly from the classroom. The instance regards new research insights gained from teaching two approaches for the study of fiscal federalism – namely, first- and second-generation theories of fiscal federalism (henceforth FGT and SGT).

The lesson learned from the instance can be summarized as follows. Motivated by preference revelation issues, the FGT considers that a federation is already in place and focuses on the internalization of externalities among federated states through intergovernmental grants. The SGT instead concerns why one should opt for fiscal federalism in the first place by trying to establish, mostly on organizational grounds, an incentive motivation for decentralization. The SGT does consider externalities, but does not explicitly consider the related role of grants. This means that there is hitherto no (or very little) normative overlap between the FGT and the SGT. I therefore ultimately suggest that in order for the SGT to be a progressive research program there should be normative overlap: the SGT ought to consider the role of grants.

My suggestion resonates with Oates (2005). However, given that my main source of inspiration is the classroom rather than the library, my reasoning differs from that of Oates on two main accounts. My reasoning is pedagogical in origin. This implies that it is more stylized, involving some degree of simplification and judgment, but not for this reason losing the essence of the original theories. More substantively, my reasoning is on the net more organizational too. It is closer in spirit to the SGT than to the FGT. These two reasoning differences allow me to assert that at present: (1) FGT and SGT concern two different organizational phases (or moments) of a federation; (2) we analytically need both phases; and (3) FGT and SGT are also both still needed, at least as much as they still need each other. Taken together, (1), (2) and (3) outline a promising research path – a positive heuristic – for the SGT.

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The Lesson

Experience from teaching both undergraduate and graduate public economics for more than a decade (and in different continents) suggests that it is fruitful to be actively dialectical. I mean this in two senses. The first is the sense that should be familiar to most: the Socratic method or maieutics, where we engage in debates with students in the hope to stimulate interest, critical thinking, material retention, and additional insights. The second sense concerns how we lecture the topics. I began by teaching the FGT and then considering the SGT – i.e., I proceeded chronologically rather than dialectically. After some trial and error, in subsequent generations of classes I switched to teaching FGT and SGT together, but in juxtaposition to one another in terms of different assumptions, motivations, origins, problems explored, and the like. Relatedly, the teaching benefited from using elemental organizational reasoning as the common expository denominator for both. More precisely, given its more mature status, I found it convenient to illustrate the arguments from the perspective of the FGT while at the same time employing, as proposed by the SGT, an organizational lens. The dialectical nature of lecturing through an organizational lens ultimately allowed for more informative analytical comparisons. In particular, it is what added value in terms of informing my research lesson from the classroom – and, consequently, also permeates what follows.

FGT and SGT: A Quick Overview

The FGT mostly originates from the public finance framework presented in the classic works of Arrow, Musgrave, and Samuelson. It is essentially a (Pigouvian) framework that deals with benevolent social planning, market failure, Musgrave's three functions of government, Samuelson's equilibrium condition with private and public goods, welfare theorems, etc.

The motivational pillar of the FGT is the conviction that fiscal decentralization solves the knowledge problem tied to the nature of public goods. That is, the partitioning of fiscal responsibilities among levels of government offers an efficient solution about how to supply a good that because of its nonexclusivity and nonrivalness does not encourage the spontaneous revelation of individual preferences (Oates 2011).

The SGT, as hinted at the outset, proposes the inclusion of insights from the theory of the firm or, more broadly, the modern economics of organization (Gibbons and Roberts 2013) to study decentralized intergovernmental fiscal relations (Qian and Weingast 1997). Though the SGT is still-emerging – and embeds different interests and approaches, e.g., the trade-off between policy design and rent-seeking as an incomplete contract problem (Seabright 1996), policy experimentation by viewing a federation as a laboratory (Garzarelli 2006), and incentive alignment between consumer-voters and elected officials as in a common agency model (Tommasi and Weinschelbaum 2007) – it has one uniting assumption that explicitly sets it apart from the FGT. That is to say that the organization of multilevel government should not be a matter of indifference in public economics. The baseline view is that different organizations have different welfare consequences.

Note that proposing this view is not tantamount to asserting that the FGT (as we will see more clearly as we proceed) denies that decentralized public sector organization, especially of the vertical type (e.g., Oates 1999), matters. Rather, the SGT is trying to define a *theoretical* research program that the FGT lacks. The point is not just to recognize that organization matters, but to see what an explicit application of economics of organization theory can add to the field of fiscal federalism. Recognition of organizational importance is insufficient if one still considers the public sector as a black box in scientific practice.

The SGT presents some overlap with political economy approaches, most notably Public Choice and Political Economics (Oates 2008). The overlap concerns the interest in aligning political incentives. For example, how decentralization of fiscal functions can improve political accountability (such as limit capture, clientelism, and shirking), and, more generally, reduce the political taste for excessive budget relaxation (e.g., Rodden et al. 2003) that can lead to Leviathan (Brennan and Buchanan 1980).

However, there is a basic difference between the SGT and political economy approaches. When performing comparative institutional analysis, political economists mostly allow for rent seeking considerations. Without negating self-interest, the SGT is instead also interested in studying positive incentives: those incentives that create value by means of trial and error learning, such as those that channel individual curiosity, initiative, and energy towards the exploration of novel policy solutions (Callander and Harstad 2015). This "muddling through" (Lindblom 1959) view to policymaking (and to other productive human action), means that the SGT is closer in spirit to the work of new institutional economists rather than to that of political economists (Garzarelli and Keeton 2018). The reason is that the new institutionalists allow

for the consideration of both value creation (positive incentives) and rent seeking (negative incentives) when assessing feasible institutional alternatives (Bates 2014). Most notably, think about the work of Douglass North and collaborators, which, while owing to (positive) political economy, especially Public Choice, considers both incentives (North et al. 2009).

The FGT and the SGT therefore originate from different traditions – public finance versus economics of organization – and have different motivations – knowledge versus (positive and negative) incentives – for fiscal federalism. So much for differences between the two; what about points of tangency?

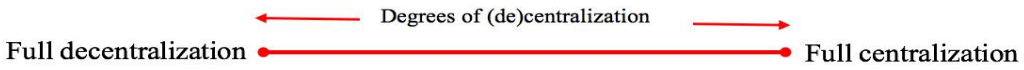
Positive Overlap

This question can be answered both positively and normatively. More or less explicitly, a part of the literature acknowledges the positive tangency point. It is the belief that public sector governance is not just about mutually exclusive positions. Public governance does not merely regard centralization or decentralization. Rather, it equally regards all the positions in between, from less to more (de)centralization. Public governance is a spectrum.

For the FGT, one can trace back the governance spectrum to Oates (1972), and as a result virtually finds it within the entire theoretical edifice of the FGT. For the SGT, the work of, e.g., Garzarelli (2006) and Weingast (2009) embeds the spectrum. Other related contributions endogenizing the spectrum are, among others, Breton (1996), Inman and Rubinfeld (1997), Cooter (2000), and Buchanan (2001, pp. 67-89). Political economics recognizes the existence of the spectrum as well (e.g., Lockwood 2002; Besley and Coate 2003; Luelfesmann, et al. 2015). Yet, the majority of the SGT and related work leaves the spectrum exogenous in practice; more precisely, it considers externalities, but does not sufficiently study grants. This is the major theme behind the lesson of this article that we will return to when dealing with the normative overlap.

From the perspective of the positive tangency point, then, centralization and decentralization are just two ideal-typical extremes of a public governance spectrum about the division of labor of fiscal responsibilities among a state's levels of government. Place full centralization at the right extreme. This is zero fiscal devolution – just one government at the central level, no local ones. At the left extreme place full decentralization. This is fully autonomous fiscal devolution; think, as the most extreme case, of governments belonging to different nation-states. See Figure 1. The two ideal-typical extremes can at times be inclusive. Think about the dissolution of many European states (Yugoslavia, USSR, etc.) that after the fall of communism led to new, autonomous states with new forms of governance (even if many of these states were purportedly politically federal, their governments all practiced economic central planning); or about the idiosyncratic EU that, from its ongoing process in the opposite direction (from autonomy to increased centralization), now could be interpreted as lying somewhere within the extremes.

Figure 1: A Positive Public Governance Spectrum



Factually, however, the majority of governance is internal to the extremes. Most economies defining themselves as unitary in reality fiscally lie inside the extremes, not genuinely coinciding with the right-hand one (e.g., Breton 2000). For example, France and Japan would be very close to the latter extreme, but Italy and South Africa less so; while over the years Belgium growingly moved from being close to this extreme to ever-increasing decentralization. The same holds for federations. Canada and the United States, for instance, can be considered closer to the left-hand extreme than, say, Switzerland. In short, no matter the de jure public governance, from a positive viewpoint, de facto, one mainly faces degrees of (de)centralization.

To sum up, the positive tangency point between FGT and SGT considers available governance, namely the spectrum of Figure 1 as the set of governance 'equilibria.' What is not yet clear is if there is also a normative tangency point between FGT and SGT.

Normative Overlap

The normative tangency point regards the relatively better governance given the available governance repertoire. That is to say that the basic interest is with the economic policy choice about 'optimal' fiscal

decentralization along the spectrum of Figure 1.[2]

No one explicitly seems to have pointed out that the often-invoked Decentralization Theorem is *only one of two* complementary policy reference points found in Oates (1972). The theorem regards what we may think of as the most general normative choice: the decision about policy direction, not the extent of (de)centralization. It prescribes that "in the absence of cost-savings from the centralized provision of a" local public "good and of interjurisdictional external effects, the level of welfare will always be at least as high (and typically higher) if Pareto-efficient levels of consumption of the good are provided in each jurisdiction than if *any* single, uniform level of consumption is maintained across all jurisdictions. In this way the [Theorem] establishes, in the absence of other kinds of offsetting benefits from centralized control, a presumption in favor of decentralized finance" (Oates 1972, p. 54, original emphasis; see also p. 35). Hence the theorem represents "a straightforward normative proposition" (Oates 1999, p. 1122) about why one would fiscally decentralize in the *first place*.

To recast the point in organizational terms, the theorem's policy guidance is the selection of the *overall normative governance strategy*. If one exogenous variable is cost of public good supply and the other is amount of preference idiosyncrasy of public good demand, then the governance strategy hinges on the following logic. If there are economies of scale benefits from centralized supply notwithstanding local consumption of the public good, then direct toward centralization. Decentralization should be approximated the more local preferences are variegated, and the more these variegated preferences sort themselves into homogenous groupings.[3]

The purpose of the theorem therefore is to inform about the route to travel within well-defined fiscal governance constraints (the feasible governance equilibria of Figure 1), but not about the destination (an equilibrium governance from the feasible ones of Figure 1). In other words, by limiting the space of policy choice only by difference does the theorem also delineate a normative fiscal governance spectrum.

The theorem's prescription – the governance strategy – naturally begs the question of what makes fiscal federalism self-sustaining according to the FGT. How does federalism survive on a daily basis? The answer to this question pivots on the complementary, more tactical FGT policy reference point.

The FGT theoretically rests on governance with at least two levels of government: central and local. The benevolent central government (or planner) deals with distribution and stabilization, and supplies national public goods (e.g., common defense, foreign affairs). The (also benevolent) local government instead deals with local public good allocation in the attempt to more precisely satisfy different dispersed preferences. But local governments could fail to coordinate in order to correct spillovers among their jurisdictional boundaries (adapt different standards, leave economies unexploited, pass conflicting laws, etc.). The central government, however, never fails, saving the day with appropriate spillover internalization through coherent, locally targeted policy (e.g., Inman and Rubinfeld 1997, pp. 45-48). It thus corrects for interjurisdictional spillovers from local public goods through matching grants (Pigouvian unit subsidies); the greater the extent of the spillovers, the greater the extent of direct central intervention through grants (the larger the unit subsidies), and vice versa.

This second policy reference point entails the following proposition.

> FGT PROPOSITION. The costs (benefits) of preference matching from (de)centralization increase (decrease) as the extent of interjurisdictional spillover falls (rises).

The proposition can be visualized readily in $\mathbb{R}^2$ as an inverse relation between preference matching and externality internalization. Thus, the normative FGT governance relation depicted by Figure 2 synthesizes the notion that externality internalization more likely occurs towards centralization, and the converse, that preference matching more likely occurs towards decentralization.

[2] An optimal policy is such in at best a second-best sense; in a first-best world, decentralization would not be necessary (e.g., Tresch 2015). One intriguing scenario is that perhaps the best second-best world is a decentralized one with many specialized governments in the same state where then the individual would necessarily belong to as many governments that are needed to satisfy her preferences (Tullock 1969).

[3] Parenthetically, it is from the latter demand consideration dealing with a sort of roundabout Tiebout (1956) effect from which springs the theorem's necessary toll – inspired by de Tocqueville (1990[1835], Ch. 8, pp. 163-164) – that centralized public good supply is uniformity. All else equal, the theorem in fact postulates that the more preferences are variegated, the more a uniform central supply will dissatisfy. Other work, however, argues that the assumption that the cost of centralization is policy uniformity need not be necessary (e.g., Lockwood 2002; Besley and Coate 2003).

Figure 2: FGT Normative Governance

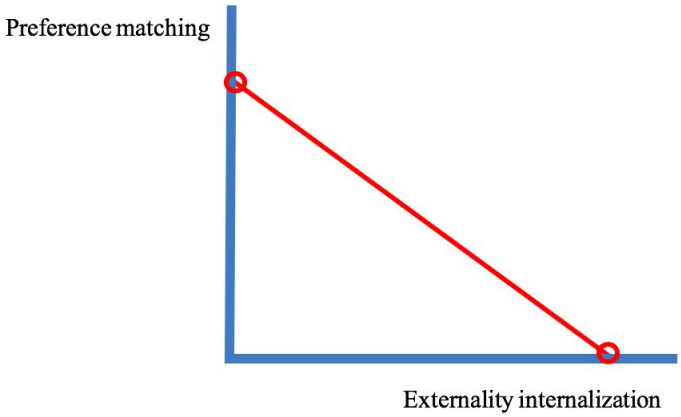


Figure 2 is one (heuristic) way to translate the positive spectrum of Figure 1 into FGT normative terms. In point of fact, the normative governance relation is also a spectrum, moving from more to less decentralization as we go from northwest to southeast. The movements along the relation are from central Pigouvian subsidies. For example, a point on the relation close to its southeast neighborhood implies a high-level central subsidy; while a point by the northwest neighborhood implies the opposite. This reasoning leads to the following corollary.[4]

FGT COROLLARY 1. The extent of (de)centralization is (inversely) proportional to grant amount: the higher (lower) the grant amount, the higher the (de)centralization.

The polar extremes are here recognized but excluded, even ideal-typically; otherwise, the normative foundational trade-off at the root of the FGT would be absent. In the case of the *x*-intercept, we would see perfect externality internalization, but no local government, as preference matching would be absent. In the case of the *y*-intercept, we would see a perfect preference matching, but no role for central government, as externality internalization would be absent. Both polar cases would not do justice to the raison d'être of the FGT: the assumption of the existence of at least a two-level decentralized system of public governance in order to work out the arrangement of fiscal responsibility within it.

An additional consequence of the discussion then is the following corollary.

FGT COROLLARY 2. The polar extremes of the normative relation are not a policy choice, irrespective of the (minimum two) given levels of governance.

Is there a relation between these FGT normative considerations and the SGT? The short answer is: partially, as one would expect given the different analytical interests of the two theories. But the relation can be rendered both clearer and more complementary – as long as we continue to reason organizationally.

Recall that the Decentralization Theorem proposes that given a pure public good that is consumed by a number of non-homogenous local jurisdictions but absent centralized cost-savings and interjurisdictional externalities, differentiated decentralized provision should be favored over uniform centralized one. Further recall that the FGT, when the theorem *does not hold*, has a role for intergovernmental grants in terms of internalization of interjurisdictional externalities.

When put in these terms, this observation follows: theorem and grants can be seen as solving two different kinds of governance problems. The theorem is originally in place to solve the preference revelation problem through public sector fiscal decentralization, while grants are in place to allow an already fiscally decentralized public sector to adapt through time.

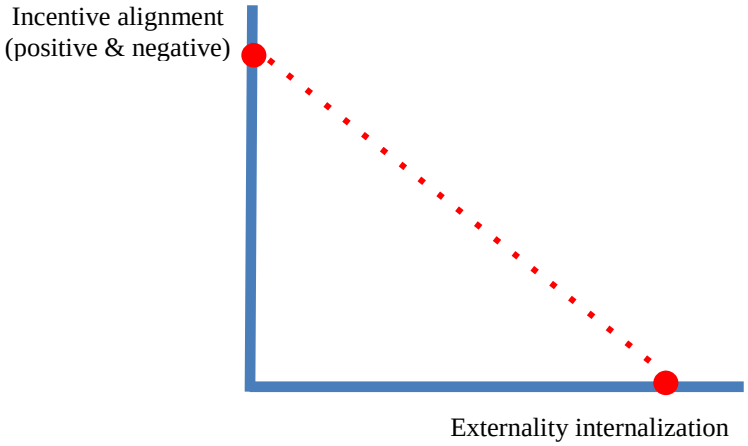
The SGT is mostly silent when it comes to a role for grants. However, one can infer that, just like the FGT, it recognizes a minimum of two levels of government. While the FGT implies that central and local

[4] A more elaborate discussion would also account for grant conditionality, but, with refinements, the reasoning would still hold (Garzarelli and Keeton 2018).

government are both benevolent social planners with no organization of relevance, the SGT suggests that government, no matter the level, is an imperfect organization given human fallibility (political motivations are often expedient rather than for the public good, policies are muddled through rather than optimized, etc.); and that is why one should decentralize irrespective of preference revelation (for political accountability, for policy experiments, etc.). Yet little is said in terms of economics of organization theory once decentralization is in place.

There are currently just two SGT normative public sector governance equilibria, which are mutually exclusive; a normative governance spectrum is absent. Figure 3 represents a possible rendering of this assertion in the same (heuristic) spirit of Figure 2. The dotted line means that, even though externalities are acknowledged, the corresponding normative governance relation that leads to organizational adaptation through grants is weakly defined or inexistent. In practice, at present there is only the binary organizational choice about centralization and decentralization of the public sector, which is indicated by the two filled dots placed on the axes. The dot on the abscissa stands for complete centralization (in the presence of interjurisdictional spillovers), while the one on the ordinate stands for complete decentralization (in the absence of interjurisdictional spillovers).

Figure 3: SGT Normative Governance



We come now to our final proposition, which can be stated from the perspective of both SGT normative choices.

> SGT PROPOSITION. The governance benefits of positive and negative incentive alignment are present (absent) with complete decentralization (centralization), or, equivalently, the governance benefits of interjurisdictional spillover internalization are present (absent) with complete centralization (decentralization).

Therefore, the SGT normative governance trade-off – differently from the FGT one – is at present one of kind, rather than of degree. This difference originates mostly because the two theories focus on two different governance phases of fiscal federalism. The two phases are not organizationally incompatible. Quite the opposite is the case. As will be clear before long, they have yet to be considered in tandem. It is up to the SGT to pick up the challenge.

Heuristic (Added) Value: A Research Path

The research lesson learned from teaching – that the SGT needs a more explicit treatment of grants – should not be accompanied by negative undertones. Recall in fact that the SGT is still an emerging research program. This means that it can easily accommodate a variety of research issues. By way of a conclusion, we shall delineate the organizational contours of a research issue more directly related to our lesson; refer to Garzarelli (2018) for an elaboration.

At its most elemental, as pointed out earlier, one can think of the problem of economic organization as being composed of two phases: first, the fixed cost of designing an organization, and, second, the variable costs of keeping an organization afloat. In our more specific context, the first phase can be likened to the so-called assignment problem of fiscal federalism. In this phase, one tries to determine which level of government should do what in terms of Musgrave's three functions of allocation, distribution, and stabilization. The typical outcome is that local governments should deal with allocation and central government with distribution and stabilization. Though the outcome is most often justified, even implicitly, in terms of the FGT motivation, the SGT motivation is not incompatible with it, and in fact can be seen as being complementary: the organizational nuance that the SGT introduces is that this first phase can be interpreted as dealing with the assignment of property rights over different types of policies to different levels of government. That is to say that, to borrow an expression from political science, we can think of this first phase as being about constitutional engineering.

By determining what level of government is responsible for what in terms of most general property rights to policy, the first phase effectively also gives legitimacy to the second. For example, the property rights to locally or centrally provided health care, education standards, environmental management, and the like commonly also fall within the first phase. But the details about how to design the relevant policy agencies (to stick to our example, the health, education, and environmental ministries) are left for the second, post-constitutional phase. The same holds for the more specific rights tied to day-to-day organizational adaptation, namely rights to policy design are also left over or, if you like, emerge by difference as needed. For instance, in the presence of a poorer municipality (a negative externality), we know from the first phase that the central government would usually hold the property rights to disburse an equalization grant to try to level the supply of public goods among all municipalities. But the design of the grant formula, a specific right that is often effectively in the domain of intergovernmental fiscal relations, is a second phase matter. The point to underscore is that the variable costs attached to these and similar survival practices should be the bread and butter of an organizational approach to fiscal federalism as well.

How can one go about considering both fixed and variable costs from a SGT perspective? One way to bridge the analysis of these fixed and variable costs through the economics of organization is to reason according to transactions (Breton and Scott 1978). Transaction costs and property rights are, after all, two faces of the same coin – they cannot be meaningfully separated. Just like in "the world of Robinson Crusoe property rights play no role" (Demsetz 1967, p. 347), so transaction costs "must be defined to be all the costs which do not exist in a Robinson Crusoe economy" (Cheung 1998, p. 515). Moreover, it can be convincingly argued that the original governance approach of Coase (1937), from which virtually all modern theories of economic organization spring, embeds both fixed and variable transaction-cost analysis (e.g., Allen 2000).

