

# ***Making Macro Memorable: The Method of Loci Mnemonic Technique in the Economics Classroom***

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## **Abstract**

Economics in the classroom has benefitted greatly from research in education and pedagogy, primarily focused on experiential learning, interactive techniques, and other methods intended to elicit greater student participation. There remains, however, much content in economics that students have to memorize, at least for exams if not for general knowledge. We describe how to adapt the method of loci mnemonic technique in the economics classroom for the purpose of committing relatively large amounts of information to memory. Examples of the technique are given for principles-level sets of information, and a preliminary test of the technique's effectiveness is presented.

## **Introduction**

Professors and teachers of economics have benefitted greatly from research and analysis of different modes of classroom instruction. To increase student interest, attention, and information retention, instructors have utilized a growing array of active learning techniques to demonstrate the principles of economics. Some typical techniques include classroom games (utility-maximizing market behaviour, auctions, etc.), experiments,<sup>3</sup> cooperative learning (pairs, team-teaching among groups of students, etc.), and using technology (simulations or in-class research on the internet). Other approaches involve the teaching of standard topics but doing so via a more accessible medium for students (demonstrating economic behavior or principles in movies, TV shows, literature, sports, and music).<sup>4</sup> These novel techniques have undoubtedly made economics more enjoyable, relevant, and possibly even more effective for modern students.<sup>5</sup>

A factor that should be considered in the use of these techniques is the longevity of the knowledge, or how well and for how long the information gets retained.<sup>6</sup> Our own attempts at using active learning are enjoyable, and students invariably remember the exercises we do in class, but often fail to remember the lesson imparted in those exercises.<sup>7</sup> In determining which in-class techniques to use, professors economize:

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<sup>3</sup> For example, see Dickie (2006) or Strow & Strow (2006).

<sup>4</sup> For example see, respectively, Mateer (2004), Hall (2005), Watts (2003), sports and economics blogs [www.thesportseconomist.com](http://www.thesportseconomist.com) and [www.sabernomics.com](http://www.sabernomics.com), and music and economics blog [www.divisionoflabour.com/music](http://www.divisionoflabour.com/music).

<sup>5</sup> See Becker (1997) and Becker & Watts (2001) for overviews of how economics at large has lagged other social sciences in implementing active or cooperative learning techniques in undergraduate teaching. Also see Emerson and Taylor (2004).

<sup>6</sup> Retention is a result of what educational psychologists call "cognitive load," or the "effort" exerted to process information. The higher the cognitive load, the less able the brain is to process information adequately (especially if presented in a fixed time format like a class), and the less able the student is to recall the information later.

<sup>7</sup> One instructor does a market supply and demand simulation where students reveal an equilibrium price of miniature Twix candy bars. Semesters or years later, students will remember "Twix day," but not the concept of supply and demand, how the appropriate equilibrium price was reached, or how the Twix bars got efficiently allocated.

which techniques can I efficiently implement? Which ones will maximize benefits (retained knowledge, enjoyment of economics) at the least cost?

A concern with experiential learning is that more frequently used exercises do not seem particularly well suited for relatively large pieces of information. An in-class exercise to demonstrate a market reaching equilibrium is fairly simple and memorable for students; it is less clear how this exercise can be adapted to encourage long-term retention of the six or seven determinants of demand. If a student can effectively show how a shift in demand will affect equilibrium price and quantity but cannot remember what events will cause a shift in demand, it is debatable whether his knowledge of the topic is useful.

For these sets of information, students turn to memorization. Memorization is typically considered passive and uninteresting, and it certainly seems less enjoyable for students compared to active learning techniques. But the classroom use of more modern active learning techniques and more traditional mnemonic techniques of memorization are not mutually exclusive, as discussed in the conclusion of Saber & Johnson (2008): “[E]ducators should not rule out using previously effective techniques such as acronyms in favor exclusively of active learning methods without empirical evidence to support this decision.” This paper discusses one method of enhancing memory that exploits the creative and engaging aspects of active learning techniques, drawing on research in educational psychology. Utilizing this technique will promote recall in students, which is especially useful in courses where information learned earlier in the semester is necessary later on. The approach is flexible and adaptable to any discipline or any set of information that a person wishes to memorize. Using this technique in conjunction with more traditional active learning techniques will encourage not only retention of information but the ability to apply that information to new situations.