The upshot is that the SGT scholar would not need to reinvent the wheel to begin exploring the two organizational phases of a decentralized public sector. One nontrivial research issue would be to explore in SGT terms the received FGT notion that when there is a local interjurisdictional externality, the central government must perform internalization – i.e., the question of whether it is necessarily the case that central government is the only organization with property rights to externality internalization. If one performs comparative (variable) transaction-cost analysis in the second phase, then it may be that in some cases top-down vertical internalization may be more costly than horizontal, autonomous intervention; a result favoring the attribution of property rights to externality internalization to one of the local governments that are directly involved. In terms of Figure 3, this would mean that the spectrum would become populated not just, as mainly implied currently, for reasons of top-down vertical internalization, but for reasons of horizontal and bottom-up vertical internalization as well. Clearly, the outcome of the comparative calculus determining the nature of internalization would also be influenced by how the federal structure is designed in the first phase, which is also an issue involving transaction cost considerations, albeit of the fixed type.

Take note that this is not synonymous with the naïve position advocating outright a sort of Coase Theorem equivalence principle for the public sector, such as the so-called Federal Coase Theorem (correctly) critiqued by Cooter and Siegel (2010). The position being advocated here is more sophisticated. It is informing us that the first phase of design is as fundamental as the second phase of adaptation, namely that, to be a progressive research program, the SGT needs Coase (1937) as much as Oates (1972) *and* Coase (1960).

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Adam Ruins Everything, Except Economics

***Jadrian Wooten and James Tierney*[1]**

ABSTRACT

Adam Ruins Everything is a self-proclaimed "half-hour informational comedy show" that appears on truTV. The main goal of the show is to take topics and discuss how they are not as great as one might expect; for example, gift giving. In doing this, *Adam Ruins Everything* touches on many economics topics that are relevant to introductory-level courses. This paper provides a comprehensive analysis of the television show *Adam Ruins Everything* to aid instructors interested in adopting television clips into the classroom.

Introduction

Over the past decade, resources have been developed to make the economics classroom more engaging with research and tools developed around music, movies, television shows, and sports. The end goal of most projects is to increase students' understanding and interest in the material. While these resources are available for implementation, faculty are not necessarily willing to abandon traditional lectures in favor of these new approaches (Goffe and Kauper 2014). Using data from an ASSA conference, researchers found that around two-thirds of faculty continue to deliver a standard lecture either because they felt it was the best method or because it was cost-effective. One fear of adapting new teaching methods was that the time spent preparing new delivery techniques could be best utilized elsewhere. By providing an episode-by-episode breakdown of the major economics topics covered, the resources outlined in this paper may alleviate some of the hesitation of devoting time to implementing additional media into the classroom.

This article provides a comprehensive analysis of the television show *Adam Ruins Everything* to aid instructors interested in adopting television clips in the classroom. *Adam Ruins Everything* debuted in September 2015 on truTV as a self-proclaimed "half-hour informational comedy show" (Conover et al. 2016). The original concept for the show was based on a web series by host Adam Conover and CollegeHumor. While Adam is the main host of the show, each episode includes guest appearances by actual researchers, scientists, professors, and even economists.[2] Character actors on the show portray Adam's friends, friends of friends, partners, and siblings.

The show has two overarching features that make it an interesting application for the economics classroom. Whether the goal is to introduce new topics or connect material across topics, *Adam Ruins Everything* serves as a bridge that brings "real life" economics into the classroom in short segments. First, each 22-minute episode is typically broken into three major segments that cover a commonly-held misconception that the host, Adam Conover, tries to debunk. Many of these segments are available on YouTube via the show's original producer, CollegeHumor, or its current television host, truTV. Starting in 2018, *Adam Ruins Everything* has been picked up selectively by Netflix,[3] while all episodes are available for purchase on Amazon, iTunes, and Google Play Store. An instructor would most likely use a segment, not the entire episode, to teach a lesson. The second benefit of using *Adam Ruins Everything* is the level of research that goes into an episode. While presented as an informational comedy show, the writers provide

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[2] Donald Shoup appears in episode 3: "Adam Ruins Cars" to discuss the economics of parking, Joel Waldfogel appears in episode 25: "Adam Ruins Christmas" to discuss the inefficiency of gift giving, Allison Schrager appears in episode 31: "Adam Ruins Art" to discuss art markets and auction houses, Penelope Prime appears in episode 37: "Adam Ruins the Economy" to discuss American manufacturing, and Teresa Ghilarducci appears in episode 42: "Adam Ruins the Future" to discuss retirement accounts.

[3] *https://www.adamconover.net/adam-ruins-everything-on-netflix/*.

on-screen citations for various claims made in each episode, which are available on the show's website.[4] Sources for each episode include a wide range of media including podcasts, government reports, peer-reviewed publications, magazine pieces, and news articles. Each episode also has citations for additional reading on topics that viewers may be interested in exploring. This allows instructors to show clips, but also follow-up by assigning additional reading.

We begin with a brief summary of the use of television shows in engaging students in the classroom, then provide background information on the show and discuss some of our favorite ways to implement media in the classroom. We then present four episodes from the show that detail a significant economic concept often taught in principles of economics courses along with a teaching tip.

Literature Review

At the turn of the millennium, Becker (2001) argued in *The Chronicle of Higher Education* that the economics curriculum needed to be overhauled because it was not appealing to the modal undergraduate student. He cited drops in the number of undergraduate economics degrees awarded as proof of a lack of student interest in the subject. Following a round of criticism by a set of highly-respected economics educators (Hamilton 2003; McMillin 2003; Hoyt 2003; Siegfried and Sanderson 2003; Watts 2003), Becker (2004) provided additional feedback about tailoring the economics curriculum to what he feels should be taught. The bulk of criticism against Becker's initial commentary focused on how instructors could work to improve their teaching and questioned whether instructors should be concerned about whether their field was "sexy" or not. A resonating point came in Hoyt's (2003) analysis that the "chalk-and-talk" method prevails because economists infer the benefits of changing their styles do not outweigh the costs associated with investing in new teaching tools, which is a sentiment echoed by Goffe and Kauper (2014) a decade later. However, other disciplines in the STEM field have embraced active learning techniques to enhance their lectures (Sax et al. 1999) even as economics has continued to resist.

Since the debate during the early 2000s, publications in economics education have focused on utilizing technology in lesson planning to improve content retention and interest. Whether it's a one-minute paper (Stead 2005), personal response systems (Elliot 2003), or a variety of alternative teaching methods (Becker et al. 2006), economics educators have spent a considerable amount of time developing resources to enhance the profession. It is not possible to determine whether the increased focus on developing resources has been the cause or the result of faculty using more alternative teaching methods since the mid-1990s. The median time devoted by faculty to teaching with traditional lectures has not changed from 1995 to 2010, but the average time spent lecturing has decreased by 8 percentage points. The median time spent teaching with media (films, movie clips, or DVDs) increased from no time at all in 1995 to 6% of the time in 2010. While the use of alternative teaching methods has moved in favor of alternative methods, the production of resources by researchers has also greatly expanded over the same time period (Watts and Schaur 2011).

The practice of using television clips in the classroom has boomed over the past few years, with clips directed at specific television shows like *Modern Family* (Wooten et al. 2020), *The Simpsons* (Luccasen and Thomas 2010; Hall 2014), *Seinfeld* (Ghent et al. 2011), *The Big Bang Theory* (Tierney et al. 2016; Geerling et al. 2018), *The Colbert Report* (Randolph 2016), *The Office* (Kuester et al. 2014; Kuester and Mateer 2018), *Parks and Recreation* (Conaway and Clark 2015; Wooten and Staub 2019), *Shark Tank* (Patel et al. 2015), and *South Park* (Hoffer and Crowley 2015). While there is value in using segmented clips to introduce or reinforce a particular concept, some of the value of the analysis may be lost when students miss backstories. Also, with traditional TV shows or movies, the actual concept may not be discussed, making it more difficult for instructors to connect the clip with the concept. On the other hand, many of the *Adam Ruins Everything* clips we discuss in this paper use the exact terminology used in common economics textbook while still presenting the material in an entertaining fashion. For example, in the episode "Adam Ruins Malls" (Conover et al. 2016), which is outlined in more detail below, Adam and Emily explicitly discuss the market power that Luxottica holds in the market for glasses and sunglasses:

> *EMILY: "80% of glasses and sunglasses brands are controlled by a single company, Luxottica."*

[4] http://www.trutv.com/shows/adam-ruins-everything/blog/adams-sources/index.html

ADAM: "But that would give them a virtual monopoly over the entire industry."

EMILY: "Bingo. And because they control the luxury brands and the cheap brands, they can charge whatever they want for either."

EMILY: "Luxottica uses that power to drive up the prices for everybody, sometimes charging as much as twenty times what they cost to produce."

While Emily's statement is not entirely accurate since monopolists cannot charge whatever they want, this quote gives instructors an opportunity to pose the issue to their students and have them respond with the correct process for monopolists selecting the price. Later in the same segment, the character representing Luxottica's CEO provides a more appropriate interpretation of monopoly pricing, quoting the actual CEO in that, "Everything is worth what people are ready to pay" (CBS News, 2014). This allows instructors to reference the process of monopolists selecting output based on marginal revenue and marginal cost, but using the demand curve to select the price since demand represents what people are willing and able to pay.

In addition, relatively few projects have taken full episodes and applied "big picture" topics or used entire shows to teach lessons. The most recent exception is Al-Bahrani and Patel's (2015) examination of economics themes in ESPN's popular 30-for-30 series of sports-centric documentaries. In *The Episodes, Concepts, and Clips* section of the paper we dive deeper into four particular episodes. Tables 1, 2, and 3 in the appendix outline each episode on a segment level and list the key relevant economic concepts. Table 4 sorts the list of episodes based on concepts that an instructor may be interested in covering.

While the literature on active learning and the use of videos in the classroom is sparse in economics, it has been shown that active learning increases student performance in science, engineering, and mathematics (Freeman et al. 2014). This comes as no surprise, as cognitive psychologists have formalized the concept of scaffolding, where you must build a structure of existing knowledge to hold more complex concepts (Van de Pol et al. 2010). We believe that the use of videos in the classroom that are already familiar to the students help in the scaffolding process and make the learning process more active than basic chalk and talk.

Pedagogical Approach

For shorter clips, like those found on show-specific websites or clip agglomerators (Mateer 2012; Wooten 2018), playing the clip in the middle of the class could serve to break monotony of a traditional lecture. Short clips could be used to segue between topics, move from theory to application, or preview an upcoming lesson. The authors routinely use shorter clips in a variety of ways to keep the use of clips from becoming repetitive. With *Adam Ruins Everything*, truTV has aided in the utilization of its shows by providing particular segments of each episode based on the topic covered in the clip. For example, in the episode "Adam Ruins Malls," the segments cover the history of malls and outlet malls, the regulation of nutritional supplements, and the market for glasses. On YouTube, truTV provides these three segments as separate videos that instructors can assign instead of assigning the entire episode.

Using media in the classroom is truly dependent on the instructor's comfort level, but does require some lead time regardless of familiarity with mode of instruction. Depending on the type of assessment, various lead times may be required of the instructor. Because the episodes contained here are comedy-based, it is important to establish the legitimacy of their analysis in an early section. This may be especially true for certain students (international students particularly) who are not familiar with satirical work. Before showing any clip, instructors must understand how the piece fits in their overall lesson and whether humor is an appropriate medium for discussing the topic at hand. Alderman and Popke (2002) used Michael Moore's *TV Nation* to introduce humor and film into a geography classroom in an attempt to have students answer broader questions. This springboard approach allows instructors to open with a series of clips from a common source over a topic interesting to students and then segue into a more thoughtful analysis in the classroom.

A creative end-of-semester assessment could involve having students research and "ruin" a commonly held notion around a particular topic. Students could work alone or in teams to form a central theme to their segments and then present their results using similar sources from the videos. Integrating active learning components into the classroom can take many forms (Al-Bahrani et al. 2016), and having students research

topics they find interesting and match the style delivered in these clips could help build a type of summative assessment.

The Episodes, Concepts, and Clips

The following episodes contain a few of the authors' favorite segments for teaching principles-level courses. We include a description of the overall story in the episode to give the reader a background, the topics and concepts covered, and one tip on how this concept could be used to engage students. In total, we have identified concepts for each of the show's episodes through the third season. Each show's topics are covered in Tables 1, 2, and 3 in the appendix.

Episode: "Adam Ruins Restaurants" (2015)

Veronica, Haylie, and Emily are eating at a nice restaurant, but before the bill is settled, Adam discusses the custom of tipping in the United States. He covers the history of tipping and wonders why the custom has persisted. The tipping portion of the episodes ends with the owner of California-based Brand 158 restaurant talking about its no-tipping policy. The second segment of the episode revolves around the decision of choosing an appropriate alcoholic beverage for dinner, specifically wine, and includes a discussion on the inability of 'wine experts' to tell the difference between certain wines. The last segment of the episode explores fish offerings at restaurants. Adam describes to the group the appropriate color of salmon, the mislabeling of fish, and the practice of renaming fish. The episode ends with Adam talking about the history of restaurants and how people can make their experience more enjoyable.

Concept: Wage Discrimination (4:25 - 4:55)

In the first segment of this episode, Adam covers the equity issue inherent in the United States' custom of tipping. One of the arguments in favor of tipping is that it serves as an incentive mechanism for improved performance, but Adam debunks that myth with the work of Lynn (2000), which showed that tipping was often random and great service was often rewarded with at most a 1% increase in the total tip amount. A follow-up issue presented is that tipping can lead to wage discrimination. Adam cites Brewster and Lynn (2014), which showed black servers were tipped less than their white co-workers regardless of the customer's race.

Teaching Tip: Pre- & Post-Clip Discussion

It is likely every student has encountered the experience of tipping. Most students have been in the role of deciding on how much to tip, but some students have worked as servers receiving tips. This personal experience should create an engaging discussion. When teaching about wage discrimination in the labor portion of a class, or when discussing unintended consequences, asking the question "Should tipping be illegal?" will certainly create discussion in the classroom. Once that discussion has finished, show this clip and reengage the students. After learning of the evidence presented in Brewster and Lynn (2014), and knowing wage discrimination is illegal, students should now be able to articulate why some believe tipping itself should also be considered illegal. The study, and concept, was also covered in a Freakonomics podcast (Lechtenberg 2013), which can be assigned as a post-class review of the material.

Concept: Overfishing and the Tragedy of the Commons (15:53 - 17:35)

Many students learn about the tragedy of the commons and overfishing in introductory microeconomics classes. This segment gives a real-life example of the negative consequences associated with overfishing. Adam explains how companies can legally decide to rename "trash fish" varieties in order to make them sound more appetizing. The reason this practice is so common is due to the tragedy of the commons and overfishing, concepts which are explicitly stated in the segment. Popular species of fish become depleted over time which forces restaurants to serve some fish that may not have previously been considered appetizing. As a final point, Adam's actual father, David Conover, a marine biologist at Stony Brook University, discusses the extent of overfishing by providing various statistics and ways viewers can help curb the overfishing problem.

Teaching Tip: Think-Pair-Share

Whether the clip is required as a pre-lecture assignment or is shown in class, a simple Think-Pair-Share

activity (Lyman 1987) can help make the concept stick with students. Students can be asked to name other examples of common resources they have seen victimized by the tragedy of the commons in their day-to-day lives. Responses will typically include examples like shared living spaces in their apartments or air pollution from cars on campus. Rao and DiCarlo (2010) note that peer instruction of this type that allows students to discuss what they're learning in relation to their past experiences helps students apply the material to their daily lives.

Episode: "Adam Ruins Malls" (2016)

Adam and Emily take a trip to their local mall to purchase some items for Emily's upcoming honeymoon, while Adam seeks a new pair of glasses. The first segment covers the history of malls and the marketing strategy of outlet malls; it focuses on how stores differentiate their own products by offering higher-priced items in their primary locations while selling a lower-quality version at their outlet stores. There is a short segment on the regulatory history of the supplements industry and how it differs from pharmaceutical regulation. The third segment of the episode has Emily explaining to Adam the breakdown of the eyeglasses and vision insurance industry.

Concept: Monopoly Power (13:45 - 18:30)

In the last segment of the episode, Adam learns about the monopoly power of Luxottica. Through vertical integration, Luxottica controls the majority of designs, manufacturing centers, distribution channels, and retail operations in the market. Luxottica also manages the second largest vision insurance company in the United States (Goodman 2014). Whether students are in the market for Oakleys or Ray-Bans, they are buying Luxottica glasses. If students expect to find competitive prices by shopping at LensCrafters instead of Sunglass Hut, they are still buying their glasses from a Luxottica-owned store. This market may be especially poignant for students who are in the market for prescription eyeglasses or designer sunglasses and would be more noticeable than traditional markets like De Beers' power in the diamond industry or OPEC's control over the oil industry, which are examples used in many principles texts.

Teaching Tip: Pre-Lecture Viewing

One way to prepare students for lecture is to require work before attending. We suggest using this segment as a pre-lecture assignment. In this segment, Adam explicitly states that Luxottica has a "virtual monopoly" in the industry and talks about how limited competition affects prices of products. By assigning this as a pre-lecture viewing, students will have been exposed to critical vocabulary before entering the classroom. Using a student response system (clicker) or through a learning management system, instructors can administer a short quiz to ensure students have watched the video before class.

Episode: "Adam Ruins the Economy" (2017)

Adam visits his friend Hank, a recently laid-off factory worker who is in the middle of filing taxes. In the first segment of the show, Adam explains the concept of the return-free filing system, where the government would complete a worker's tax return and then send the results to the worker. This system would allow workers to save time that is normally spent with tax forms or tax filing software. In the second segment, Adam and Hank discuss popular measures of the strength of an economy including the Dow Jones Industrial Average, the unemployment rate, and gross domestic product. The last segment of the episode discusses the history of manufacturing employment in the United States.

Concept: Rent Seeking (2:02 - 5:20)

In the opening segment, Adam presents the incentives of tax-filing software companies like TurboTax and H&R Block who lobby to ensure the tax return system is complicated enough that consumers will need to purchase software to complete their returns. While offering a free version for two-thirds of Americans, many more opt-in to the system because it makes filing a bit easier. Tax software companies lobby Congress to ensure a return-free filing system never becomes implemented for fear of losing market power.

Teaching Tip: Combine with a classroom game

Goeree and Holt (1999) argue that using classroom exercises alongside lecture and textbook reading has

the potential to increase interest about economic theory while simultaneously decreasing some of the skepticism around its application. The authors propose a simple classroom exercise which shows how rent seeking leads to inefficiencies. This clip can be used in conjunction with the Goeree and Holt (1999) in-class experiment to connect economic theory to real-life applications that students will encounter at some point if they had not already.

Concept: Unemployment (8:20 - 10:00)

In the second segment, Adam and Hank discuss what it takes to be officially classified as unemployed. While the show presents the unemployment rate (U-3) as a flawed number, it is careful to mention that the unemployment rate does not include many individuals that others might consider unemployed. For example, Hank drives for Uber a few nights per week, which disqualifies him from being classified as unemployed, but results in his actually being considered underemployed. Two other individuals in the episode are disqualified because they would be considered discouraged workers or because they earned just enough to be classified as employed.

Teaching Tip: Pre- & Post-Clip Clicker Question

Studies have shown the use of student response systems (clickers) enhance student engagement and learning outcomes (Mula and Kavanagh 2009; Premuroso et al. 2011). These systems provide immediate feedback for both the students and the instructor. For this concept, we suggest conducting a pre- and post-clip clicker question to gauge student understanding of the requirements to be classified as unemployed by the Bureau of Labor Statistics. Before showing the clip or beginning a discussion on the topic, survey the students on whether they believe they are unemployed:

"*According to the economic definition, are you considered officially unemployed?*"
A. Yes
B. No
C. Unsure

Record these percentages and show the clip from "Adam Ruins the Economy." After the clip finishes, but before beginning the discussion, re-poll the class with the exact same question. Responses will likely shift toward a more accurate response and hopefully lead to a healthy discussion on who is officially considered unemployed. This clip is a useful starting point because many students consider themselves unemployed despite the fact that they are not actively searching for a job as full-time students.

Episode: "Adam Ruins the Future" (2017)

The episode starts with Adam struggling to evaluate his relationship with his girlfriend, Melinda. His struggle focusses on where their relationship is going and segues into a theme of "the future" for the entire episode. The first segment of the show covers food expiration dates from a public policy standpoint and how firms benefit from this state-driven regulation. The second segment of the show covers retirement accounts and a lack of American savings. The episode ends with Melinda trying to convince Adam that he cannot predict the future despite how many research papers he reads or how hard he tries to control his life. This episode can also be used as an introduction for a personal finance course or used to discuss the role of government in retirement savings plans.

Concept: Retirement Accounts and Savings (7:15 - 11:35)

In the second segment of the episode, Adam explains to Melinda about the riskiness associated with 401k retirement accounts. He explains how companies' changing from pensions to 401k accounts, especially in the 1990s, were an attempt to provide workers an incentive to save their own money. This segment of the episode can be used in a principles of finance course as a primer on different types of retirement accounts. In the second segment, Adam covers the volatility of selecting stocks by focusing on the dot-com bubble of the late 1990s and then on the 2008 financial crisis. This segment ends with a discussion by labor economist Teresa Ghilarducci on how 401k accounts should not be the only method of retirement savings. This portion of the clip can be used to discuss diversification strategies and the importance of portfolio management.