The rest of the paper proceeds as follows: a discussion of relevant literature in economic education and psychology on various methods of memory retention; a description of the method of loci technique; examples of the loci technique specific to a Principles of Economics course; a preliminary empirical test of the effectiveness of the technique, and a conclusion.

## Literature Review

In economics, most of the relevant literature consists of discussions about active learning techniques: the topic or topics covered, how to set up and implement the game or discussion, and whether the technique achieved better results than a control (typically a traditional lecture). This literature provides a wealth of good ideas on teaching specific concepts for professors to try in their own classes. A very short list of examples include Byrns & Stone (1984), Becker & Watts (1998), Becker, Watts, & Becker (2006), and, more generally, the *Journal of Economic Education*.

There has been much less written about various methods of retaining large amounts of information through mnemonic techniques. The few exceptions typically involve using acronyms.<sup>8</sup> In remembering the factors affecting the likelihood of collusion, Kamerschen (2004) suggests “CARTEL:” Concentration, Additional, Revenue, Talk, Entry, and Likeness. To recall the condition of utility maximization, Stein (2009) uses “Mrs. Pixpy maximizes utility,” derived from  $MRS_{x,y} = P_x/P_y$ . In Byrns & Stone (1984), six determinants of demand (own Price, other Prices, expected Price, Income, Number of potential customers, and Tastes and preferences) are remembered as “PPPINT” or simply “pint,” used with the example of a beverage sold in pints. For determinants of supply, Byrns & Stone (1984) use “PEST:” Prices of other goods, Expectations, Supplier input prices, and Technology.

Outside the economics literature, research into various methods of long-term information retrieval is quite extensive. Though the examples in the previous paragraphs are termed “mnemonics” by their respective authors, mnemonic devices encompass more than just acronyms and typically require more active engagement of the imagination (which also encourages better long-term retention). An additional benefit to certain mnemonics is their ability to not only facilitate the recall of lists of information, but the ability to recall those lists in a specified order. The keyword technique involves visualizing an association between a word to be recalled with a word that rhymes; Richmond, Cummings, & Klapp (2008) demonstrate its effectiveness, with better results compared to the pegword or method of loci techniques

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<sup>8</sup> The use of acronyms does show up in non-economics literature as well. See Saber & Johnson (2008) where three methods are tested against a control (verbal repetition, acronym, and verbal repetition plus acronym). The use of acronyms significantly improved short- and long-term recall in both low and high active learning scenarios, whereas simple verbal repetition did not show an improvement.

(along with providing good descriptions of how to use each technique). “Pegging” refers to a technique where information in a list is to be remembered in order, where the person associates each integer with a particular memorable word or keyword and then imagines that word interacting with the concept to be remembered.<sup>9</sup> Levin, McCormick, & Dretzke (1981) demonstrate the effectiveness of combining several mnemonic techniques, including the keyword, pegging, and loci techniques, relative to a control group that was not instructed in using these techniques. Among the numerous studies, no consensus has yet been reached that one particular mnemonic method is consistently superior over others.

This paper will primarily apply the method of loci technique, for which there is literature demonstrating its effectiveness. Cornoldi & De Beni (1991) demonstrates the usefulness of the loci technique especially in settings where students listen and need to recall an oral recitation of a text. Massen & Vaterrodt-Plünnecke (2006) describe the method of loci technique, as well as its ability to utilize the same “locations” but applied to different lists of items to be remembered (overcoming so-called proactive or retroactive interference: confusion while learning or difficulty recalling later on). They demonstrate the superiority of mnemonic techniques relative to simple rehearsal, and further that the method of loci (compared to the mnemonic link technique also tested) does not demonstrate proactive interference. Kleigl et al (1990) describe significant improvements in recall after instruction in the loci technique, and how the effectiveness of the technique is inversely related to age (perhaps reinforcing its usefulness to a younger audience of college or high school students, since younger subjects may have less pro- or retro-active interference because they have not applied the technique in many situations).

### **Method of Loci Technique**

Brief discussions of how to use the method of loci technique are given in Cornoldi & De Beni (1991).<sup>10</sup> The examples given below will primarily rely on method of loci, but will occasionally incorporate keywords. The process essentially consists of two parts. First, visualize a scene with numerous different locations. Then imagine moving from one location to the next in order, stopping at each one. Each location in the scene remains fixed so that the first location is always followed by the second and not the third. For example, the scene may be the entryway of a house, with the first location being the front door, the second being the rug, the third being the side table, etc. You always visualize moving from the door to the rug to the table (and not from the door directly to the table, skipping the rug) to ensure that the items to be remembered later are always in their correct order.

After the scene is rehearsed several times so that the movement to the individual locations is remembered, the second part involves placing at each location an image associated with the information to be memorized. For example, in a History of Economic Thought course a student may wish to remember the chronology of Adam Smith, then David Ricardo, then Karl Marx. The student may associate Adam Smith with a large black anvil, reminiscent of a blacksmith; David Ricardo with a pile of rice; and Karl Marx with Groucho Marx’s face, complete with bushy eyebrows, glasses, moustache, and cigar. Then, as the student “walks” through the entryway of the house, he first visualizes the large anvil blocking the front door, followed by looking down at the pile of rice on top of the rug, and then looking over to see Groucho Marx sitting on the entryway table.<sup>11</sup>

Some comments about this technique: first, the images that are used do not need to correspond accurately with the information to be remembered. You may wonder why it would not be better just to picture Karl instead of Groucho Marx by the table, or Ricardo himself sitting on the rug instead of rice. It is more important to visualize an image that is easily remembered than one that is more accurate. Even though Karl’s beard is a pretty memorable image, Groucho’s image is arguably much more distinct and will likely be remembered better.<sup>12</sup> In most cases, more silly, absurd, vivid, or out-of-place images are better recalled than typical, mundane images. Since it is unlikely that a pile of rice would be on an entry rug, that image is easier to recall than, say, a pair of shoes on an entry rug.

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<sup>9</sup> E.g., in a history of economic thought class where Adam Smith is the first economist studied, a student may associate “one = sun,” and then visualize a well-known photo of Smith with a bright sunrise in the background. See the introduction of Massen and Vaterrodt-Plünnecke (2006) for a short description of pegging.

<sup>10</sup> The author was introduced to the technique in Vost (2006), which uses a variation of the “house” example described below.

<sup>11</sup> In the interest of space, we present here only three items to be recalled; in practice, there can be a dozen or more locations to accommodate a large list of information.

<sup>12</sup> If the beard is the image used, there are a number of early economists who may be erroneously recalled (Pareto, Menger, Walras, etc.) instead of Marx.

The “images” themselves do not have to be static or silent and it is typically better if they are not. If a fourth location in our entryway was a coat rack next to the table, and the student wanted to remember Francis Edgeworth, he may picture the rack tilted up on its *edge*, wobbling and about to tip over, with a price tag on it and a man (who looked like Edgeworth) asking what the rack is *worth*. In this case, the fourth location incorporates movement (the wobbling) and sound (Edgeworth’s voice) which makes it more dynamic and hence enhances its ability to be recalled.

Information can be “built” onto each image as well, so that one location does not have to contain only one bit of information. If a student wanted to remember that Adam Smith was from Scotland and wrote the *Wealth of Nations*, he may enhance the first image so that the anvil blocking the front door is painted in a tartan pattern, and on top of the anvil is a globe with a notch in the top where gold coins are being dropped in, like a child’s bank. You could even picture a little colonial war on the globe between the U.S. and England to recall that the *Wealth of Nations* was published the same year as the signing of the *Declaration of Independence*. The entire image does not need to be visualized at once; you can incorporate movement so that the mind’s eye moves from the anvil, to noticing the colors, to seeing the globe and coins, to focusing on the globe and the little war. Once you have practiced the movement a few times, you can “step back” to see the entire image and likely recall all the information contained within it.

There is a relatively large fixed cost in setting up the scene with the different images at each location; students have to come up with images that they themselves will find easy to remember and rehearse “moving” to each location. With time and practice, though, moving through the scene becomes faster and the student may not need to consciously focus on each part of the image to recall all the information therein. The important point, obviously, is to remember Adam Smith, Scottish, *Wealth of Nations*, 1776 and not exactly what the anvil image looked like. If the student finds he can recall *all* the information after just seeing the tartan-clad anvil, then he can just move on to the rug.