Teaching Tip: End-of-Class Minute Paper

A "minute paper" is typically defined as a short in-class writing assignment in response to an instructor-prompted question. The goal of these papers is to have students reflect on the class's material or provide instructors with some meaningful feedback. Given that the concepts of retirement accounts and investment strategies are foreign to many principles students, this section provides a unique opportunity to elicit student's perception of the relevance to the topic. Questions could include:

- What idea(s) struck you as most relevant that you could or should put into practice today?
- For you, what questions still remain unanswered about today's discussion?
- What was the most surprising and/or unexpected idea covered in today's lecture?

These types of questions not only have students reflect on the material covered, but also provide valuable insight to the instructor regarding which concepts could be covered better in future lessons. This assessment can provide a meaningful sense of closure to the topics covered that day.

Conclusion

Instructors have slowly begun adopting various teaching methods in their classrooms in order to improve content retention and understanding. While it is important for instructors to feel comfortable with the material they have selected to present to their classes, connections to "real world" economics can have a lasting impact on students. The topics presented throughout *Adam Ruins Everything* provide a basis for analysis for students because of the familiarity of the examples, the commonality of the misconception, and the humor utilized in the show.

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APPENDIX

Table 1: Title, Concepts, and a Description of the Economic Topics Covered for Season 1

Ep.	Title	Show Topics	Economic Topics
1	Adam Ruins Giving	Diamond rings	Marketing, advertising, intrinsic value, cartels, competition, supply and demand, charity, production costs, profit, efficiency, cost-benefit analysis, warm-glow effect, rationality
		Tom's shoes	
		Canned-food drives	
2	Adam Ruins Security	Airport security	Cost-benefit analysis, opportunity costs, marketing, advertising, unintended consequences, rationality
		Tylenol	
		Credit card fraud	
3	Adam Ruins Cars	Car dealerships	Regulation, monopolies, anti-competition laws, tax revenue, rent seeking, marketing, advertising, negative externalities, induced (derived) demand, overconfidence, unintended consequences, personal finance, budgeting, price discrimination
		Automobile industry	
		Car ownership	
4	Adam Ruins Forensic Science	Polygraph	Behavioral economics (false memory, attribution bias)
		Eye witnesses	
		Fingerprinting	
5	Adam Ruins Restaurants	Tipping	Labor economics, minimum wage, input costs, incentives, wage discrimination, advertising, acquisitions, overchoice, utility, overfishing, tragedy of the commons
		Wine	
		Fish	
6	Adam Ruins Hygiene	Mouthwash and Soap	Marketing, advertising, profit, public utilities, unintended consequences, negative externalities, growth, poverty
		Flushable wipes	
		Running water	
7	Adam Ruins Voting	The Electoral College	Cost-benefit analysis, corruption, political economy
		Voting	
		Gerrymandering	
8	Adam Ruins Work	The standard work week	Labor economics, labor unions, profit, productivity, incentives, labor laws, unemployment insurance, wages, asymmetric information, wage discrimination
		Internships	
		Salaries	
9	Adam Ruins Summer Fun	Summer vacation	Growth, human capital, technological improvements, subsidies, barriers to entry, marketing, advertising
		Cartoons	
		Video Games	
10	Adam Ruins Sex	Circumcision	Unintended consequences, opportunity costs, cost-benefit analysis
		Herpes	
		The hymen	
11	Adam Ruins Nutrition	Vitamins	Decreasing marginal returns, advertising, research design, decision making
		Breakfast	
		Health Shows	
12	Adam Ruins Death	Death	Shutdown decision, mark up, profit, mergers, negative externalities, cost-benefit analysis, acquisitions
		Funerals	
		End-of-life care	

Table 2: Title, Concepts, and a Description of the Economic Topics Covered for Season 2

Ep.	Title	Show Topics	Economic Topics
13	Adam Ruins Hollywood	Movie awards	Signaling, advertising, prestige, winner's curse
		Movie ratings	
		Reality shows	
14	Adam Ruins Football	NFL playoffs	Sample size, advertising, preferences, research ethics, unintended consequences, sports economics
		Hydration myths	
		Concussions	
15	Adam Ruins Weddings	Weddings	Capitalism, commercialization, complements, preferences, demand, price discrimination, correlation vs causation, principal-agent problem, specialization, trickle-down economics
		Newlyweds	
		Divorce	
16	Adam Ruins Malls	Evolution of malls	Commercialization, regulation, price discrimination, unintended consequences, advertising, monopolies, vertical integration, product differentiation, predatory pricing, willingness to pay, substitutes
		Outlet malls	
		Eyeglasses	
17	Adam Ruins Animals	Cats and dogs	Club goods, standardization, incentives, unintended consequences, property rights, common resources, tragedy of the commons
		Poaching	
		Trophy hunting	
18	Adam Ruins Immigration	Illegal immigration	Labor economics, immigration, allocative efficiency, migration
		Immigration courts	
		Deportation	
19	Adam Ruins Housing	Buying vs. renting	Mobility costs, personal finance, principal-agent problem, diversification, portfolio strategy, Great Recession, opportunity costs, regulation, discrimination, price discrimination
		Airbnb	
		Houses for the homeless	
20	Adam Ruins Drugs	Marijuana	Correlation vs. causation, health, economics of crime, incentives, principal-agent problem, unintended consequences, product differentiation, preferences, supply and demand
		DARE	
		Opioid epidemic	
21	Adam Ruins Prison	Private prisons	Economics of crime, rationality, profit, cost minimization, privatization, public services, principal-agent problem, incentives, unintended consequences
		Solitary confinement	
		Recidivism	
22	Adam Ruins the Wild West	Cowboys	Mobility costs, black markets, compensating differentials, labor economics, entrepreneurship
		Women in the Wild West	
		Air Conditioning	
23	Adam Ruins the Internet	Power of the internet	Growth, technological improvements, productivity, monopolies, natural monopolies, barriers to entry, imperfect competition, collusion, government intervention, antitrust policy, opportunity costs, tradeoffs
		Cable companies	
		"Free" websites	
24	Adam Ruins Justice	Coffee lawsuit	Discrimination, statistical discrimination, self-interest
		Jury bias	
		Public defenders	
25	Adam Ruins Christmas	Christmas	Inefficiency, gift-giving, rationality, behavioral economics, willingness to pay, demand, consumer surplus, subjective value, surplus, inequality
		Gift giving	
		Santa Claus	
26	Adam Ruins Going Green	Littering	Preferences, unintended consequences, cost minimization, inputs, outputs, production, opportunity costs, input costs
		Electric cars	
		Climate change	

Table 3: Title, Concepts, and a Description of the Economic Topics Covered for Season 3

Ep.	Title	Show Topics	Economic Topics
27	Adam Ruins Having a Baby	Pregnancy	Tradeoffs, opportunity costs, correlation vs. causation
		Breastfeeding vs. formula	
		Postpartum depression	
28	Adam Ruins Weight Loss	Low-fat diets	Tradeoffs, opportunity costs, correlation vs. causation, health
		Calorie counting	
		Weight-loss shows	
29	Adam Ruins the Hospital	Healthcare costs	Health, insurance, self-interest, correlation vs. causation, unintended consequences, monopolies, incentives, barriers to entry, false positives, statistics, framing, rent seeking
		Misuse of antibiotics	
		Mammograms	
30	Adam Ruins Dating	Dating websites	Matching markets, correlation vs. causation
		Alpha males	
		Personality tests	
31	Adam Ruins Art	Classic art	Preferences, self-reinforcement, spillover effect, price fixing, markets, supply and demand, subjective value, luxury goods, auctions
		Famous artists	
		Tax evasion	
32	Adam Ruins What we Learned…	Christopher Columbus	Incentives
		King Tut	
		Grammar	
33	Adam Ruins College	Dropout billionaires	Human capital, education, ability bias, signaling, survivor bias, labor force, labor economics, skilled labor, training, incentives, debt, government intervention, capital market imperfections
		Selecting a top college	
		Student loan debt	
34	Emily Ruins Adam	IQ measurements	Rationality, bounded rationality, overconfidence
		Mistakes Adam has made	
		Backfire effect	
35	Adam Ruins His Vacation	Mount Rushmore	Behavioral economics, framing, hot hand fallacy, gambler's fallacy, loss aversion, labor vs. leisure
		Slot machines	
		Hawaii	
36	Adam Ruins the Suburbs	Lawns	Opportunity costs, tradeoffs, negative externalities, spillover costs, moral hazard, inequality, discrimination
		Suburbs	
		School segregation	
37	Adam Ruins the Economy	Filing taxes	Incentives, rent seeking, taxes, stock market, unemployment rate, GDP, comparative advantage, inputs, autarky, international trade, gains from trade, training, human capital, automation, labor economics, migration, unemployment types
		Economic indicators	
		American manufacturing	
38	Adam Ruins Conspiracy Theories	Fake moon landing	Normative vs. positive statements, bounded rationality, gambler's fallacy
		1980s Satanic Panic	
		False theories	
39	Adam Ruins Spa Day	Detox treatments	Correlation vs. causation
		MSG	
		Placebo effect	
40	Adam Ruins Halloween	Poison candy	Substitutes
		War of the Worlds	
		Mediums/Psychics	
41	Adam Ruins Science	Lab rates	Incentives, investments, principal-agent problem, unintended consequences, externalities, sample size, reproducibility, econometrics
		Scarce funding	
		Reproduction	
42	Adam Ruins the Future	Food expiration dates	Regulation, standardization, income, wealth, stock market, technological improvements, growth
		Retirement accounts	
		Unpredictability of future	

Table 4: Concept Covered in *Adam Ruins Everything* and Corresponding Episodes

Concept	Title	Ep. #
Ability Bias	Adam Ruins College	33
Acquisitions	Adam Ruins Death	12
	Adam Ruins Restaurants	5
Advertising	Adam Ruins Cars	3
	Adam Ruins Football	14
	Adam Ruins Giving	1
	Adam Ruins Hollywood	13
	Adam Ruins Hygiene	6
	Adam Ruins Malls	16
	Adam Ruins Nutrition	11
	Adam Ruins Restaurants	5
	Adam Ruins Security	2
	Adam Ruins Summer Fun	9
Allocative Efficiency	Adam Ruins Immigration	18
Anti-Competition Laws	Adam Ruins Cars	3
Antitrust Policy	Adam Ruins the Internet	23
Asymmetric Information	Adam Ruins Work	8
Attribution Bias	Adam Ruins Forensic Science	4
Auctions	Adam Ruins Art	31
Autarky	Adam Ruins the Economy	37
Automation	Adam Ruins the Economy	37
Barriers to Entry	Adam Ruins Summer Fun	9
	Adam Ruins the Hospital	29
	Adam Ruins the Internet	23
Behavioral Economics	Adam Ruins Christmas	25
	Adam Ruins Forensic Science	4
	Adam Ruins His Vacation	35
Black Markets	Adam Ruins the Wild West	22
Bounded Rationality	Adam Ruins Conspiracy Theories	38
	Emily Ruins Adam	34
Budgeting	Adam Ruins Cars	3
Capital Market Imperfections	Adam Ruins College	33
Capitalism	Adam Ruins Weddings	15
Cartels	Adam Ruins Giving	1
Charity	Adam Ruins Giving	1
Club Goods	Adam Ruins Animals	17
Collusion	Adam Ruins the Internet	23

Commercialization	Adam Ruins Malls	16
	Adam Ruins Weddings	15
Common Resources	Adam Ruins Animals	17
Comparative Advantage	Adam Ruins the Economy	37
Compensating Differentials	Adam Ruins the Wild West	22
Competition	Adam Ruins Giving	1
Complements	Adam Ruins Weddings	15
Consumer Surplus	Adam Ruins Christmas	25
Correlation vs. Causation	Adam Ruins Drugs	20
	Adam Ruins Dating	30
	Adam Ruins Having a Baby	27
	Adam Ruins Spa Day	39
	Adam Ruins the Hospital	29
	Adam Ruins Weddings	15
	Adam Ruins Weight Loss	28
Corruption	Adam Ruins Voting	7
Cost Minimization	Adam Ruins Going Green	26
	Adam Ruins Prison	21
Cost-Benefit Analysis	Adam Ruins Death	12
	Adam Ruins Giving	1
	Adam Ruins Security	2
	Adam Ruins Sex	10
	Adam Ruins Voting	7
Debt	Adam Ruins College	33
Decision Making	Adam Ruins Nutrition	11
Decreasing Marginal Returns	Adam Ruins Nutrition	11
Demand	Adam Ruins Christmas	25
	Adam Ruins Weddings	15
Discrimination	Adam Ruins Housing	19
	Adam Ruins Housing	19
	Adam Ruins the Suburbs	36
Diversification	Adam Ruins Housing	19
Econometrics	Adam Ruins Science	41
Economics of Crime	Adam Ruins Drugs	20
	Adam Ruins Prison	21
Education	Adam Ruins College	33
Efficiency	Adam Ruins Giving	1
Entrepreneurship	Adam Ruins the Wild West	22
Externalities	Adam Ruins Hollywood	13

	Adam Ruins Science	41
False Positives	Adam Ruins the Hospital	29
Framing	Adam Ruins His Vacation	35
	Adam Ruins the Hospital	29
Gains from Trade	Adam Ruins the Economy	37
Gambler's Fallacy	Adam Ruins Conspiracy Theories	38
	Adam Ruins His Vacation	35
Gift-Giving	Adam Ruins Christmas	25
Government Intervention	Adam Ruins College	33
	Adam Ruins the Internet	23
Great Recession	Adam Ruins Housing	19
Gross Domestic Product (GDP)	Adam Ruins the Economy	37
Growth	Adam Ruins Hygiene	6
	Adam Ruins Summer Fun	9
	Adam Ruins the Future	42
	Adam Ruins the Internet	23
	Adam Ruins the Internet	23
Health	Adam Ruins Drugs	20
	Adam Ruins the Hospital	29
	Adam Ruins Weight Loss	28
Hot Hand Fallacy	Adam Ruins His Vacation	35
Human Capital	Adam Ruins Summer Fun	9
	Adam Ruins College	33
	Adam Ruins the Economy	37
Immigration	Adam Ruins Immigration	18
Imperfect Competition	Adam Ruins the Internet	23
Incentives	Adam Ruins Animals	17
	Adam Ruins College	33
	Adam Ruins Drugs	20
	Adam Ruins Prison	21
	Adam Ruins Restaurants	5
	Adam Ruins Science	41
	Adam Ruins the Economy	37
	Adam Ruins the Hospital	29
	Adam Ruins What We Learned in School	32
	Adam Ruins Work	8
Income	Adam Ruins the Future	42
Induced (Derived) Demand	Adam Ruins Cars	3

Inefficiency	Adam Ruins Christmas	25
Inequality	Adam Ruins Christmas	25
	Adam Ruins the Suburbs	36
Input Costs	Adam Ruins Going Green	26
	Adam Ruins Restaurants	5
Inputs	Adam Ruins Going Green	26
	Adam Ruins the Economy	37
Insurance	Adam Ruins the Hospital	29
International Trade	Adam Ruins the Economy	37
Intrinsic Value	Adam Ruins Giving	1
Investments	Adam Ruins Science	41
Labor Economics	Adam Ruins the Wild West	22
	Adam Ruins College	33
	Adam Ruins Immigration	18
	Adam Ruins Restaurants	5
	Adam Ruins the Economy	37
	Adam Ruins Work	8
Labor Force	Adam Ruins College	33
Labor Laws	Adam Ruins Work	8
Labor Unions	Adam Ruins Work	8
Labor vs. Leisure	Adam Ruins His Vacation	35
Loss Aversion	Adam Ruins His Vacation	35
Luxury Goods	Adam Ruins Art	31
Mark Up	Adam Ruins Death	12
Marketing	Adam Ruins Cars	3
	Adam Ruins Giving	1
	Adam Ruins Hygiene	6
	Adam Ruins Security	2
	Adam Ruins Summer Fun	9
Markets	Adam Ruins Art	31
Matching Markets	Adam Ruins Dating	30
Mergers	Adam Ruins Death	12
Migration	Adam Ruins Immigration	18
	Adam Ruins the Economy	37
Minimum Wage	Adam Ruins Restaurants	5
Mobility Costs	Adam Ruins Housing	19
	Adam Ruins the Wild West	22
Monopolies	Adam Ruins Cars	3
	Adam Ruins Malls	16

	Adam Ruins the Hospital	29
	Adam Ruins the Internet	23
Moral Hazard	Adam Ruins the Suburbs	36
Natural Monopolies	Adam Ruins the Internet	23
Negative Externalities	Adam Ruins Cars	3
	Adam Ruins Death	12
	Adam Ruins Hygiene	6
	Adam Ruins the Suburbs	36
Normative vs. Positive Statements	Adam Ruins Conspiracy Theories	38
Opportunity Costs	Adam Ruins Going Green	26
	Adam Ruins Having a Baby	27
	Adam Ruins Housing	19
	Adam Ruins Security	2
	Adam Ruins Sex	10
	Adam Ruins the Internet	23
	Adam Ruins the Suburbs	36
	Adam Ruins Weight Loss	28
Outputs	Adam Ruins Going Green	26
Overchoice	Adam Ruins Restaurants	5
Overconfidence	Adam Ruins Cars	3
	Emily Ruins Adam	34
Overfishing	Adam Ruins Restaurants	5
Personal Finance	Adam Ruins Cars	3
	Adam Ruins Housing	19
Political Economy	Adam Ruins Voting	7
Portfolio Strategy	Adam Ruins Housing	19
Poverty	Adam Ruins Hygiene	6
Predatory Pricing	Adam Ruins Malls	16
Preferences	Adam Ruins Art	31
	Adam Ruins Drugs	20
	Adam Ruins Football	14
	Adam Ruins Going Green	26
	Adam Ruins Weddings	15
Prestige	Adam Ruins Hollywood	13
Price Discrimination	Adam Ruins Cars	3
	Adam Ruins Weddings	15
	Adam Ruins Malls	16
	Adam Ruins Housing	19
Price Fixing	Adam Ruins Art	31

Principal-Agent Problem	Adam Ruins Drugs	20
	Adam Ruins Housing	19
	Adam Ruins Prison	21
	Adam Ruins Science	41
	Adam Ruins Weddings	15
Privatization	Adam Ruins Prison	21
Product Differentiation	Adam Ruins Drugs	20
	Adam Ruins Malls	16
Production	Adam Ruins Going Green	26
Production Costs	Adam Ruins Giving	1
Productivity	Adam Ruins the Internet	23
	Adam Ruins Work	8
Profit	Adam Ruins Death	12
	Adam Ruins Giving	1
	Adam Ruins Hygiene	6
	Adam Ruins Prison	21
	Adam Ruins Work	8
Property Rights	Adam Ruins Animals	17
Public Services	Adam Ruins Prison	21
Public Utilities	Adam Ruins Hygiene	6
Rationality	Adam Ruins Christmas	25
	Adam Ruins Giving	1
	Adam Ruins Prison	21
	Adam Ruins Security	2
	Emily Ruins Adam	34
Regulation	Adam Ruins Cars	3
	Adam Ruins Cars	3
	Adam Ruins Housing	19
	Adam Ruins Malls	16
	Adam Ruins the Future	42
Rent Seeking	Adam Ruins Cars	3
	Adam Ruins the Economy	37
	Adam Ruins the Hospital	29
Reproducibility	Adam Ruins Science	41
Research Design	Adam Ruins Nutrition	11
Research Ethics	Adam Ruins Football	14
Sample Size	Adam Ruins Football	14
	Adam Ruins Science	41
Self-Interest	Adam Ruins Justice	24

	Adam Ruins the Hospital	29
Self-Reinforcement	Adam Ruins Art	31
Shutdown Decision	Adam Ruins Death	12
Signaling	Adam Ruins College	33
	Adam Ruins Hollywood	13
Skilled Labor	Adam Ruins College	33
Specialization	Adam Ruins Weddings	15
Spillover Costs	Adam Ruins the Suburbs	36
Spillover Effect	Adam Ruins Art	31
Sports Economics	Adam Ruins Football	14
Standardization	Adam Ruins Animals	17
	Adam Ruins the Future	42
Statistical Discrimination	Adam Ruins Justice	24
Statistics	Adam Ruins the Hospital	29
Stock Market	Adam Ruins the Economy	37
	Adam Ruins the Future	42
Subjective Value	Adam Ruins Art	31
	Adam Ruins Christmas	25
Subsidies	Adam Ruins Summer Fun	9
Substitutes	Adam Ruins Halloween	40
	Adam Ruins Malls	16
Supply and Demand	Adam Ruins Art	31
	Adam Ruins Drugs	20
	Adam Ruins Giving	1
Surplus	Adam Ruins Christmas	25
Survivor Bias	Adam Ruins College	33
Tax Revenue	Adam Ruins Cars	3
Taxes	Adam Ruins the Economy	37
Technological Improvements	Adam Ruins Summer Fun	9
	Adam Ruins the Future	42
	Adam Ruins the Internet	23
Tradeoffs	Adam Ruins Having a Baby	27
	Adam Ruins the Internet	23
	Adam Ruins the Suburbs	36
	Adam Ruins Weight Loss	28
Tragedy of the Commons	Adam Ruins Animals	17
	Adam Ruins Restaurants	5
Training	Adam Ruins College	33
	Adam Ruins the Economy	37

Trickle-Down Economics	Adam Ruins Weddings	15
Unemployment Insurance	Adam Ruins Work	8
Unemployment Rate	Adam Ruins the Economy	37
Unemployment Types	Adam Ruins the Economy	37
Unintended Consequences	Adam Ruins Animals	17
	Adam Ruins Cars	3
	Adam Ruins Drugs	20
	Adam Ruins Football	14
	Adam Ruins Going Green	26
	Adam Ruins Hygiene	6
	Adam Ruins Malls	16
	Adam Ruins Prison	21
	Adam Ruins Science	41
	Adam Ruins Security	2
	Adam Ruins Sex	10
	Adam Ruins the Hospital	29
Utility	Adam Ruins Restaurants	5
Vertical Integration	Adam Ruins Malls	16
Wage Discrimination	Adam Ruins Restaurants	5
	Adam Ruins Work	8
Wages	Adam Ruins Work	8
Warm-Glow Effect	Adam Ruins Giving	1
Wealth	Adam Ruins the Future	42
Willingness to Pay	Adam Ruins Christmas	25
	Adam Ruins Malls	16
Winner's Curse	Adam Ruins Hollywood	13

Financial Analysis of the Beer Logistics and Transportation Industry: A Unique Interdisciplinary Finance Travel Course

Jocelyn Evans, Kent Gourdin, and Alan Shao[1]

ABSTRACT

This course takes an innovative approach to learning utilizing a travel study abroad course that integrates supply chain, logistics and credit analysis finance topics. The highlight of the course is a trip to Europe that introduces students to managers in both logistics companies and financial institutions that provide resources to multinational companies such as Heineken that rely heavily on an efficient supply chain processes. The article provides a blueprint to educators on how to incorporate assignments, organize the trip, and integrate lectures from local professionals.

Introduction

With U.S. undergraduate applications dropping over the past six years and for the foreseeable future, it is important that business school administrators and faculty design academic programs that differentiate their curriculum and prepare students for the most needed jobs (Nadworny 2018). In response to declining enrollments, many universities have launched unique, flexible programs in sought-after areas such as finance and supply-chain logistics management (College Choice 2019). Few, however, offer interdisciplinary, study abroad courses that incorporate both academic areas, even though supply chain finance teaches students how to use financial analytical problem-solving skills to analyze the cost structure of logistics and supply chains. Each step in the logistics and supply chain process requires revenue and cost forecasting as well as capital budgeting analysis. For example, in the brewing industry, financial analysis is important from three different perspectives: 1) buying firms can optimize working capital in a way that improves cash flow by minimizing accounts receivables; 2) suppliers can better assist their large buyers with inventory planning and revenue forecasts to improve profitability; and 3) bankers can lower their underwriting risk if analysts understand the costs at each level of the logistics and supply chain.

We outline a study abroad course that provides students with finance-related logistics and supply chain knowledge from a global perspective. Many academics advocate this type of experiential learning because it goes beyond classroom lecturing to ensure that students retain and understand the information (Buchanan and Gjerstad 2017). Study abroad courses provide students with authentic learning journeys that enable them to engage with professionals in the logistics/supply chain and finance industries in another country - an immersive, alternative experiential learning opportunity. The intent is to have students apply the theoretical concepts they learn in class to existing corporate strategic issues in a memorable and engaging way within a specific industry context. Applying this approach to the Commercial Lending in the Brewing Industry course gives students intrinsic motivation to better understand firms' logistics and supply chain issues.

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Adaptability of Course Curriculum and Study Abroad Trip

Our 'Commercial Lending in the Global Beer Industry' course is an example of innovative, experiential teaching, which Buchanan and Gjerstad (2017) argue is essential for increasing student learning and employment skills. It is a semester-long, interdisciplinary, study abroad course. In addition to traditional lecturing from the instructor, the course has several unique components: 1) lectures from professionals and on-site visits to nearby breweries; 2) a financial analysis of Heineken's supply chain and logistics costs; 3) a trip to meet finance, logistics, and supply chain professionals in the Netherlands and Belgium;[2] 4) a visit with the Rotterdam Port Authority logistics managers and executives at other corporations; 5) lectures with industry professionals that pay for a professional development course, providing students with training in supply chain fundamentals and leadership skills; 6) professional guest lecturers in the finance class; and 7) a Beer Game business-to-business eCommerce case (Reimer 2008). An appendix available upon request from the authors provides a program overview, itinerary, and syllabus for the travel-study course.[3]

Finance students' ability to participate in the Global Logistics and Transportation Professional Development class that is designed for supply chain and logistics professionals in South Carolina is an important experiential component of this study abroad course. Recognized leaders in the logistics and supply chain profession lecture on innovative technologies, recent industry concerns, and the logistics industry. We decided to have finance majors only attend the seminars that focus on practical knowledge and training of supply chain and logistics cost strategies. The instructor and guest lecturers integrate financial analysis applications and global logistics and transportation strategies to ensure that students meet certain discipline-based, interdisciplinary, and study abroad learning goals.

To our knowledge, few finance or supply chain undergraduate degrees offer interdisciplinary, travel-focused courses (Gourdin and Shao 2013), even though this type of interdisciplinary course provides students with different analytical and valuation skills. The course is most appropriate for students with either a finance major, finance minor, supply chain or logistics major, supply chain and logistics minor, or any student that has the necessary prerequisites. Recommended prerequisites include an introduction to finance, managerial accounting, financial accounting, and possibly a production course. The instructor, however, can choose to waive any of the prerequisites for select students such as those non-traditional enrollees with substantial related work experience that are interested in auditing the course.

We chose the brewing industry due to its extensive reliance on logistics and supply chain management in addition to the large number of breweries in Belgium and the Netherlands. According to the Brewers Association, the protection of the supply chain with respect to the cost of accessing hop raw material is an important ongoing strategic issue (Skypeck 2016). Disease and fluctuating raw ingredient costs can greatly affect firms' profitability and ability to deliver product at a specified price to buyers. One of the biggest concerns is unprecedented pressure on the global hop supply due to the escalating popularity of craft beers. This and other supply chain challenges that affect beer production globally are analyzed in the course.

Although the type of industry and specific firm is flexible, the course focuses on Heineken because it is a publicly-traded corporation with headquarters in the Netherlands that faces stiff competition from craft breweries in Belgium and other countries.[4] Due to the global nature of its product markets, the logistics and supply chain management process is an important aspect of cost control. Hence, to analyze how these costs affect financial performance, students benefit from receiving formal training about the complications derived from complicated supply chain relationships.

The academic course can be duplicated or adapted at any university by choosing a corporation in a different industry that has a dominant market share in a country outside of the United States. For example, professors at business schools located in other cities with ports and transportation hubs can adapt the curriculum blueprint to their stakeholder needs. The largest and busiest ports within the United States are in coastal regions with liberal arts universities. For example, the Port of Los Angeles and Port of Long Beach

[2] The insight regarding the travel abroad component is based on over twenty-five years of student (more than 300) participation in the Global Logistics and Transportation minor trip at the College of Charleston. *http://sb.cofc.edu/academics/professional-programs/glat/*.

[3] The study abroad course can be substituted with a local interdisciplinary experience that provides interaction with the businesses within the corporate community that use supply chain and logistics strategies.

[4] Other firms in different industries that rely on supply chain and logistics techniques can be used to exemplify the same concepts.

are close to UCLA, one of the most acclaimed MBA finance programs in the world. Given that this port facilitates much of the transpacific trade, an interdisciplinary travel abroad course within the business-economics program under the College of Letters and Sciences could add value to their students since an undergraduate business program does not exist. Other universities near ports can contextualize financial analysis for supply chain/logistics operational decisions: Morgan State University (Baltimore, Maryland), New York University (Port of New York and New Jersey), Georgia Southern University (Port of Savannah), University of Richmond (Port of Virginia), University of Houston (Port of Houston), University of California-UC Berkeley (Port of Oakland), and Florida International University (Port of Miami). Examples of internationally important ports are those in China, Hong Kong, and Panama.

If the university or college is not located near a port, the study abroad trip and experiential learning opportunities can focus on different types of transportation hubs. For example, Federal Express is a multinational transportation company headquartered in Memphis, Tennessee. Federal Express owns a shipping provider (Roberts Express), a truckload freight carrier (Viking Freight), airfreight, and a logistics and technology solutions subsidiary. The University of Memphis has a Global Supply Chain Management curriculum that emphasizes the importance of real-world work experiences that could be complemented with an experiential interdisciplinary study abroad course that is jointly developed with the department of finance. Thus, instead of analyzing Heineken's financial performance, a professor at the University of Memphis could choose one of Federal Express's corporate partners in another location.

Related Literature

Supply chain/logistics supply and demand factors are strongly linked to financial budgeting, forecasting, and valuation in a way that creates repeat patronage, deepens account penetration, and, ultimately, strengthens long-term customer and supplier relationships. Surprisingly, there has been minimal academic pedagogy research on this interdisciplinary topic (Larson and Halldorsson 2004), even though it is well known that effective and efficient supply chain/logistics management is viewed as a valuable way of securing a competitive advantage and improving organization performance (Li et al. 2006).

Sanders and Wagner (2011, p. 317) comment that, "While researchers have extensively studied supply chain performance measurement (Griffis et al. 2004) and the various components of working capital (and in particular inventory) (e.g., Eroglu and Hofer 2011), there are numerous topics at the supply chain–finance interface that warrant further study." Stronger supply chain–finance links provide tangible value (Miller and De Matta 2008). Research on how to deal with volatile market supply and demand (as we have seen with transport capacities or inventory levels prior to and during the 2007-2009 financial crisis[5]) requires close collaboration between finance and supply chain management (Dooley et al. 2010). These topics are highly relevant for practitioners but are minimally addressed in finance or supply chain/logistics courses. For example, the supply chain's impact on a firm's share price is very interesting to practitioners (Presutti and Mawhinney 2007) and, therefore, deserves more attention in the pedagogy literature.

Consistent with existing literature (Bajada and Trayler 2013), we believe that our study abroad course piques students' interest in finance supply chain topics. In other contexts, experiential education has been shown to be beneficial because it immerses learners in an experience that encourages reflection about hard to understand topics (see, for example, Al-Bahrani et al. 2017 and Steiner and Laws 2006). These authors comment that some universities now emphasize interdisciplinary learning by requiring curriculum and assignments to integrate two or more academic functional areas within the business school.

Sanders and Wagner (2011) suggest that supply chain and logistics instructors must address the challenges of globalization, process integration, cost efficiency, and sustainability within a multidisciplinary framework to remain relevant as a discipline. They argue that a siloed, single perspective inadequately addresses complex, interdependent issues that tie firms' financial performance to each other. While instructors in supply chain and logistics performance measurement teach about alternative sourcing strategies (e.g., single sourcing, multiple sourcing, supplier switching, supplier development, supplier integration) and finance instructors teach the various components of working capital (in particular inventory), few professors discuss topics related to the supply chain/logistics finance interface.

[5] The 2007-2009 financial crisis is often referred to as the Great Recession. It began in 2007 with a crisis in the subprime mortgage market in the United States that spilled over into other countries as a banking crisis on September 15, 2008. The crisis was followed by global business failures that required effective supply chain and logistics management skills to streamline costs.

Demand for Financial Analysts in the Supply Chain and Logistics Industry

The multidisciplinary finance study abroad course is a partial response to the need for financial analysts in the supply chain and logistics industry as well as the hiring needs of the Port of Charleston. Because South Carolina's port system is a major part of the state's economy, our business school established the state's first intermodal transportation program in 1985 through the Global Logistics and Transportation program[6] due to the strong partnership with the maritime community. In fact, financial contributions from the state, several corporations, transportation professional groups, and several European manufacturers located in South Carolina support the Amsterdam study abroad trip for Global Logistics minors.

The demand for supply chain/logistics analysts at the Port of Charleston is consistent with the National Survey by the Society for Human Resource Management's report in 2016 that public and private sector employers need more statisticians and data analysts to analyze the cost efficiency of supply chain and logistics systems (American Statistical Association 2016). In a national survey, eighty percent of the responding organizations identified a need for employees with financial analysis and supply chain management skill sets. These positions require employees to analyze large data sources to identify abnormal trends in inventory turnover, cost per unit, and shipping time. An employee usually identifies strengths and weaknesses in the processes and must be able to effectively communicate them to customers, suppliers, production managers, and senior management.

Business schools have an opportunity because some firms reported having difficulty finding qualified candidates. For example, companies like ACE Logistics Solutions in Las Vegas, Nevada hire financial analysts for transportation and logistics areas (Indeed 2019). The analyst positions requires a B.S. degree in Finance, Accounting, Supply Chain Management and Logistics, or any another business major with an analytical emphasis. Moreover, employment projections from the Bureau of Labor Statistics report that job growth in this area is projected to increase substantially from 2016 to 2026 (Bureau of Labor Statistics 2019).

A Multidisciplinary Study Abroad Course

To this point, we have discussed the relevance for creating a multidisciplinary, integrative study abroad course. The supply chain management, logistics, and credit analysis academic interface create learning complementarities that provide students with a unique perspective, bringing together theory and practical skills from two different professions. Chief financial officers (CFOs) of many corporations understand the value of the supply chain and logistics as critical drivers of shareholder value (Davis 2005). For manufacturing firms, these costs are substantial and directly impact a firm's profit through its ability to effectively implement lean inventory practices and generate revenue from on-time delivery. As such, CFOs should not just view the supply chain and logistics departments as cost centers. When properly managed, these areas give firms a competitive advantage that enables them to develop close, symbiotic relationships with their customers and suppliers. Consequently, students (future employees) need to learn to evaluate the value impact of lowering costs through inventory management and improving product availability as it is reflected on the financial statements and by the stock price.

The interface shows how value is created or destroyed across the supply chain for both shareholders and other stakeholders affected by the company's operations. Dooley et al. (2010) discuss how changes in the economy impact the supply chain by affecting the flow of materials and products through unexpected shifts in consumer demand, resulting in what is known as the "bullwhip" effect. An unexpected decline in the economy creates an unexpected decrease in customers' demand for its products, which should ideally lead to lower inventory purchases from retail firms in the supply chain to wholesalers. In turn, wholesalers should order less from distributors or manufacturers. Typically, however, the lag in delivery of orders forces firms further downstream to estimate the demand for their product with uncertainty (e.g., default risk, lead times variations, and capacity restrictions), which makes inventory management less effective. Dooley et al. (2010) show that when demand for products and services is volatile because of a shock to end-customer demand such as during the 2007-2009 financial crisis or as a response to Brexit, close collaboration and communication is needed between financial analysts that provide earnings estimates and supply chain or

[6] http://sb.cofc.edu/academics/professional-programs/glat/

logistics professionals. Essentially, supply chain and logistics professionals can provide earnings guidance to financial analysts to increase forecast accuracy through big data analysis of customer sales trends.

Important questions students should consider include the following: 1) how do exchange rates and taxation affect the flows of material, information, and funds through global supply networks?; 2) what supply chain management and logistics strategic priorities should be emphasized with respect to cost, quality, delivery, flexibility, and innovation of products and services?; 3) how is risk management applied to supply chain problems?; and 4) how can measures of diversification (e.g., sourcing in different regions of the world) reduce default risk?

The course curriculum that complements the study abroad component explains how these questions are addressed. The course consists of a combination of lectures, class discussion, quizzes on select presentations in the professional development program, a historical paper on the Dutch East India Company, a Brexit research paper, several academic research papers, a brewing industry strategy paper, a strategic and financial analysis on Heineken, a Beer Game in business-to-business eCommerce case simulation, tours of local breweries, and the requirement for students to attend the Spring Break study abroad component in the Netherlands and Belgium.

The grade the students receive for the course is intended to certify their demonstrated proficiency of eight learning goals and objectives. Proficiency is evaluated by measuring performance as follows:

1. Participation at Local Visits to Breweries: Individual 10%
2. Beer Game Case Study write-up (1): Individual 10%
3. Participation in Europe Study Abroad Trip: Individual 10%
4. Academic research paper summaries and quizzes on Intermodal Transportation and Other Lectures: Individual 10%
5. Paper on the Dutch Shipping Company: Group plus Peer Review 10%
6. Paper on the Brewery industry: Group plus Peer Review 10%
7. Strategic and Financial Analysis of Heineken over past 5 years and 4 competitors (Include Brexit, Taxes, Tariffs, Sustainability, Intercultural Awareness, etc.): Group plus Peer Review 40%

A detailed blueprint on the experiential learning assignments addresses the following eight learning goals.

Understanding of Intercultural Awareness (Study Abroad Trip)

Intercultural awareness is understanding the similarities and differences in U.S., Belgium, and Netherlands corporate cultures. Employers value employees with intercultural awareness because it is a key foundation of global business communication and decision making. For example, it is important to understand corporations' cultures and strategic goals as they pertain to national values. For example, firms in the Netherlands and Belgium place a much stronger emphasis on environmental issues than most U.S. corporations, which most likely impacts the cost and form of their logistics and supply chain models. Since we are visiting corporations, the Rotterdam Port Authority, and academics overseas, it is necessary that the beginning lectures discuss intercultural awareness.

Goal:	Provide students with an international, experiential learning experience that discusses the cultural differences and geographic complexity within the corporate community.
Assessment:	Group oral presentations to executives at firms in the Netherlands and Belgium.
Target:	Every group will be measured on a scale of exemplary, high performance, meets expectations, and fails to meet expectations.

Students visited the largest port in Europe, Port of Rotterdam, to learn about the importance of supply chain management and logistics in the European Union within a Brexit uncertainty and environmentally friendly environment. They visited Heineken, craft beer makers, Servicenow, Shell Oil, universities, Cushman and Wakefield, and BlackRock. This approach is like Buchanan and Gjerstad's (2017) use of historical sites, local markets, and business visits to explain how supply and demand operate differently in European countries (see also McCannon 2011, Wright and Hind 2011, and Smith 2007).

Surveys revealed several differences that were noticed by the students: 1) the team performance is more important than the individual performance (Servicenow); 2) more efficient and open office structure in which management do not have closed offices (Servicenow); 3) stated high quality of work life with less stress due

to team efforts; 4) business casual instead of business professional dress with the exception of Blackrock; 5) very ecofriendly as evidenced by the use of wind energy from windmills (Port of Rotterdam); and 6) acceptance of nationally legislated bonus caps (20% of salaries).

Current issues: Global Logistics and Professional Training (GLAT) Program (Intermodal Transportation, Other Lectures and Local Visits to Breweries)

Students attend selected lectures presented in the Global Logistics and Transportation Professional Training Program at the College of Charleston. Instructors for the seminars are experts on transportation and logistics topics. Their career experiences in both public and private sectors not only provide practical application to theoretical academic topics, but it also enables them to convey the most up-to-date and practical information to the students. The GLAT program is designed to provide practical knowledge and training in diverse areas of global logistics and transportation. The instructors for the seminars are experts in specific areas and have substantial experience in the private and public sectors of the industry. In addition, professionals outside of the above program are asked to speak to the students during their class time as well as visits to local breweries.

Goal:	Understand current issues in the brewery industry relative to logistics and supply chain strategy.
Assessment:	Quizzes on lectures by GLAT and other professionals.
Target:	Each student should earn at least a score of 80.

Independent of the GLAT program, industry professionals are scheduled to lecture on other finance topics such as how the new set of U.S. tax and tariff law changes will affect supply chains in the beer and other industries. Prior to the law, if a company imports beer costing $1,000 and sells it for $1,100, the company's taxable income was $100 after deducting the cost of goods sold. After the new law, the $1,000 is no longer deductible making the taxable income increase from $100 to $1,100. In contrast, the tax is zero on export revenue. This could be a major concern because alternative domestic suppliers are not always suitable replacements, which could cause severe disruptions in supply chains globally. Tax-law-induced disruption will be costly because many corporations have invested a lot of resources into establishing relationships with key suppliers around the world. The potential negative impact on cash flow due to tax law changes is compounded by managers' concern about how currency hedge and forward contracts can be reported on the financial statements.

Understanding of Interdependence within Logistics and Supply Chain Globalization (Dutch Shipping Company Paper)

Kouvelis and Niederhoff (2007) discuss why global market companies do not compete solely as individuals but as part of an entire supply chain. They conclude that strategic managers must consider the whole supply chain and fully understand global forces and relevant trends when making operational decisions.

Goal:	Understand interdependencies along the supply chain strategy that can be disrupted by shocks.
Assessment:	Individual historical analysis of the Dutch East India Company and participation at local brewery visits.
Target:	Each student will earn at least a score of 80 on both.

The students learn about the impact of globalization on the supply chain industry from researching the history and life cycle of the Dutch East India Company. Founded in 1602, the Dutch East India Company traded East Indies spices around the world throughout the 17th and 18th centuries until 1800. Many companies today use the Dutch East India Company's shipping business model for their supply chain and logistics strategy. The company, which was headquartered in Amsterdam was the first publicly traded corporation in the world. The firm was able to issue shares publicly because it was the first corporation to have formal licenses in several different regions including Africa, the Middle East, South Asia, and the Far East. At one

time, the Dutch East India Company was the largest, most valuable company in the world. In today's currency, its market capitalization would be worth $7.9 trillion.

A research paper highlights how supply chain and logistics strategies and warehouses in port cities can create substantial wealth for investors. The questions that formulate the research are as follows:

1. How did the Dutch East India Company come to exist and how did it become the most powerful shipping company in the world?
2. How did it become a globalized corporation and what supply chain management and logistics strategies did it use?
3. What were its major contributions to transportation and navigation?
4. When did it become publicly traded?
5. Why did it disappear?
6. How did the growth in the Dutch East India Company parallel the current rise in Chinese shipping companies and port dominance?

Today, China is dominant in the shipping industry and has the largest ports by size in a way that was once enjoyed by the Dutch East India Company. The Chinese government continues to build infrastructure and dredge waterways that are making its coastal cities as prosperous as Amsterdam was in the 1600s. It is apparent that establishing supply chain and logistics dominance by building large facilities near major ocean ports is a winning strategy because it gives firms easy access to global trade. Both research on the Dutch East India Company and Chinese enterprises illustrates timeless lessons about how supply chain and logistics expertise enable corporations to better forecast projected growth and expansion of international trade.

Understanding of Strategic Supply Chain Alignment - Matching Supply with Demand (Beer-Game Case Study Simulation)

A supply chain is comprised of all the parties involved in fulfilling a customer order. The integrated management of this network is a critical determinant of success in today's competitive environment. Companies like Amazon, Toyota, Walmart, and Heineken have excellent supply chain management that is a cornerstone of their financial strength and industry leadership. There have been recent examples such as Kmart and Sears, however, showing that reduced funding from supplier partners caused bankruptcy. The instruction emphasizes how increasing competition and political uncertainty creates challenges and opportunities for global supply chain and logistics relationships.

Goal:	Provide a strong understanding of how abrupt changes in demand and supply for products or services affects profitability due to the degree of supply chain and logistics alignment across and within corporations.
Assessment:	Individual written analyses of the Beer-Game case study simulation and an article titled "Inventory Management and the Bullwhip Effect during the 2007-2008 Recession."
Target:	Every individual should earn at least a score of 80.

The 2007-2009 housing crisis led to a recession that ultimately affected the global economy at all production levels. Dooley et al. (2010) analyze how product demand variation at each level of the supply chain before, during, and after the recession affected inventory levels between 2005 and 2009. The first hypothesis tests whether demand variation from the most recent recession causes excessive inventory due to miscommunication between wholesalers to manufacturers, then retailers to wholesalers, and then consumers to retailers. By analyzing the negative impacts from the 2007-2009 recession, the authors argue that supply chain alignment between firms through information sharing leads to more efficient inventory management strategies.

Prior to the recession hitting, retailers were building up inventories because the economy was doing well. The assumption is that consumer pessimism about the economy is not accurately forecast, probably because the suppliers' products are only a small part of retailers' total revenue. Consequently, retailers did not signal a decrease in consumer demand by lowering their orders to wholesalers because few managers anticipated the 2008 recession. Retailers increased their orders from wholesalers until just the month prior to the official start of the economic downturn, which did not give wholesalers, distributors, and manufacturers much time to adjust. Manufacturers and wholesalers did not lower their production and purchases, respectively, until almost nine and eleven months after the onset of the 2008 crisis.

The bull whip effect was exemplified in a Beer Game simulation explained by Reimer (2008). During the in-class Beer Game simulation, students learned how an unexpected shock to consumer demand creates havoc with respect to inventory management across the supply chain. Each student played the role of either manufacturer, distributor, wholesaler, or retail store. The objective of the game is for each supply chain group of four to obtain the lowest amount of inventory-related costs. Costs in the game arose due to excessive inventory levels or backorders resulting from insufficient stock. The cost of backorders is double the cost of holding excess inventory. The restriction is that none of the four players can communicate with each other at any time during the simulation game.

The retailer received the customer order first. If the order is smaller than the initial stock, the request is fulfilled immediately, and the student must pay for warehousing costs of $0.50 per unit. In contrast, if the stock is less than the initial order, the unfulfilled part is a backorder costing $1.00 per unit. The friction, orders delivered two weeks after the request, created inventory uncertainty. Once the retailer received an order from the end-customer, it then ordered inventory from the wholesaler. The wholesaler then ordered from the distributor after fulfilling the retailer's order, and lastly the distributor ordered from the manufacturer.

It became difficult for students to keep inventory costs at a minimum while also meeting customer orders. The ability to minimize costs by keeping inventory low became increasingly difficult as the end-customer amounts changed drastically. An increase from 5 to 100 units of beer caused large backorders because the unexpected rise in demand was not anticipated by the students. Later in the game when the recession caused consumers to drop their orders back to 5 units, the students had high inventory levels. Like Dooley et al. (2010), the retailer had the lowest inventory costs because it had the closest contact with the end consumer.

Understanding of Alternative Logistics and Supply Chain Strategies for Managing Resources and Technology (Brewery Industry Paper)

The students make decisions as a group by completing the Beer Game, a business-to-business eCommerce case. Each group acts as a financial analyst team assigned to effectively manage resources and maintain financial transparency regarding transportation costs, inventory management, logistics costs, average component supplier cost per product sold, etc. The consulting teams evaluate the integration of logistics and production decisions on brewery firms' financial performance.

Goal:	Understand strategic supply chain and logistics decisions that affect financial outcomes.
Assessment:	Group written brewery industry analysis.
Target:	Every consulting group should earn at least a score of 80 on the brewery industry analysis.

Universities which have an Enterprise Resource Planning (ERP) system such as SAP can use simulations to evaluate how production and logistics strategic decisions impact firm profitability while controlling for other determinants. Our university is an SAP-sponsored School of Business, so we can incorporate the ERP system either within an individual class or across the core curriculum. The ERP simulation enables students to see precisely how customer orders and inventory levels can be seen by the sales, production planning, and finance business units as well as vendors in an integrated centralized database system. The ERP simulation enables students to separate logistics and supply chain costs from selling expenses and costs of goods sold, respectively. In this way, the supply chain and logistics strategy choices are immediately translated into cost efficiency level and customer service as defined by inventory availability. The trade-off between waste reduction from lean management and backorders becomes stark, e.g., a capital budgeting decision between large (small) warehouse space and more (less) transportation costs. Another option is the Cesim Global Challenge simulation that improves students' understanding of supply chain and logistics business operations in a dynamic, simulated competitive environment.

Forecasting revenue and expenses in a Brexit environment (Heineken strategic and financial analysis)

Politicians and business executives continue Brexit discussions (Fox 2017a). The pending final agreement creates uncertainty for supply chain and logistics managers because it will have profound implications for import and export firms that operate within the UK. The 2016 British vote to leave the European Union

biggest effect on firms' costs and revenue will occur if a Brexit deal is not obtained with the other EU countries. If Brexit negotiations end in Britain not being a part of the single market pass port system, tariffs could decrease the profitability of Heineken and all firms that sell an appreciable amount of their products in the UK. The higher costs will most likely have a trickle-down effect within the logistics industry and throughout a firm's supply chain, forcing suppliers to pass on increased costs to the consumer (Fox 2017b). The study abroad trip allows students to discuss this issue with experts in the country.

Goal:	Make strategic decisions that affect financial outcomes.
Assessment:	Group written Heineken strategic and financial analysis.
Target:	Every group should earn at least a score of 80 on the brewery industry analysis.

Supply chain management today is about much more than finding and lowering the cost of inventory. While cost controls, optimization, efficiencies, and operational excellence are important to a successful supply chain, maintaining strong relationships with customers and effective risk management strategies differentiate winners from strugglers in the Brexit uncertainty environment. In this environment, the ability to forecast revenue and costs is vital. Brewery corporations are fast-paced organizations that must constantly respond to changes in international trade rules (Brexit), changes in consumer preferences, and ever-increasing competition. Forward planning with respect to trucking, shipping, and other types of transport is especially needed.

Ability to Analyze Other Types of Risk (Academic Research Paper Summaries)

Another important skill is the ability to differentiate between deterministic and uncertainty risks. As mentioned above, political uncertainty (Brexit) is important due to its ability to destabilize international trade within the European Union. Given that corporations' supply chains and logistics systems often extend across countries in the EU, it is important to prepare for immeasurable political instability, possibly by moving production and warehouse facilities to other countries that have lower tariffs and more efficient ports. A more measurable, deterministic type is exchange rate risk that can be partially hedged away. Given that currency risk directly affects the cost of production and logistics, students need to be aware of how these factors impact financial performance along the supply chain. For example, students in the class learn that firms can hedge rising raw materials costs with futures, forward, and option contracts. This is one way to take some control of risk and mitigate a sudden increase in supplier costs.

Recent changes to U.S. tax law also raise some foreign corporations' supply chain and logistics costs (Patrick 2017). It is purported that U.S.-based manufacturing firms and freight industries are pleased, but port management has some reservations because the law increases costs for supply chain managers working with foreign suppliers, shipping companies, etc. Consequently, everything else held equal, many of the largest American companies that import inventory will be at a competitive disadvantage to those that buy domestically.

Goal:	Exhibit skills to assess supply chain and logistics performance through a risk/return perspective.
Assessment:	Make recommendations to increase Heineken's supply chain competitiveness in a written paper.
Target:	Each group will earn at least a score of 80 on the written analysis.

Each student works on a consulting team assigned to evaluate critical technology, information, and supply chain issues from a financial perspective that should enable them to recommend innovative solutions to Heineken's operational and competitive challenges. As noted by Cartwright and Stepanova (2012), focusing the written analysis on a specific company within a single industry makes it easier for students to gain intercultural competence regarding understanding the financial implication of supply chain structures and the challenges within the industry. We chose Heineken because it is a large international brewery that competes against other large companies and smaller craft brewers that continuously expand their distribution footprint globally. To remain a market leader, Heineken and other firms in the brewing industry must have an effective logistics and supply chain strategy to protect their market shares. This is particularly problematic in the UK where the brewing industry is now saturated: "supermarkets like Tesco have responded to the growth by replacing half of Heineken's mainstream beer brands with up to 30 craft beers" (Thorburn 2017). The

increased competition makes selecting the most cost efficient and/or quickest route for delivering goods to distributors or the final consumer, whether by ship, plane, train, or truck, an important strategic issue.

Since Heineken is the largest Netherlands-based brewery, its supply chain and logistics routing and scheduling system is global and complicated. Therefore, this firm is an appropriate case study for our study abroad course. For Heineken, improving logistics efficiency is a critical part of its strategy for achieving profitability and market share goals because it ships its product to almost every country in the world. Unless a student understands the logistics costs incurred between the brewer, its transportation suppliers, the network of wholesalers, and the destination for each customer, the risks inherent in forecasting revenue and resource needs will not be reduced. Few finance students understand the importance of maximizing shipping volumes on a given day or measuring trucking capacities, the benefits of relying on alternative energy sources, the selection between multiple ports, and the tradeoff between labor costs at the shipping docks and technology.

Sustainability (Study Abroad Trip)

Key topics in Corporate Social Responsibility (CSR) reports are responsible sourcing, sustainable packaging, reverse logistics, minimizing water and wastewater use, as well as clean energy and gas emission. The reduction of water consumption and recycling are important aspects of companies' supply chains and logistics operations and missions. The trip to the Netherlands enables the students to talk with logistics financial professionals who explain why these CSR initiatives are economically profitable. The aim of the trip is to also show the way in which the CSR conception is put into practice by brewing enterprises in the Netherlands, especially Heineken.

Goal:	Understand the costs/benefits of a sustainable supply chain.
Assessment:	Individual participation at the presentation by the Rotterdam port.
Target:	Each student should earn at least a score of 80.

Recommendations and Conclusions

Many universities have global awareness as part of their business school mission statement because it is a priority of most corporations and, therefore, an academic responsibility (Open Doors 2017). Consequently, experiential international education is a key component of the curriculum. Hence, innovative travel courses that enable students to meet academics and professionals outside of the U.S. are valuable (McClure 2009) because they prepare individuals to be global citizens. Study abroad programs that exemplify the interaction between financial analysis and supply chain management or logistics, however, are rare even though a large percentage of students studying abroad are in the field of business and management.

To successfully incorporate logistics, transportation, and/or supply chain management into a study-abroad finance course several things must occur. First, a champion for the effort must be found both within the School of Business and in the local business community. Having multiple professors teach the study abroad course is optimal because the lead instructor that organizes the trip can alternate each year. At our school, the business community partner role is fulfilled by the South Carolina State Ports Authority and local craft brewery owners who are alumni of the College of Charleston. The collaboration between academia and the business community is beneficial.

Second, a lack of available scholarships and grants as well as students' need to work during the academic year is an impediment. Therefore, to make study abroad accessible to all students, several courses with spring break trips were added to the curriculum. For many of our students, their only opportunity to study abroad is with a faculty-led short-term study abroad class. Dessoff (2006), Lewis and Niesenbaum (2005), and Ingraham and Peterson (2004) also find that the largest growth in study abroad programs has been in shorter duration trips over the past decade. Funding from corporate sponsors and self-supporting activities such as professional education programs are necessary to ensure the quality and viability of the program. In addition, our dean solicited philanthropic funds from some of our donors and convinced the university to approve student business school credit hour fees ($75 per credit hour) for study abroad scholarships and grants.

Shorter study abroad experiences reduce the cost to the point that students with financial concerns, family commitments, and limited vacation from work, etc. can participate. Lowering the cost of travel mitigates the ongoing challenge of meeting enrollment minimums. This approach has been a resounding success at our institution. A total of forty students have enrolled in the course for spring 2019, which necessitated another

instructor to co-teach the class. After the enrollment exceeded 20 students, however, another professor was recruited to make the travel study component manageable from an activity point of view.

Third, the pre-requisites for the course must be tailored to the assignments and the requirement that the students attend the spring break trip to the Netherlands and Belgium. Since many of the assignments are group oriented, we limited the prerequisites to junior standing and the introduction to finance course because most of the individuals were finance students who encouraged their friends to register. The prerequisites should be waived for nontraditional students with substantial work experience in a relevant field. The only other suggestion is that if the instructor adds an ERP component, an information management instructor should be the second faculty leader on the trip and the prerequisites should include the core accounting, economics, finance, marketing, management, and production courses.

The fourth concern is that the professional development course for local executives only had space for forty students. If the enrollment at a university can only accommodate ten extra attendees, some of the same speakers can be invited to lecture during the finance course class time on a volunteer basis. If existing faculty do not have the time or an interest in teaching this type of course, the department can look to practitioner adjuncts to supplement the supply chain and logistics instruction.

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Does Order Matter? Micro- and Macroeconomics Principles Courses at an Access Institution

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ABSTRACT

For Principles of Microeconomics and Macroeconomics, there is no consensus as to the "correct" course order either in the literature or practice. If ordering affects learning, outcomes could be improved by choosing the optimal sequence. Here, we examine student data from an access institution, finding strong evidence students generally perform better in their second economics principles course, and weaker but not insignificant evidence that taking macroeconomics first improves grades more than the opposite order. Taking the courses concurrently also appears to significantly improve microeconomics grades but has no apparent macroeconomics performance effect. Findings are largely robust to different econometric specifications.

Introduction

Economic education is important, not least for its contribution to civic engagement in a functioning democracy. That is why the authors of this study, like many economics educators, are consistently looking for ways to improve students' educational outcomes in the area of economics. Here, we examine the extent to which course order affects students' grades in principles of microeconomics and macroeconomics using a thorough set of econometric tools to try to account for the direction, magnitude, significance, and robustness of the effects, if any. Several prior studies have addressed this question, but results have been inconsistent. While the results from one institution cannot hope to be dispositive, we present information on an important and growing population: students at open-access institutions.

Much of the literature and popular press coverage of undergraduate education concerns itself with highly selective schools, despite the fact that the majority of undergraduate students attend less selective institutions. For example, in 2014, over forty percent of all college students were enrolled in community college (Ma and Baum 2016). In 2009, only 16 percent of all college students attended private, nonprofit institutions, and less than 10 percent attended state flagship universities or other public schools conducting high profile research (O'Shaughnessy 2011). To assume that research on students at selective institutions can be generalized to students at less selective schools ignores significant differences between these student bodies. Less selective schools are likely to be more diverse in terms of race/ethnicity, representation of non-traditional students, and academic preparedness. Students are more likely to be from lower-income households or to be first-generation college students, thus affecting their expectations, experiences, and test-taking abilities. Given the differences in student populations, it may be necessary to determine whether previous findings are robust.

There are many reasons why there could be different course order effects between access and selective institution students in economics classes. One possibility is that a student experiences an increase in confidence from completing their first economics course which drives them toward better performance in their second course. This effect could be larger for access students who may have fewer mechanisms for

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coping with setbacks and less academic confidence overall if they are the first in their family to attend college. Another possibility is that the high level of ethnic diversity and percentage of older students at an access institution could lead to the stimulation of a greater (or lesser) amount of student interest in economics as a result of taking either macro or micro first. This greater (or lesser) amount of interest generated in their first course could then be carried forward to improve (or worsen) engagement and outcomes in their second course. For example, much of the content in macroeconomics is international in nature or related to the labor market which could be of especially strong interest to older or more ethnically diverse students. Alternatively, it might be the case that the topics covered in microeconomics (markets, competition, the impact of price controls, etc.) results in a higher level of interest among those students. Because of potential differences such as these, it is important to add studies of access institutions to the literature.

Students in this study attend an open-access, four-year public college serving over twelve thousand students. The college is the most ethnically diverse college (either public or private) in the Southern Region (U.S. News & World Report 2017; Georgia Gwinnett College 2016). A third of the institution's students are non-traditional (older), and the college is recognized as a Military Friendly School (Georgia Gwinnett College 2017). The school was modeled after a liberal arts college, and class sizes, even for popular courses such as principles of microeconomics and macroeconomics, are capped at 40 students per section (with a college-wide average class size of 21). Our primary focus as faculty is on teaching, student engagement, and mentoring, and our goal in this study is to generate research with a direct bearing on practices in economics education at institutions similar to ours.

At present, there is no recommended economics principles course ordering at our institution, although the courses are numbered such that macroeconomics precedes microeconomics numerically. Microeconomics, on the other hand, is a prerequisite for Financial Management, and so many advisors advise students to take microeconomics first. The discussion about making one principles course a pre-requisite for the other has been ongoing at our institution, with those teaching macroeconomics the most adamant about using micro as a prerequisite for that course. Administration requested evidence that establishing a prerequisite order would benefit students, so we decided to review other schools' catalogs for a consensus. Of the 58 regional colleges we investigated, 50 offered separate principles of microeconomics and macroeconomics courses. Of these, 33 (or 66 percent) specified no required order, 9 (or 18 percent) required microeconomics first, and 8 (or 16 percent) required macroeconomics as the pre-requisite for micro. Our findings somewhat deviate from those using the Princeton Review's Best 380 Colleges in that those schools were relatively more likely to designate microeconomics as a pre-requisite for macroeconomics than in our subsample. A significant majority of schools in that group (67 percent), however, still specify no order for the principles courses (Prante 2016)

Given the variation across institutions, we explored the literature on economic education for insight. Much of the empirical research suggested macroeconomics first was preferable, but this research was conducted at more selective institutions and was counter to some faculty members' expectations. Opinions in our department were as diverse as the paradigms around us, and here we find ourselves, asking on behalf of the discipline: does order matter?

There are reasons to expect that order matters for students' grades, but such reasoning supports hypotheses on both sides of the issue. Macroeconomists, for example, assert that much of their theory is rooted in microeconomic foundations. For example, theories of money supply and demand or chapters on labor markets and unemployment are built around microeconomic principles. Students entering macroeconomics with a better understanding of microeconomics may grasp content more quickly or more thoroughly in a subsequent macroeconomic class, enabling professors in these courses to cover more topics or existing content at a greater depth.

On the other hand, some research suggests that macroeconomics before microeconomics may be the preferable order. Macroeconomics includes topics such as GDP and unemployment with which students might be more familiar from stories in the media, perhaps making initial connections easier and faster. While there is an abundance of microeconomic stories in the news, too, students' unfamiliarity with microeconomics may hamper their connection between course content and current events. Given greater familiarity with macroeconomics, taking this course first may improve students' economic thinking and outcomes more than the opposite sequence.

We test the extent to which order matters in principles courses, differentiating our study from others in two ways. First, we employ econometric approaches not used in previous studies. Many of the cited studies on the proper micro/macro sequence are more than 20 years old, and methods to control for unobservable characteristics or correlated error terms were less developed at the time. It is possible that we reach different conclusions when correcting for statistical issues. Second, we analyze student data from an open-access, four-

year college, one of many institutional types underrepresented in education research. Differences in student body compositions and academic preparedness could affect findings. Using our selected econometric models and open-access student body data, we find that taking principles of macroeconomics either before or simultaneously with principles of microeconomics has a specification-robust positive effect on student outcomes, while evidence for taking microeconomics first is mixed at best.

The article that follows represents our contribution to the collective discussion among economists regarding economic education. We begin with a review of the relevant literature. In Section 3, we describe the data obtained from student records at our institution and our modeling approaches. In Section 4, we present results using both restrictive and non-restrictive parametric assumptions. We conclude with a discussion of our findings.

Previous Research

The lack of consensus among undergraduate economics programs regarding the ordering of microeconomic versus macroeconomic principles is consistent with the mixed and contradictory results in the economics education literature regarding the optimal ordering of those classes. Most popular economics teaching handbooks and teaching survey articles in the literature do not address the ordering of principles-level economics courses (Hoyt and McGoldrick 2012; Hansen et al. 2002; Watts and Schaur 2011; Becker 1997, 2000; Siegfried and Walstad 1998; Saunders and Walstad 1990, 1998). Some researchers have, however, specifically explored the ordering issue and found that taking microeconomics first will produce a better understanding of economics (Fizel and Johnson 1986), while others have concluded taking macroeconomics first may improve grades in microeconomics but not the other way around (Lopus and Maxwell 1995; Perumal 2012; McCoy et. al. 1991). Another study determined that concurrent enrollment in the two courses is optimal (Terry and Galchus 2003). Given the disparate findings, it is important to consider these ordering studies in more detail.

Lopus and Maxwell (1995) examine sequencing effects using a sample of Test of Understanding of College Economics III data from research universities, liberal arts colleges, and two-year colleges. As mentioned above, they find completing macro first improves micro scores, but not the other way around. The authors attribute their findings to the following two possibilities. First, instructors may emphasize economic forces when teaching macroeconomics that better prepare students for micro whereas microeconomic instructors do not relate material to macroeconomics. Second, some instructors may include microeconomic material when teaching macro such that when students take microeconomics after macroeconomics, content is more familiar to students who previously completed macroeconomics.

Perumal (2012) measures sequencing effects using students' grades on a sample of 405 students from the University of Canberra in Australia. Taking macroeconomics before micro improves students' grades in microeconomics by an average of seven percent, while taking micro first does not have a significant effect on macroeconomics grades. McCoy et al. (1991) similarly use grades as a dependent variable in an education production function and conclude that microeconomics before macroeconomics has no statistically significant effect on grades in macroeconomics, but the opposite order appears to improve outcomes in microeconomics. All three studies (Lopus and Maxwell 1995; Perumal 2012; McCoy et al. 1991) use independent OLS models to estimate the ordering effect, meaning one for micro grades and another for macro. Therefore, results may be impacted by the presence of correlation across residuals.

Fizel and Johnson (1986) administered the Revised Test of Understanding of College Economics to students at The University of Wisconsin to assess how ordering principles classes affect students' understanding of economics. Using two-stage least squares and OLS regressions in many different specifications, the authors find that taking micro first improves students' understanding of economics, contradictory to the two studies previously cited. The authors also emphasize that there is a need for similar studies at different schools because of the variation across educational settings and institutions. Our analysis here constitutes the first study to be performed at an access institution where a large part of the student body consists of non-traditional and first-generation college students and is noted for its ethnic, racial, and cultural diversity.

Terry and Galchus (2003) use both OLS and ordered probit regressions on a sample of 870 business students at the University of Arkansas at Little Rock to determine sequencing effects. These researchers find that the optimal approach is for students to take micro and macro concurrently, with micro prior to macro being the second-best sequence. The authors conclude that the benefits from taking both courses concurrently

may be a result of synergies, as both courses contain common terminology and similar frameworks of analysis, as well as increased focus on the part of students taking two closely related courses at the same time.

Lastly, other authors have considered the ordering issue and recommended a single principles course in which students are taught economic literacy, eliminating some of the traditional material from the dual principles-course approach. Hansen et al. (2002) argue that students would be better served by a single course without some components such as cost curves, elasticity computations, graphing, national income accounting, comparisons of imperfectly competitive industries, multiplier formulae, and aggregate demand and supply, while adding components such as a focus on problems, policies and issues, and creating more opportunities to practice economics. For those students who would continue on to focus their studies on economics, the authors envision a second, more advanced principles course that would incorporate more graphs, equations, rules for optimization, the derivation of supply and demand curves, and other tools.

As described above, existing studies on course ordering contain conflicting results and therefore conflicting suggestions for prerequisite requirements. We attempt to add to this ongoing discussion by using a number of econometric approaches to examine the ordering effects of principles economics courses on students' grades. By implementing a variety of approaches, both parametric and non-parametric, we can more easily compare our results to the previous literature.

Data and Methods

We have data on 5,762 students who completed one or both economics principles courses between the spring semester of 2007 and the fall semester of 2013. By the end of this time period, 1,596 students had taken both courses, and 1,203 students had taken them both at our institution. We restricted our sample to this last group of students to better control for instructor fixed effects.

Business majors are the only students that are required to take both principles courses at the sampled institution. Using the typical GPA scale (A=4, B=3, etc.), the mean micro (macro) grade was 2.719 (2.868), implying the average student within the sample fared a little better in macro than micro. Students completing one course may fall into a variety of categories including dual enrollment (high school) students, transient students on our campus for one semester, students that transferred to other schools after taking one economics course, students that chose not to continue with their education, students pursuing a minor in business, students that changed their major from business, or students completing a requirement for outside programs such as pre-pharmacy. Our institution offers a one-semester introductory economics course for non-business majors that satisfies core education requirements, helping to create principles courses that almost exclusively serve business students. Over half of the 1,203 students in this study were declared business majors when the data were collected. Another 18 percent are listed as undeclared, but it is likely that such students are leaning towards a major in business given that business is the only major required to take both courses. For other students, it is possible that they change their major from business after (or while) completing the sophomore level courses or they intend to change their majors to business but failed to file the appropriate paperwork with the registrar's office. Anecdotally, we know that the percentage of students verbally declaring business at the time of the principles course exceeds that which is suggested in our data.

Our measure of student performance, grades, was provided by the institution's registrar along with other key variables such as the semester courses were taken, course instructors, and students' GPAs. Economic literacy, or "ability," is a potential variable of interest. Unfortunately, such data is not readily available. Grades, as a dependent variable, are subject to inflation through assignments that assess effort over economic understanding. It is also possible that students with poor grades have a greater understanding than what their grades reflect if the student fails to turn in required assignments. Although grades and underlying ability are not perfectly correlated, we contend that the two are likely positively correlated, and as such, grades are a reasonable choice for a dependent variable. Grades are also more relevant when examining students' progression, a metric now used to determine funding for higher education in our state. We can thus treat grades directly as a variable of interest (for the purposes of retention, progression, and graduation) or as an outcome variable contingent on the underlying latent variable, ability.

Because the distribution of grades is our outcome of interest, we will spend some time discussing these before we move to the analysis. Table 1, panel (a) presents mean grade (measured in grade points, A = 4, B = 3, C = 2, D = 1, F = 0) from the first time taking a course based on the course ordering. Figure 1 shows the

full distribution of first-attempt grades in microeconomics, while Figure 2 shows the full distribution for macroeconomics. Figures 3 and 4 illustrate the correlation between the two courses.[2]

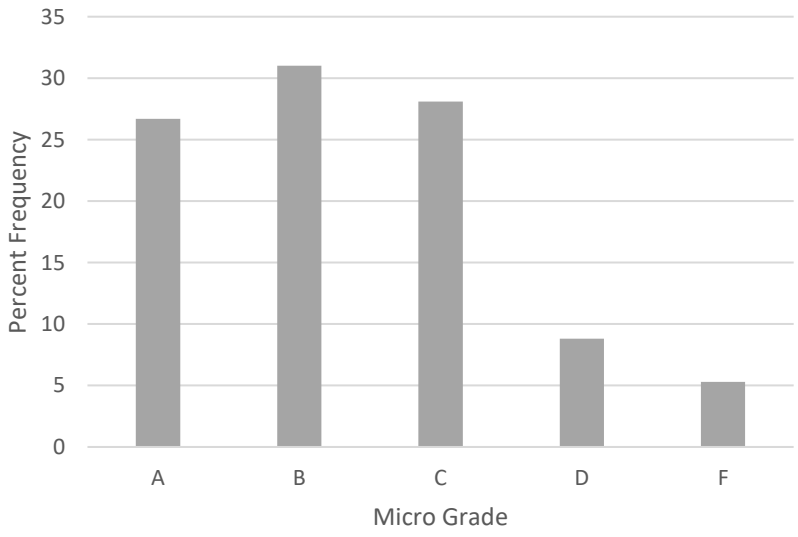
Table 1: Grades and Nonparametric Tests of Equality

(a) *Summary statistics of course grades by course ordering*

Course Ordering	Micro grade	Macro grade	*N*
Grade			
Micro first	2.591	2.878	428
Macro first	2.787	2.845	567
Simultaneous	2.798	2.909	208
(b) *P-values from Wilcoxon tests of equality of distributions*			
Hypothesis test p-values			
Micro first vs. Macro first	0.008	0.474	
Micro first vs. Simultaneous	0.017	0.000	
Macro first vs. Simultaneous	0.541	0.220	

Notes: Mean grade (A = 4, B = 3, C = 2, D = 1, F = 0) is displayed for each subsample, along with p-values for Wilcoxon tests of equality.

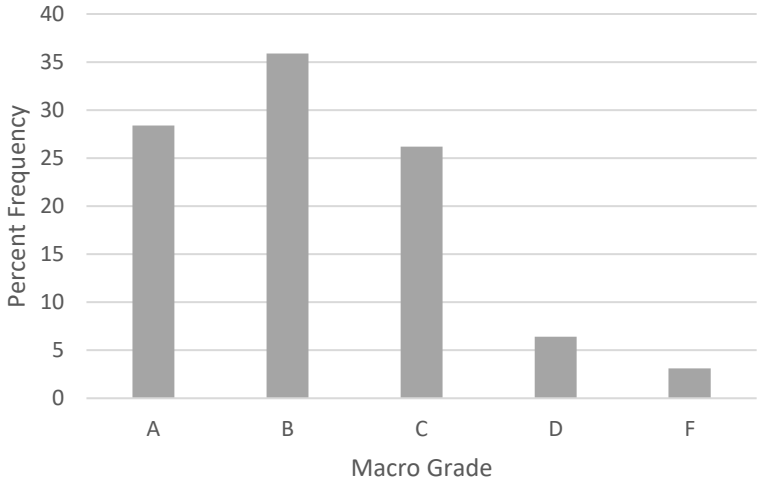
Figure 1: Micro Grade distribution



Notes: n = 1,203.

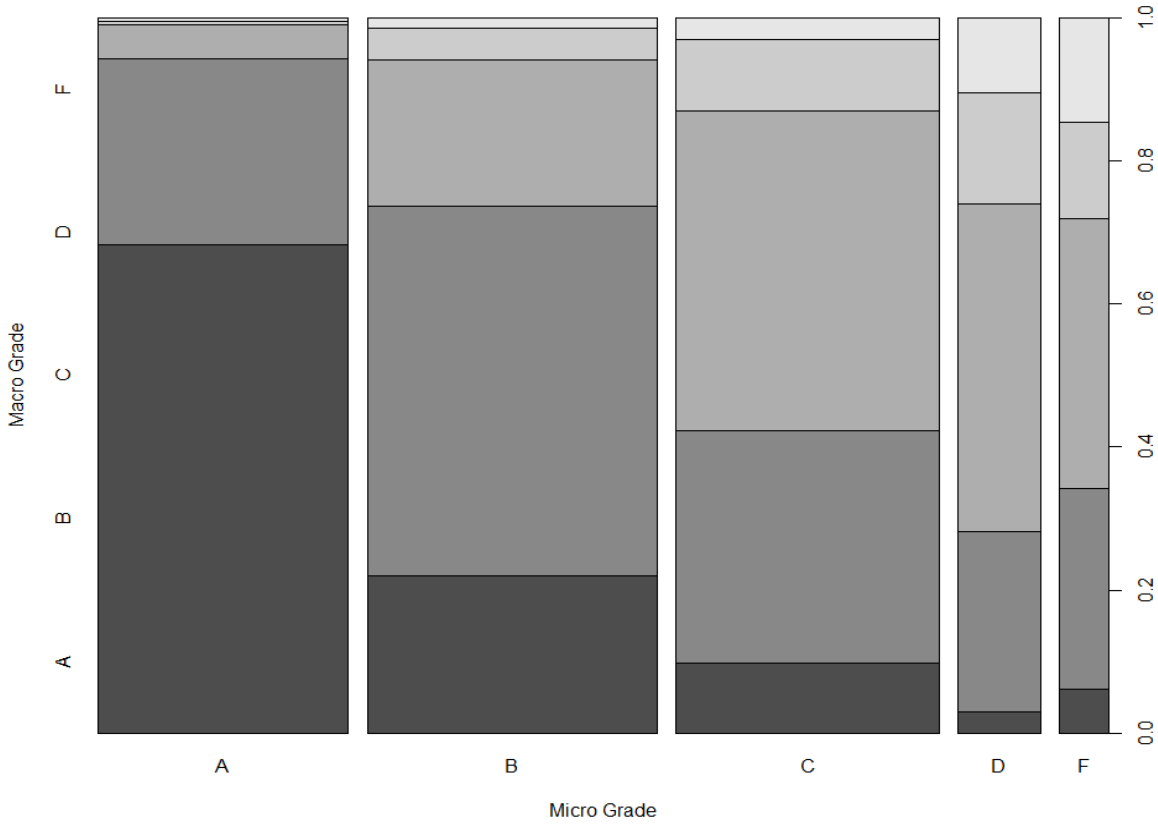
[2] A brief interpretation aid: the large dark rectangle in the lower left of Figure 3 indicates students who received an 'A' in both courses. The width of the rectangle indicates the proportion of all students who earned an 'A' in microeconomics, while the height of the rectangle indicates the proportion who earned an 'A' in macroeconomics, conditional on having earned an 'A' in microeconomics. From this we see that almost no one who earned an 'A' in micro earned a 'D' or 'F' in macro (the very thin slivers in the top left), while some of those who earned an 'F' in micro nonetheless earned an 'A' in macro (the dark rectangle in the bottom right corner of Figure 3). A similar pattern is visible in Figure 4.

Figure 2: Macro Grade Distribution



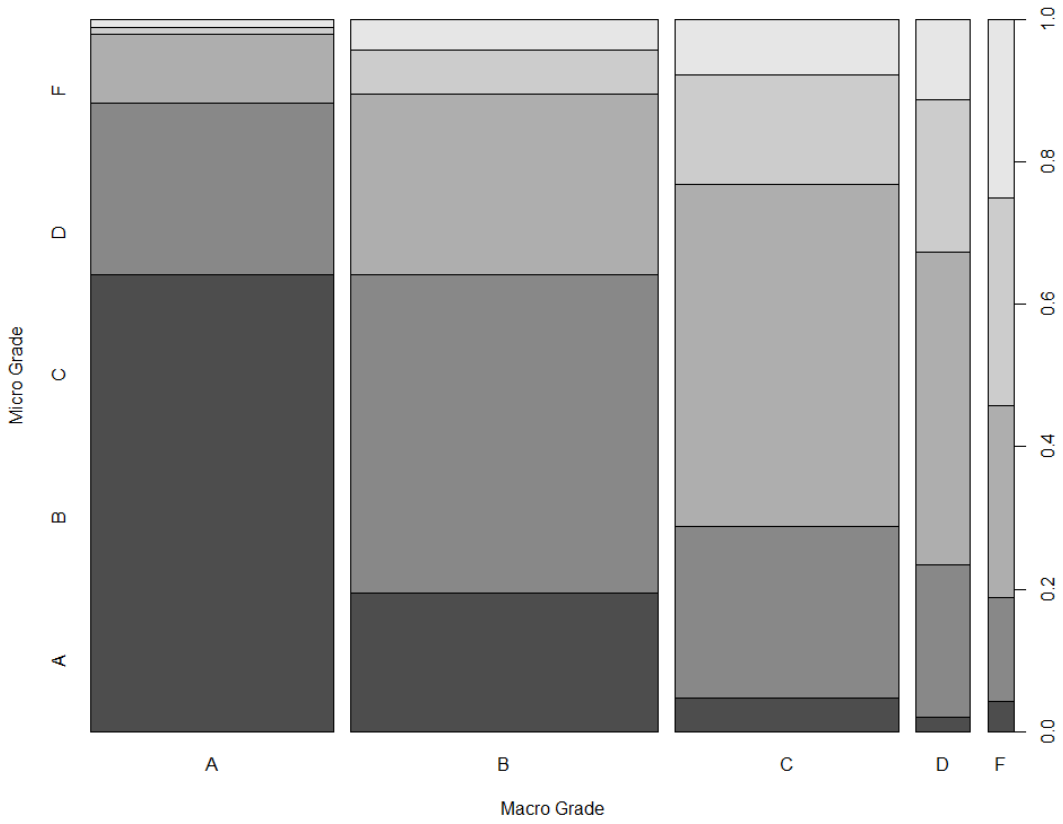
Notes: n = 1,203.

Figure 3: Micro-Macro Heat Map with Micro Bins



Notes: n = 1,203. Bar widths sized to Micro Grade relative frequencies.

Figure 4: Micro-Macro Heat Map with Macro Bins



Notes: n = 1,203. Bar widths sized to Macro Grade relative frequencies.

To determine the optimal course ordering, if any, we would want to identify the effect of course order on overall economic understanding. The ideal experiment would be one in which we could directly observe economic understanding, randomly assign course orderings, and then observe the difference in the change in economic understanding across the course orderings. The outcome measured would be economic knowledge, i.e., did the first principles class allow the student to actually learn more in their second, and if so, which principles class provides the larger effect? Simple models of the form,

$$\text{Micro ability}_i = \alpha_1 + \beta_1 \text{Macro taken}_i + \epsilon_{1i} \quad (1)$$
$$\text{Macro ability}_i = \alpha_1 + \beta_1 \text{Micro taken}_i + \epsilon_{2i} \quad (2)$$

would allow us to estimate the effect of taking one principles class before the other. Finding that the estimators of the β coefficients are significantly greater than zero would provide evidence that taking a principles class raises the outcome of the second principles class. As the β coefficients are the return from taking one class before the other, significantly different estimates would allow us to determine an optimal course sequence such that students take the principles class that provides the highest return first.

Our data deviates from the ideal approach in two ways. First, we are unable to measure student economic ability directly. We can, however, use the students' letter grade (A, B, C, D, or F) in each course as a proxy for the latent variable, economic understanding. Second, students' selection of courses may not be random. To address this, there are two approaches we could take. The first, and least demanding, is to assume that the process roughly approximates the ideal experiment. This is not as implausible as it might seem at first glance: if students have little information on which order is optimal (and the need for the current study would seem to indicate that even very well-informed students would have little to guide them), then their choices are likely to depend on other characteristics. They may choose instructors with good reputations or courses with

convenient times or locations. While these are non-random, they may be uncorrelated with course order, which is to say, "random enough" to approximate random assignment. This approach would allow for simple comparisons with very few assumptions required, and would also have the benefit of easy interpretation.

The other approach asserts that sortation into courses is not "random enough." For example, it may be the case that some instructors provide better introductory material, and that students are aware of this and provide such insight to their fellow students. These information flows would imply that students with more aptitude for or interest in learning about course selection would also be more likely to choose optimally, which would imply biased estimates of the effect of course ordering on overall understanding. This is just one of many arguments for taking measures to try to more precisely approximate an experiment using econometric methods to construct appropriate counterfactuals. These methods have the disadvantage of requiring more extensive modeling assumptions, being more data-intensive, and providing less in the way of straightforward interpretations. They do, however, provide the advantage of avoiding biased estimates of the treatment effect.

In this study, we consider both approaches. The least restrictive assumptions allow for a broader view, while the more restrictive assumptions provide more clarity as to the accuracy of our identified effect, if any. A total of three econometric approaches appear in this study. The first and least restrictive approach is the Wilcoxon rank-sum test of equality of two distributions. This provides simplicity, but does not allow for conditional mean estimation of the treatment effect.

The Wilcoxon rank-sum tests make very few distributional assumptions. A causal interpretation, however, treats the data as though any variation in the students' choice of course order is strictly exogenous or random. Because this may not be the case, we can consider other methods with more restrictive assumptions to try to control for nonrandom selection issues. Multiple estimation techniques are used to better understand the ordering effects of principles courses on grades. First, if we are willing to assume that the error term follows a standard normal distribution, then we can use an ordered probit model to estimate the effect of having taken a previous or concurrent economics course. Including other controls for student, faculty, and course characteristics, we have the following two full models:

$$\text{Micro grade}_i = \alpha_1 + \beta_1 \text{Macro taken}_i + \gamma_1 \text{Simultaneous}_i + \delta_1 X_i + \theta_1 F_i + \lambda_1 f_i + \phi_1 T_I + \epsilon_{1i} \quad (3)$$

$$\text{Macro grade}_i = \alpha_2 + \beta_2 \text{Micro taken}_i + \gamma_2 \text{Simultaneous}_i + \delta_2 X_i + \theta_2 F_i + \lambda_2 f_i + \phi_2 T_I + \epsilon_{2i} \quad (4)$$

where Micro grade$_i$ and Macro grade$_i$ are the student's ordinal grades in the respective principles class; α an intercept; Macro taken$_i$ and Micro taken$_i$ are dummy variables for those students that took microeconomics or macroeconomics, respectively, in a previous semester; Simultaneous$_i$ is an indicator for those students who took both classes during the same term; F_i and f_i are faculty fixed effects for each principles class; T_i are semester fixed effects; X_i is a vector of individual characteristics (prior academic achievement, other-course outcomes, age, gender, number of credit hours, and major); and ε_i is a well-behaved error term. We also cluster the errors around the faculty fixed effects to better account for different grading distributions among professors.

Because these models describe processes at the same institution occurring with the same student body, the assumption that the error terms would be uncorrelated across the models would likely be violated. Thus, we implement a third econometric approach, seemingly unrelated regression (SUR) to allow for correlation between the models and to estimate the coefficients of both models simultaneously. This approach allows the use of a Wald test to directly test whether $\beta_1 = \beta_2$, something which cannot be done when estimating (3) and (4) independently of one another.

Results

We begin with the results from our nonparametric hypothesis tests to see if there are differences in the underlying distributions without regard to other conditions. These results are in panel (b) of Table 1. The response variable is either the grade achieved in the first attempt at taking Principles of Microeconomics or the grade achieved in the first attempt at taking Principles of Macroeconomics, depending on the column. In the first row, we see that there is a difference in micro grades between the group that took micro first and the group that took macro first (p = 0.008—in this test we are testing the difference between the 2.591 mean grade in micro from the macro-first group and the 2.787 mean grade in micro from the macro-first group), but that there is no difference in macro grades between these groups (p = 0.474—here we are testing the

2.878 vs. 2.845). We also find those who take the course simultaneously outperform those who take micro first in both courses ($p = 0.017$ for micro grade differences, $p < 0.001$ for macro grade differences). These results provide some preliminary evidence: Students who take macroeconomics first or the two subjects concurrently perform significantly better in microeconomics. However, it is important to note that the higher GPA in all orderings of macro may make it more difficult for a student to improve their macro score after taking micro versus the reverse case. Also, causal inference should be cautioned against in this case, as other differences between these groups may be nonrandom.

We can have more confidence in our inferences by controlling for observable differences among students in the different conditions. Table 2 presents summary statistics for our student-specific control variables. We have data on prior academic achievement, other-course outcomes, age, gender, number of credit hours, and major. In addition, we can identify the instructor of the course, as well as the term, and we use these controls in a number of specifications to check for the robustness of our results. Ideally, we would want to control for race, first-generation status, and parent's education levels, but these and other socio-economic variables were not available from our data source.

Table 2: Student-specific control variable summary statistics.

Continuous variable	Mean	SD	Min	Max
Freshman year GPA	2.937	0.987	1	4
Current term GPA (exclusive of the econ course)	2.308	1.097	1	4
Enrolled credit hours for current term	7.346	5.527	3	19
Age at matriculation	24.450	7.183	16	54
Binary variable		Percent frequency		
Male		52.4		
Major: biology		6.3		
Major: business		56.3		
Major: chemistry		0.1		
Major: criminal justice		1.6		
Major: English		0.6		
Major: exercise science		2.6		
Major: history		1.3		
Major: information technology		5.4		
Major: math		1.2		
Major: pre-nursing		0.7		
Major: political science		1.3		
Major: psychology		4.0		
Major: special education		0.4		
Major: undeclared		18.1		

Notes: n = 1,203. Minimums and maximums rounded to the integer.

The results from several ordered probit models are visible in Table 3. Here, the dependent variable is a student's ordinal letter grade (A through F) in either micro or macro. The simplest model includes none of the controls mentioned, while in the most comprehensive model, we include professor and term fixed effects, professor-term interactions, and student characteristics. In every model we see that taking either macroeconomics first or concurrently improves a student's expected microeconomics grade. These results are relatively robust with respect to magnitude as well. Students are shown to perform better in their second economics course. That is, the estimated effect of having taken micro first on a student's macro grade, as well as the estimated effect of having taken macro first on micro, is positive. Additionally, taking the courses simultaneously is estimated to improve one's micro grade but to have no effect (positive or negative) on their macro grade. Specifically, in the 2 models with the highest level of control (column 5), a student who has already taken micro is estimated to be 34% more likely to earn a higher letter grade in macro than other students, on average. The estimated impacts on micro grades are noticeably higher, with students who have already taken macro being 69.7% more likely to earn a higher letter grade in micro, on average. Even larger in magnitude is the estimated impact of simultaneous enrollment on one's micro grade, 91.9%, though the magnitude of this estimate is less robust to included controls, ranging 35.7-59.0% in the other models.

Table 3: Ordered Probit Results

Independent variable	Model				
	(1)	(2)	(3)	(4)	(5)
Dependent variable = Micro grade					
Has taken macro	1.706***	1.452***	1.390***	1.372***	1.697***
	(0.150)	(0.132)	(0.127)	(0.126)	(0.162)
Took simultaneously	1.357***	1.590***	1.472***	1.497***	1.919***
	(0.107)	(0.143)	(0.134)	(0.136)	(0.174)
Pseudo R^2	0.004	0.017	0.022	0.023	0.177
Dependent variable = Macro grade					
Has taken micro	1.150	1.285***	1.365***	1.358***	1.340***
	(0.100)	(0.115)	(0.123)	(0.122)	(0.122)
Took simultaneously	0.915	1.158	1.132	1.119	1.073
	(0.064)	(0.106)	(0.104)	(0.104)	(0.101)
Pseudo R^2	0.001	0.009	0.014	0.015	0.075
Controls					
Professor fixed effects		X	X	X	X
Student characteristics			X	X	X
Term fixed effects				X	X
Professor-term interactions					X
Clustered standard errors		X	X	X	X

Notes: Values are odds ratios with standard errors in parentheses. Clustered standard errors, when used, are clustered at the professor level (of the course in question). Student characteristics comprise prior academic achievement, other-course outcomes, age, gender, number of credit hours, and major. Professor fixed effects refers to both courses. *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$. n = 1,203.

Given that observations are drawn from overlapping students and instructors, it seems unlikely that the errors across models of micro and macro grades are independent, which is why we next use a SUR approach. In Table 4, we present results from five different SUR ordered probit models. Like before, results show previously completing a college-level economics principles course improves expected grades in the second course: taking macro first is associated with a 16.2% - 20.2% increase in the likelihood of a higher micro grade (models 5 and 3), while taking micro first is associated with a 10.5% - 16.8% increase in the likelihood of a higher macro grade (models 1 and 5—only marginally significant in some specifications). Also, like before, concurrent courses improve microeconomics grades but not macroeconomics, on average, and even then, the magnitude of the point estimate of the effect of macro-first on a student's microeconomics grade is larger than the estimated effect of micro-first on their macroeconomics grade. Importantly, Wald tests indicate that there is no statistically significant difference between the estimated micro first and macro first coefficients under any of our specifications. Although the effects of order are not statistically different in this specification based on the Wald test, we do observe a larger magnitude of the odds ratio showing that macro's estimated effect on micro is larger than in the reverse. Future research using more data might improve the ability of this test to distinguish a statistically significant difference between order effects which would be consistent with the findings from the other specifications used in this study. However, the emerging significance of those results is not guaranteed.

As a test of whether "outlier students" may be significantly influencing these estimates, we subsample to business majors between the ages of 18 and 30 and re-estimate the ordered probit and SUR ordered probit models. Key results from these models are presented in Table 5. The estimated magnitudes of the course ordering effects do change, but not in large ways, and the overall story remains. As mentioned previously, we consider one of our primary contributions to be an analysis of a diverse open-access student body. Therefore, we consider estimates from our full sample (those in Tables 1-4) to be primary, but still find these subsample tests valuable.

Table 4: SUR Ordered Probit Results

Independent variable	Model				
	(1)	(2)	(3)	(4)	(5)
Dependent variable = Micro grade					
Has taken macro	1.190***	1.186***	1.202***	1.198***	1.162***
	(0.060)	(0.060)	(0.061)	(0.061)	(0.061)
Took simultaneously	1.199**	1.227***	1.226***	1.227***	1.159*
	(0.080)	(0.080)	(0.081)	(0.081)	(0.082)
Dependent variable = Macro grade					
Has taken micro	1.105*	1.118*	1.126**	1.123**	1.168***
	(0.061)	(0.061)	(0.062)	(0.062)	(0.062)
Took simultaneously	1.095	1.089	1.074	1.071	1.048
	(0.077)	(0.077)	(0.078)	(0.078)	(0.078)
Wald test: Has taken macro = Has taken micro					
χ^2 value	0.640	0.400	0.520	0.500	0.001
Prob > χ^2	0.424	0.525	0.472	0.478	0.949
Controls					
Professor fixed effects		X	X	X	X
Student characteristics			X	X	X
Term fixed effects				X	X
Professor-term interactions					X
Clustered standard errors		X	X	X	X

Notes: Values are odds ratios with standard errors in parentheses. Clustered standard errors, when used, are clustered at the professor level (of the course in question). Student characteristics comprise prior academic achievement, other-course outcomes, age, gender, number of credit hours, and major. Professor fixed effects refers to both courses. *$p < 0.10$; **$p < 0.05$; ***$p < 0.01$. n = 1,203.

Combining the Wilcoxon, ordered probit, SUR ordered probit, and subsample model results, we have taken a systematic approach to establishing the direction, magnitude, significance, and robustness of the ordering effects of principles courses in economics. We find that, across varying levels of modeling assumptions, taking macroeconomics first consistently leads to statistically significant improvements in microeconomics grades. While students appear to generally perform better in their second economics course, evidence of micro helping macro is slightly less consistent and often of smaller magnitude than the reverse. Taking the courses concurrently consistently appears to aid in micro but not macro performance, giving further evidence that macro education somehow helps micro students but perhaps not (or less so) the opposite. However, within our only methodology which allows for a direct statistical test of equality for the two effects (the Wald tests following the SUR ordered probits), we found evidence that the two primary course ordering effects cannot be called statistically distinguishable, even though the magnitude of the odds ratios indicated that macro's estimated effect on micro is larger than in the reverse.

Conclusion

The purpose of this project was to employ a number of methods to determine whether the sequencing of principles of macroeconomics and microeconomics affects students' grades in these courses. Looking to improve students' educational outcomes and strengthen our curriculum, we assessed how other, similar schools arranged these courses and reviewed the existing literature on the subject. Previous studies, however, provided mixed evidence and, in practice, some schools require micro first, others macro, and even more let students decide. To some extent, differences in the literature may be attributed to statistical issues, such as failing to account for correlated error terms as well as non-random assignment of students into treatment groups, or because of a lack of external validity, since studies are based on different types of institutions. To this end, we find that our main contributions to the literature are: 1. The use of data for an open-access

institution, and 2. The application of multiple econometric techniques to provide a sense of both the magnitude and the robustness of any course-ordering effects.

Table 5: Sub-sample models, business majors 18-30 years of age

Independent variable	Ordered probit	SUR ordered probit
Dependent variable = Micro grade		
Has taken macro	1.704***	1.175***
	(0.168)	(0.063)
Took simultaneously	1.900***	1.161*
	(0.169)	(0.084)
Dependent variable = Macro grade		
Has taken micro	1.301***	1.170***
	(0.132)	(0.060)
Took simultaneously	1.081	1.056
	(0.120)	(0.081)
Wald test: Has taken macro = Has taken micro		
χ^2 value		0.002
Prob > χ^2		0.930
Controls		
Professor fixed effects	X	X
Student characteristics	X	X
Term fixed effects	X	X
Professor-term interactions	X	X
Clustered standard errors	X	X

Notes: Values are odds ratios with standard errors in parentheses. Clustered standard errors, when used, are clustered at the professor level (of the course in question). Student characteristics comprise prior academic achievement, other-course outcomes, age, gender, number of credit hours, and major. Professor fixed effects refers to both courses. *p < 0.10; **p < 0.05; ***p < 0.01. n = 502.

With the majority of U.S. students attending less selective institutions (O'Shaughnessy 2011), scholarship of teaching and learning should include more research on these schools. Our institution, recognized for its diversity along a number of dimensions, provides an excellent setting for this type of analysis. While our results fall in line with many of the previous studies, this finding is not one that could easily be extrapolated given the selectivity inherent in previous studies. Our econometric techniques also differ from earlier studies.

The non-parametric (Wilcoxon tests) results show that students perform better in microeconomics when they have either already taken macroeconomics or are taking it concurrently. Results from the ordered probit models differ from the findings of the non-parametric approach but generally suggest the same course ordering. In these models, taking microeconomics first increases the expected grade in macroeconomics, but taking macroeconomics first has a larger positive effect on the expected grade in microeconomics. The magnitudes of these two effects are often comparable and probably not statistically differentiable, although these models are incapable of distinguishing the estimated impacts statistically. As with the nonparametric approach, simultaneous courses in microeconomics and macroeconomics appears to improve outcomes in microeconomics but not macroeconomics. These patterns appear robust to various institutional and student control variables under this ordered probit approach.

The SUR ordered probit models are broadly consistent with the previous ordered probits. Students score better in their second economics course, and when taken simultaneously, perform better in micro but not macro. However, when allowing the models to run simultaneously, the estimated impact of taking macro first on micro grades is no longer noticeably different (larger) in magnitude than the reverse. Also, based on post-regression hypothesis tests for these models, there is no evidence that the two effects are statistically different.

To summarize, we have three results that are consistent across all empirical approaches: taking macro first will improve a student's micro grade, taking the courses simultaneously will improve a student's micro grade, and taking the courses simultaneously will have no impact on a student's macro grade. Ordered probit

models show an additional impact of micro first on macro grades, but one that is smaller in magnitude than the consistent impact of macro on micro. Finally, when the ordered probit models are estimated simultaneously in a SUR framework, we no longer see a difference across those two positive effects. However, even in this approach, concurrent enrollment has a statistically significant impact on micro but not macro grades, implying macro may help micro but not the reverse. We see value in all of these empirical methodologies. The nonparametric approach, for example, has both advantages and disadvantages when compared to the parametric techniques. Therefore and overall, we feel our results imply that if one course must serve as a prerequisite to the other, Principles of Macroeconomics should be placed first, as it has the most consistently estimated impact on student grades.

There are many reasons why taking macroeconomics first might be advantageous. First, macroeconomics is built on microeconomic foundations, meaning students encounter essential elements of microeconomics during the macroeconomics course. It is typical for Principles of Macroeconomics to discuss market demand and supply, which is at the core of many concepts in Principles of Microeconomics. Students begin to build the skills necessary to think like an economist before more foreign concepts such as elasticity or profit maximization are introduced. Second, macroeconomics introduces students to current affairs and the aggregate economy, both of which may pique student interest more than firm-level and perhaps individual-level theories of microeconomics. This interest could carry forward into subsequent economics courses. Another reason is that students may be more familiar with macroeconomics from the media. While stories on microeconomics are abundant, they may be harder for students to identify prior to a microeconomics course. Articles on GDP, interest rates, and inflation are much more recognizable as economic news. Again, familiarity with the subject levels the playing field more in macroeconomics courses, whereby having a previous course in microeconomics does less to improve students' grades in macroeconomics than the reverse. Two more explanations for a beneficial macro first-order effect are specific to access institutions. First is the possibility that these students, often being the first in their family to attend college, receive a larger confidence boost from performing well in macroeconomics (average grades in macro were higher regardless of ordering) which leads to better performance in their later micro classes. A second possibility is that the content in macroeconomics courses which includes many topics that are international in nature or related to the labor market may generate higher levels of interest among the diverse and non-traditional students at access institutions, which could lead to higher levels of interest and engagement in microeconomics classes later on. Finally, as our results show, concurrent enrollment in the two courses can improve student achievement in microeconomics. Thus, listing macro as prerequisite/co-requisite may be a viable option.

Our unique sample and variety of econometric approaches yield at least a tentative answer to the question, "Does Order Matter?" The answer, it appears, is "yes," followed by more questions: "why?" and "now what?" among them. The results we present should inform both the curriculum design process at schools like ours, as well as future research on economic literacy and undergraduate economics education. In particular, additional research on the effects of ordering when the curriculum is intentionally designed to be ordered would be informative. In addition, our results run counter to some of the theoretical arguments on the importance of microeconomic foundations as prerequisites for macroeconomics work.

Future research may be of use to determine whether our result differs based on the level of material: at more selective institutions or in graduate work, there may be more direct links between, for example, choice theory and agent-based macroeconomic models. In these contexts, the course ordering question may need revisiting. The significance of program assessment and assurance of learning in economics and business programs will continue to have economists considering the best way to approach economic foundations in both microeconomics and macroeconomics. Our institution's course ordering requirements and/or recommendations may or may not change as a result of this study, but our desire, along with economics faculty everywhere, is to provide our students with the greatest gains in economic understanding along with the highest chance of academic success in our courses.

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The Power of Interest: Connecting the Real World to the Finance Classroom

Alma D. Hales, Laura Cruz, and Jacob Kelley[1]

ABSTRACT

This study examines how the incorporation of a project utilizing real-world financial data from the Bloomberg Professional Service affects student engagement in an introductory finance course. This mixed methods study demonstrates that the project provides insight into the role played by receptivity, relevance, discipline, and integration in bridging the gap between teaching and learning and between theory and practice.

Introduction

A basic tenet in finance is that a dollar today is worth more than in the future due to the power of interest. But the importance of interest in the finance classroom extends beyond the principles of time value of money. The type of interest that makes our students curious about the world of finance can make positive and significant contributions to their learning. While there are multiple pathways towards increasing student interest, research in learning sciences strongly suggests that the perceived relevance of course material may play a significant role (Brown et al. 1989; Sperber and Wilson 2004). This is especially the case for applied sciences, such as those fields commonly represented in business, for which the clear and direct connection between the subject matter and career success is what many students cite as their primary reason for selecting the major (Malgwi et al. 2005). Bringing the real-world to the classroom is compelling in theory; in practice, however, it has proven challenging to implement and no single pedagogical standard has emerged to define how this could or should be accomplished whether in business or other fields (Carlile et al. 2016; Donovan et al. 2006).

In this study, we assess efforts to harness the power of student interest in an introductory finance course through the integration of real-world tools and project-based learning. Our study aligns with recent literature on using technology and analytics to teach economics and finance (Evans and Jones 2016; Gehy and Hoffman Smith 2016; Keys 2016; Kazemi 2015). However, our study contributes to the literature in a distinct way. Rather than discussing details that illustrate how to implement a singular intervention, such as the use of Bloomberg terminals or project-based learning (both used in the study), we focus on larger questions of how the implementation of such an intervention, especially at an early stage in the curriculum, affects the student learning experience. The findings of our mixed methods study indicate that principles of finance courses can reach beyond knowledge acquisition and skill development. With proper guidance, students in introductory courses can be motivated to use the tools of inquiry and, through them, extend those principles into the complex, real-world.

Related Literature

Research on active learning strategies, such as project-based learning, spans several decades, with the majority of studies indicating positive results when implemented effectively (Freeman et al. 2014; Lee et al. 2014; Prince and Felder 2006). With this consensus, the questions to be answered have shifted from whether or not these approaches work to how to make them work well within specific disciplinary contexts, across

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different mediums, and/or with distinctive audiences. That being said, challenges to implementation persist throughout higher education and recent research has focused on identifying those factors that impede teaching transformation; including (among others) attention to the role of diverging disciplinary standards, low faculty motivation to change, and unclear connections between teaching and research (Dallas et al. 2014; Porter and Graham 2016).

In the case of business education, these factors appear less applicable. The primary accrediting body for colleges and schools of business in the United States, the Association to Advance Collegiate Schools of Business includes in its mission the goal to "amplify impact in business education." AACSB standards include significant time and attention paid to fostering and assessing student learning outcomes, adopting best practices in teaching, and actively engaging students in real-world business challenges through curricular, co-curricular, and extra-curricular activities. Faculty in colleges and schools of business are often engaged directly in that real-world as consultants, business owners, board members, and related roles. Thus, one of the fundamental assumptions of the business mindset is the need for constant adaptation to a changing environment.

This adaptive orientation is evident in the burgeoning literature on best practices in business education; business faculty have served as pioneers in several key areas of contemporary pedagogical practice including technology-mediated instruction (classroom-based technologies, on-line and hybrid modes of instruction, and virtual simulations) (Alavi and Leidner 2001; Arbaugh 2014; Arbaugh et al. 2009; Davis et al. 2005; Duxbury et al. 2016; Farley et al. 2011; Hornik et al. 2008; Whitaker et al. 2016; Yu et al. 2014); interdisciplinary integration (ethics, communication, social justice/law) (Toubiana 2014); and problem-based learning (case studies, simulations, and role-play) (Anderson and Lawton 2014; Bigelow 2004; Farrell 2005; Stahl and Dunning 2015; Stinson and Milter 1996). Many of the innovations within business education fall under the umbrella of engaged or authentic learning, in which student activities are closely connected to the world outside of the classroom. This is a link that is often emphasized in marketing materials for the college or school (Fink 2013; Herrington et al. 2014; Rule 2006). Despite this initial success, business schools, like other areas in academia, have struggled to move from the early adopter to the late majority phase on the diffusion of innovation curve (Eschenfelder et al. 2014; Watty et al. 2016).

It is possible that the solution may emerge through disciplinary-based educational research. Business education is an aggregate term that aligns with the AACSB's college-level accreditation process and the widespread implementation of an integrated core business curriculum. That aggregation has facilitated large-scale studies of key educational indicators, such as student success, but it glosses over differences between disciplines housed in the college, such as accounting (which has an especially lively teaching research base), management, information systems and finance. Each of these disciplines face distinct challenges in student learning and faculty adoption.

In the case of finance, students grapple with a set of inter-related challenges. The study of finance requires advanced proficiency in quantitative analysis, a set of skills which have been identified as daunting in many academic disciplines (Conners et al. 1998; Jain and Dowson 2009; Pan 2003) but especially when compared to other, relatively less-quantitative majors within business. It could be said that finance instructors must contend with a student perception of relative deprivation (Sanford et al. 2014; Theodosopoulos et al. 2014).

This emphasis on quantitative proficiency contributes to the perception that finance classes are more challenging than others in the core, so students enter the class with a sense of trepidation or foreboding, which can affect their receptivity to the material (Worthington 2002). Finally, the need for advanced skill proficiency often drives instruction, meaning that students spend considerable amounts of time on skill development versus application, analysis, or synthesis (Grove and Wasserman 2006; Janor et al. 2013; Mauffette et al. 2004; McCullough and Munro 2016; Wentworth and Funck 2015). The latter are not only valued as higher order thinking skills, but they are also closely correlated with student satisfaction (Smith and Cook 2012).

Methodology

This study examines how integration of the Bloomberg Professional Service and project-based learning affects the student experience in Principles of Managerial Finance, an introductory finance course required of all business majors. The study took place over the course of one semester at a medium-sized, doctoral-granting institution located in a suburban region of the southern United States. During the study, only one instructor taught all (four) sections of the course; three sections met Monday-Wednesday while one met

Tuesday-Thursday. Table 1 below shows the composition, by major, of the 166 participants in the study. Although this is a finance course, only 11.45% of the participants are pursuing finance as a major. These demographics highlight the challenge of and the need for increasing engagement in this introductory course.

Table 1: Composition of Sample by Program of Study

Major	# of Students	% of Sample
Accounting	26	15.66
Business & Information Technology	17	10.24
Economics	6	4.82
Finance	19	11.45
Management	29	17.47
International Business & Cultures	8	4.82
Marketing	26	15.66
Other	35	21.08
Total	166	100.00

Notes: Other includes students with majors outside the College of Business but pursuing business minors and students in the College of Business with undeclared majors.

To meet this goal, the professor introduced a multi-part project. The project's objectives are: "enable [the student] to see how course content is applied in the real business world" and "introduce [the student] to the Bloomberg Professional Service to enhance [their] marketable skill set." As a first step, the project requires students to self-select into groups of three or four and choose a company to analyze. For simplicity, eligible companies include only those in the S&P 500. After group formation, the project consists of five data collection stages and three analyses in alignment with course units. Students may report their findings using their preferred method including essay, presentation, podcast, or infographic.[2] The final analysis requires students to compare and contrast their company to a suitable peer, as determined by the course instructor. Table 2 displays a subset of data items/guiding questions offered to participants at each stage of the project. To support participants in the completion of the project, the course instructor offered written feedback for both the data collection and analysis phases. Students with errors in data collection had multiple opportunities to make corrections. Furthermore, feedback on Analyses 1 and 2 helps guide the creation of the final analysis.

Table 2: Stages of the Project

Phase 1-Introduction/Company Overview: Collect basic company information including a description of the company's main operations and general information on the company's management.

Phase 2-Time Value of Money: Collect information on the historical rates of return for the company's stock and a market index, specifically the S&P 500.

Phase 3-Company's Bonds & Interest Rates: Collect bond characteristic information for one of the company's outstanding bonds including but not limited to coupon rate, issuance date, maturity date, par amounts, and bond ratings

*Analysis 1***:** What is your company? What does your company do? Why did you select this company? Did the company fare better than the overall stock market? What does this suggest about stock picking? Consider the coupon rate of this bond. Do you think the rate is attractive? Irrespective of the coupon rate, what are some attractive qualities of investing in bonds?

Phase 4-Company's Stock: Collect information on the risk and return of the company's equity including: annual mean returns, the standard deviation of returns, and required returns based on the Capital Asset Pricing Model.

Phase 5-Company Financials: Compile historical financial statements for the company and information on the company's financial ratios for over time and relative to an industry average.

Analysis 2: Consider the stock's required return**.** Is it increasing or decreasing over time? What is driving these changes? Is it changes in expected inflation? Changes in risk aversion? Changes in beta? Analyze the company's liquidity, asset management, debt and profitability using time series analysis.

Final Analysis: Which of these two companies do you feel is better managed? Why?

Notes: Detailed descriptions for each phase available from the authors upon request.

[2] Most students select written report. Exceptions include some PowerPoint presentations and one poster.

To examine the impact of the pedagogical intervention, this study incorporates a variety of assessment tools. First, we used information gathered from a series of focus group interviews. We invited students to participate in focus group interviews conducted by the authors not involved in course instruction. This maximized our ability to obtain unbiased feedback on the implementation of the project. We offered students extra-credit points in the course and snacks (pizza and drinks) to encourage focus group participation. To ensure that participation remained strictly voluntary, the instructor offered all students an alternative extra credit opportunity, with 76 opting into the alternative. For the focus group interviews, a total of sixty-three students participated in seven distinct groups centering on a list of IRB-approved questions including, but not limited to:

If a friend had the choice of taking FIN 3210 either with or without the Bloomberg tool, what would you tell them?

If you had to describe the benefits of the Bloomberg tool to an upcoming student, what would you tell them?

Please describe any challenges or obstacles you experienced in using the Bloomberg tool.

Following data collection, the researchers applied thematic analysis to the transcripts of the focus group audio recordings. We first identified potential themes through independent review, which consists of the researchers locating ideas or experiences that were shared among the participants across focus group interviews (Patton 2015). Then we used NVivo, a qualitative analysis software package, to search the transcripts and analyze word frequency to assess support of our themes. This allowed us to explore the data in a different way in an attempt to infuse trustworthiness into our study (Marshall and Rossman 2016).

The researchers also searched for evidence of student engagement by analyzing student learning outcomes. First, we review aggregate student performance on a set of course examinations before and after the intervention. In addition, we review quantitative data from the course's assurance of learning (AoL) mechanism. The process includes asking all students enrolled in Principles of Managerial Finance a set of six standardized multiple choice questions developed and approved by all members of the college's finance faculty. The use of the AoL mechanism is an AACSB-accreditation requirement and precedes the implementation of the Bloomberg project. To examine whether the incorporation of project-based learning impacts student outcomes, we compare the exam and AoL results across the sections taught by the same instructor in different semesters—with and without the Bloomberg intervention. Secondly, we evaluated the final analysis section of students' Bloomberg projects.[3] After removing all identifying information, each member of the research group and one external member analyzed and rated the student products independently based on the rubric provided in Table 3. Finally, we averaged the scores across all three internal raters to develop a composite score.

Table 3: Student Product Scoring Rubric

Factor	Description	Possible Ratings
Appropriate Terminology:	The student employs terminology in a clear and accurate manner as to demonstrate understanding. When appropriate, the student also defines terminology.	Absent (1) Emerging (2) Proficient (3) Advanced (4)
Multiple Dimensions:	The student considers a variety of financial concepts when deciding on a position in order to enhance their argument.	Absent (1) Emerging (2) Proficient (3) Advanced (4)
Effective Argument:	The student articulates a definitive position that was supported by evidence. Proper writing conventions are observed.	Absent (1) Emerging (2) Proficient (3) Advanced (4)
External Connections:	The student makes connections beyond the scope of the project, including the overall financial environment and content of other courses.	Absent (1) Emerging (2) Proficient (3) Advanced (4)

[3] We used only those projects for which all participating students provided IRB-approved consent, N=19.

Findings and Discussion

The multiple methods of assessing the outcomes of this project revealed several key components of building student interest in the finance classroom. We have grouped these components into four categories: receptivity, relevance, discipline, and integration.

Receptivity

Research suggests that student resistance can be a critical factor in the adoption of new teaching strategies, and it is not uncommon for students to be initially uncomfortable with changes that fall outside of the expected culture within the department or college (Hayward et al. 2016; Walder 2015). We expected student resistance since this was the first semester in which students had been asked to complete not just this project but any project in relation to this Principles of Managerial Finance course. Not surprisingly, student receptivity was linked to the incorporation of not just a new pedagogical approach but also new technology. Participants in the focus group interviews expressed having limited knowledge regarding Bloomberg prior to this course. The majority reported knowing nothing or only having heard of Bloomberg through media, particularly movies, a perception that confirms previous findings (Gehy and Hoffman Smith 2016). Students expressed concern over the difficulty navigating the terminal particularly as first-time users, as demonstrated by the focus group excerpt below:

I am scared of technology so it's hard for me…

Based on analysis of the focus group interview transcripts with NVivo, we discern 20 references to ambiguity, which led to some push back from the students. Student resistance to the introduction of new technologies in the classroom is a well-documented phenomenon (Carty and Baker 2015; Mintu-Wimsatt 2001), though there is some evidence that the effect is not as significant for business students (Spinelli 2001). Our experience is in line with these findings since the students point out technical issues. Yet, they do not recommend doing away with the project or the Bloomberg tool. Instead, they conveyed a desire for additional formal instruction regarding use of the service. They suggest training videos, class demonstrations, and full days in the lab to provide step-by-step demonstrations of Bloomberg functions required for the project. Similarly, logistical issues, particularly a limited number of Bloomberg terminals and limited lab hours, decreased student interest at first. Rather than solving the problem through direct resistance to the technology, their comments focused on finding ways to alleviate logistical constraints.

Beyond student receptivity, systemic faculty resistance is often posited as a more critical barrier to classroom innovation. Business instructors and evaluators are no exception (Redpath 2012). Practitioners may be tempted to attribute these differences in receptivity to broad demographic factors, but this case, in which a Generation X professor introduces a new tool directly from the business world to a group consisting largely of resistant Millennials suggests that such simple lines of causation may not be sufficient. For this course, the instructor initiated a form of proprietary technology that students would be likely to encounter in their careers and allowed them to engage directly with the same information used by business professionals. This strategy resulted in little direct student resistance to the tool or the intervention itself. Rather, student feedback focused on the logistics and integration of the tool as part of the course, while simultaneously recognizing the value of working with business-ready applications. Implicit in these results are several potential lessons for improving both student and faculty resistance to technology-mediated instruction.

Relevance

Another lesson to be drawn from this study is the impact of relevance in the classroom. As mentioned previously, it is not a new idea to suggest a strong positive correlation between student interest and the relevance of course material (Rule 2006). That being said, relevance presents a distinctive challenge to finance, in which the pedagogy is conventionally grounded in the development of advanced quantitative skills. In this sense, teaching finance is more akin to other fields outside of business, such as statistics or applied math, in which such skills feature prominently (Conners et al. 1998; Jain and Dowson 2009; Pan 2003). Skill-based learning presents two challenges to fostering relevance. First, skill development is a graduated process in which students need to develop foundational proficiency before moving on to the next level and secondly, they need to practice the same skills repeatedly in order to gain proficiency. Conventionally, these outcomes are accomplished through the use of problem sets that take into account the level of student ability and allow for repetition. This project did not replace skill building activities but instead

aimed to complement them by bridging the gap between curated problem sets and the complexities of the finance world. For this project, the instructor spent significant time developing the stages of the project to align with student abilities, creating a body of resources for technical support and instructions, and identifying ways in which the parameters of student inquiry using the terminals could be confined to the appropriate introductory level. To put it another way, students in this course are not prepared (yet) to deal with the full ambiguity and complexity of financial decision-making. The project, however, was designed to spark their interest by offering a controlled peek at real-world of finance.

As evidenced by the excerpts below, many students recognize and appreciate the relevance of the course content to a real-world company, particularly the interpretation of financial ratios. In fact, the NVivo analysis resulted in 62 references to relevance from the focus group interviews.

As a whole, I feel more prepared to do financial work in a company. It's nice to real life experience with real life numbers about a real-life company.

It made it more realistic and relevant. You sit in a class and they talk about things that you may never see and do. This project went beyond that.

[Our] classes are pretty much providing concepts with math problems. Once you got the math problems or financial ratio … then you could use Bloomberg say this is what in the real world.

In two instances, students cited direct examples of the relevance of the skills they gained through the project:

… I got an internship this summer and they kind of ask me some information about like some ratios about their companies like they ask me if I knew any information about their company about how they calculate ratios and so I went into Bloomberg kind of on my own time and I was able to look that up.

There's this girl… she is interning in Walmart. They asked her about the company about what she knew, because of the Bloomberg and everything she did, she could tell them you know, what she knew about it how it went. So it's really beneficial….

Table 4: Results from Course Examinations

Panel A: Results from Course Evaluations, All Students

		No Intervention	Intervention	Difference
Exam 1	Mean	64	65.524	1.5244
	Std. Dev.	(23.001)	(19.213)	
Exam 2	Mean	68.210	73.055	4.8454*
	Std. Dev.	(24.115)	(17.609)	
Exam 3	Mean	64.810	63.4939	-1.316
	Std. Dev.	(22.6648)	(20.057)	
	N	105	164	

Panel B: Results from Course Examinations, Standardized Questions

	No Intervention	Intervention	Difference (% points)
Net Income	94%	93%	-1
Time Value of Money	62%	77%	+15
Bond Pricing	45%	50%	+5
Risk and Return	57%	75%	+18
Financial Ratios	78%	70%	-8
Capital Budgeting	52%	71%	+19

Notes: * represents statistical significance at the 10% level. Statistical difference of means is tested via a t-test with unequal variances across groups. The "Intervention" sample includes all students completing the course during the implementation of the Bloomberg Project, Spring 2017. The "No Intervention" sample captures the previous spring semester (2016) when the course was taught by the same instructor with no project.

In addition to the focus group comments, aggregate student performance on a set of course examinations, shown in Panel A of Table 4 above, suggests gains in student learning after the incorporation of the intervention. It is important to note that all scores reported are for the same instructor and the content assessed across the two time periods is similar. No major changes were made to course materials or to the instructor's teaching style from one semester to the next. Exam 1 assesses time value of money, bonds, and interest rates and Exam 2 assesses stocks and financial statements. Finally, Exam 3 is a comprehensive final exam that

encompasses all topics and also measures mastery of capital budgeting issues. Across two of the three course examinations, differences in performance are not statistically different. However, in Exam 2, student performance during the intervention time period is higher than in the time period prior to the intervention, and this difference is statistically significant at the 10% level.

Furthermore, Panel B of Table 4, shows results across a set of common questions across the two time periods examined. Student performance improved across four of the six questions but decreased substantially across one area, financial ratios; this is a surprising result given the focus group comments. Overall, we cannot attribute changes in performance directly to the implementation of the project, as we do not control for possible confounding effects. However, we view the results as evidence that the project does not hinder student progress in the course but could have potentially positive learning effects that extend beyond the subject matter covered directly by the project.

Discipline

Student response to the Bloomberg project varied along disciplinary lines. As shown in the excerpts below, students report the value of the project to be highest for majors closest to finance and accounting:

I can see if I was a finance major or accounting major like this could be really efficient. [Be]cause it's…hands on finance but for me like I don't really need to know all this stuff.

It really depends on your major. If you are in the finance it could be super useful but you are in human resources it's hard.

Furthermore, student receptivity did seem to be linked to the perceived rigor of the course, a perception that was often tied to major, as follows:

Finance is a very hard subject.

Her class is a very challenging class.

I think as much as how demanding our class is already…

Analysis of the focus group transcripts using NVivo indicates 36 references to difficult/rigorous content. Nonetheless, based on the focus group interviews, it appears that the project did allow for higher student engagement with the course material, even outside the finance major. A number of students gained a broader appreciation of both finance and the Bloomberg service, as suggested by the excerpts below:

Even if you are not a business major…it's kind of cool that you can go and look at the stocks you know. And everybody has to retire someday

I can see how it would be useful for you to understand even if you didn't work on the financial portion of the company you just understand what they are doing so you could better assist in doing your part.

I am not a finance major but I can see how it can eventually help me with companies one day…I would probably want to look at it to better the company. So it's good practice to start now.

To investigate whether these perceptions are consistent with student performance, we revisit the exam scores reported in Table 4 but we decompose the results based on students' academic major. We create one group consisting of finance and accounting majors and another group with all other majors including, but not limited to, marketing, management, information technology and non-business. The decomposed scores are shown in Table 5.

The results reveal support for the aforementioned perceptions. On average, finance and accounting majors outperform other majors and that outperformance is statistically significant in 50% of the cases considered. This is consistent with the notion that finance is a difficult course particularly for those outside of finance and accounting. Furthermore, we explore whether differences in performance after the intervention vary by academic major. The difference in average performance before and after the intervention is not statistically different from zero for finance and accounting majors on any examination. Interestingly, the previously reported improvement in performance on Exam 2 appears driven by majors outside of finance and accounting. Specifically, for students outside of finance and accounting, the average score on Exam 2 increases by 5.596 points after the intervention and that change is statistically significant at the 10% level.

Table 5: Results from Course Examinations by Academic Major Categories

	No Intervention			Intervention			Difference	
Exam	FIN/ACC	Other	Diff.	FIN/ACC	Other	Diff.	FIN/ACC	Other
#1	71.90	60.84	-11.06*	71.09	63.55	-7.55*	-0.09	2.71
	(20.64)	(23.26)		(17.68)	(19.42)			
# 2	73.90	65.93	-7.97	77.35	71.53	-5.82*	3.45	5.60*
	(26.02)	(23.10)		(18.35)	(17.16)			
# 3	69.20	63.05	-6.15	67.77	61.98	-5.79	-1.43	-1.08
	(25.31)	(21.45)		(19.98)	(19.95)			
N	30	75		43	121			

Notes: * represents statistical significance at the 5 or 10% levels. Statistical difference of means is tested via a t-test with unequal variances across groups. The "Intervention" sample includes all students completing the course during the implementation of the Bloomberg Project, Spring 2017. The "No Intervention" sample captures the previous spring semester (2016) when the course was taught by the same instructor with no project. Finance & Accounting Majors include all students listing one of these two disciplines as their primary major. Other Majors include business majors, outside of finance and accounting, and non-business majors.

As these results suggest, students perceive finance differently than they do other business fields and those perceptions present contextual challenges that studies of business education more broadly are unlikely to discern (Arbaugh 2005). The tension between concentrations raises the question of what it means to require such a course for non-majors. Finance is an integral part of the business core and even those who do not plan to work directly in finance are expected to be familiar with the analytical insights that it provides to the firm as a whole. That begs the question: are the needs of those in non-finance fields sufficiently similar to those for whom this course serves as the foundation for advanced finance courses or are their needs sufficiently differentiated to justify separate approaches (and courses) for majors and non-majors? The answer to this question lies in finding solutions within the finance classroom. The data collected on this project is not sufficient to answer the question, but they do suggest that the question is worth asking.

Integration

The recent learner-centered revolution has focused attention on the importance of students meeting an identified set of cognitive learning outcomes. Particularly at the level of the university, instructors aspire to have their students reach the upper-most stages of cognitive development, often referred to as higher-order thinking, which includes skills such as problem solving, critical and creative thinking, and synthesis (Johnson et al. 2015). These skills are often depicted hierarchically, with lower-order skills, such as understanding and remembering, serving as the base of a pyramid or ladder, but this does not mean that such skills have to be treated strictly sequentially. For example, there are faculty and administrators who do not believe that first-year students are capable of engaging in higher-order thinking and suggest that introductory courses should focus on building a foundation of lower-level skills.

Table 6: Student Product Ratings

	Terminology		Dimensions		Argument		Connections	
	Internal	External	Internal	External	Internal	External	Internal	External
Minimum	2	2	1.67	2	1	1	1	1
Maximum	4	4	4	4	4	4	2.7	3
Mean	3.18	2.842	3.02	2.95	2.68	2.74	1.33	1.37
Median	3.33	3	3	3	2.67	3	1.33	1

Notes: Internal shows the average scores of 3 independent raters of 19 student products using the rubric displayed in Table 3. External reflects the ratings for a rater outside the research team. Includes only the 19 projects for which all student participants signed IRB-approved consent forms.

Our experience with the Bloomberg project suggests otherwise. Interestingly, despite all the challenges students describe, the evidence from their student products suggests that important gains were made in learning, particularly in the use of critical thinking. Table 6 displays the average scores across three internal raters and one external rater for the Final Analysis portion of the project. The external rater is a business professor outside the research team. In our composite ratings, the students score highest, on factors related to lower-order thinking, such as terminology and application (called dimensions). Both factors had an average rating of 3. The patterns are similar although ratings are somewhat lower for the external rater. Although the

scores on the higher-order skills, such as developing an argument (on average 2.61) or connecting to external information (on average 1) are lower, as might be expected, they are not absent, with at least three student project reports reflecting the skills of evaluation and synthesis, even though the latter were not explicitly required. Interestingly, the external rater results on the higher order skills were marginally greater than those of the internal raters. The similarity in scores across the raters is not indicative of rating inflation. Therefore, these findings strongly suggest that, even in an introductory course, there are at least some students who have the capacity to process what they are learning at the highest levels.

This result may not be too surprising. After all, the project was designed to utilize a number of pedagogical strategies with proven track records in higher order thinking, ranging from problem-based to inquiry-guided learning. By providing that glimpse into the real-world, however, it also brought in another, more unexpected, factor. Both educational psychologists and employers seem to agree that college graduates need to be well-equipped to deal effectively with the ambiguity of the real world, but the skills for navigating indefinite problems are difficult to teach. Their results are also difficult to capture, especially when most objective assessments of student learning, including those recognized by AACSB, are not usually geared towards measuring cognitive abilities such as flexibility (Selingo 2016). In our NVivo analysis of the focus group transcripts, we found 20 references to a growing recognition of the ambiguity, complexity and interdependence of real-world data analysis; including the sometimes startling realization of the power of self-directed learning:

You are learning problem solving with the different issues…It gives you the opportunity to learn how to handle …different situations, to adjust.

It's not like it [the project] applies to one chapter, it applies to it all and then you carry each problem to the next unit-it just ties everything [together].

I was able to use it, I have got…money saved, I've got to put in different funds I can kind of keep track of them without having to report through a broker. I think I kind of can do it on my own. Don't need that middle man in there.

And you are able to actually calculate yourself without actually really needing someone to tell you with and you can apply it too. [I want to be a]CEO of a company, so these things would help me get to that knowing how to not just look at the numbers but to apply it to a company and this helps you think and prove it to get to that cause it doesn't just affect finance it also affects finance, management, affects research and development, marketing, it affects everything.

This last lesson, that the learning gains from the project affect everything, also applies to the results of this study.

Conclusions

Our results suggest that the introduction of the Bloomberg project was effective in increasing the power of student interest; and it did so in ways that were direct and indirect. Unlike conventional scholarship of teaching and learning projects, we did not produce a set of interventions that others could readily adopt. Although other instructors would be welcome to use the design of the project in their own instruction (available upon request), our results suggest larger questions about this emerging field; with implications for both future teaching practice as well as pedagogical research in finance and other business courses. Rather than merely exposing students to the functions of the Bloomberg terminals, our experience suggests that other factors may play a significant role in the successful integration of educational technology. Rather than inserting the project into an existing course structure, the takeaway may be the critical role course design plays in enhancing student engagement. Rather than limiting lower-level courses to lower-level thinking; our study shows that students in introductory course may be more ready to engage with higher-order problem-solving, albeit in a carefully structured way, than previously believed. Rather than keeping students out of the real-world until they have fully developed the skills necessary to manage all of its challenges and complexities; our project suggests that business students in particular may benefit from making those connections not only earlier, but more often, than conventional approaches may allow.

Our conclusions should not be overstated. The current study encompasses four sections of a single face-to-face course, taught in one semester and at one institution. Our method reflects the limited ability researchers have to control all variables inherent in teaching and learning (Mayhew et al. 2016). As such, our

results may or may not be representative of the experiences of students and instructors in other contexts. That being said, our results do present some potentially productive avenues for future research in finance, business, and other applied fields in which instructors are looking to foster a stronger connection between what students do in the classroom and the real world. By listening directly to our students through their words and work, we discovered that we do not need to throw them into the deep end of the pool. Instead, by allowing them to dip their toes into the water, they begin to get an enticing picture of just what it means to swim in those waters. To put it less figuratively, the results of the Bloomberg project suggest that students appreciated the growing realization of the complex and contested nature of the real world and that awareness contributed meaningfully to their interest in being prepared to engage with it.

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