### Examples in a Principles of Economics Course

Students in a Principles of Microeconomics course will have to remember the four different types of market structure: perfect competition, monopolistic competition, oligopoly, and monopoly. The discussion usually proceeds by showing a horizontal line measuring the number of firms, with monopoly at the “one” endpoint and perfect competition at the “infinity” endpoint. To incorporate more information about each market structure type, we use the following visualization (a sample illustration is provided in Appendix B):

Imagine a life-sized version of the “market structure line,” with four distinct points on it (the “line” may be a main street in your hometown, and the four points are four stores or buildings). At the first point, you see a **big room full of tiny cats**, all of whom are participating in a **purring contest**. As you move to the second point, you see **about ten Rich Uncle Pennybags** (from the *Monopoly* board game), who are all fairly short but are all getting in a **fight** with each other. As you move to the third point, you see that the “store” is actually a jail; inside are **two prisoners** in separate cells. In front of the jail, you almost step in **three big puddles of oily globs** on the ground. At the fourth point, you see **one very tall Rich Uncle Pennybags** standing smugly by himself with arms folded.

The room of **many tiny cats** having a **purring contest** should remind you of **perfect competition**, which is made up of a **large number of very small firms**. The **fight** among **Rich Uncle Pennybags** helps you recall **monopolistic competition**. The **small number of oily globs** helps you remember **oligopoly** (and the **prisoners** help you recall the **prisoner’s dilemma**, a classic oligopoly example). And the **lone Rich Uncle Pennybags** of course reminds you of **monopoly** itself.

Note that several of the images are odd but memorable once you’ve visualized them. It is also helpful if the image is able to convey some of the inherent meaning of the information to be recalled.<sup>13</sup> A student may

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<sup>13</sup> Educational psychology refers to this integration of multiple pieces of reinforcing information as enhancing “germane cognitive load.” The effort to mentally process the information is easier when the pieces reinforce the overall concept. An early reference is Sweller (1988).

be able to recall “perfect competition” simply by picturing two regular-sized cats in a contest, but picturing several of them each very small further reminds him of the concept being recalled, that a perfectly competitive industry consists of a large number of small firms.

In the chapter on fiscal policy in their Principles of Macroeconomics text, Gwartney, et. al (2008) discuss the following schools of economic thought: (old) classical, Keynesian, Crowding Out, Neoclassical, and Supply Side. The following mnemonic helps students to learn the chronology of these schools and some of their basic tenets:

Picture a two-story schoolhouse with an attic at the top. There are two rooms on the first floor, two rooms on the second, and the attic, making five different locations. The first classroom on the lower floor is filled with **men** from an old **black and white picture** with **powdered wigs playing grand pianos**, and when they see you they shout at you to **leave them alone**. Moving across the hall to the second classroom on the lower floor, you see a room full of **walking canes** and **Uncle Sam**; most of the canes are **depressed** and crying, and those that aren't are **demanding** that Uncle Sam **do something** about their depression.

Going upstairs to the second floor, you stop in the third classroom and see **Uncle Sam** again in a room with **Rich Uncle Pennybags** and a **French man** (with beret and baguette). Uncle Sam is wearing a shirt with a large “**i%**” on it, when he suddenly starts to expand and **balloon out to fill the whole room** (which makes the “**i%**” on his shirt get ever larger), **pushing** Rich Uncle Pennybags and the French man **out** the window. Next door in the fourth classroom, you see a very **muscular Uncle Sam** struggling to **push a downward-sloping beam** across the floor, but **it won't budge**. Also in the room is a bunch of **infants** (or better yet, the character **Neo** from the *Matrix* movies) **playing grand pianos**, and they are telling the struggling Uncle Sam that **his efforts won't work** to move the beam. Finally, as you go upstairs in the attic, you see a room full of people **supplying aluminium siding to successful new businessmen** who are erecting new buildings, and they are bartering the siding in exchange for the businessmen giving up some **carpet tacks**.

The first room with **men playing pianos** should remind you of **classical music** and thus the (old) **Classical school**, with its notion of *laissez faire*. The second room will help you remember **Keynesians** (rhymes with **canes**), and how they wanted the **government** to fix the **Great Depression**. The third room showed an **expanding government** (i.e. the inflating **Uncle Sam**) pushing up the **interest rate (i%)**, which crowds out **business investment (Pennybags)** and **net export/foreign spending (French man)**, the main point of the Crowding Out school. The fourth room shows the **government's inability** to affect **aggregate demand (downsloping line)**, a point made by the Neo- (or new, hence the infants) classicals. In the attic, there is more supplied as the businessmen have less tacks (tax), the main argument of the Supply Siders.

One benefit of the method of loci technique, discussed in Massen & Vaterrodt-Plünnecke (2006), is that the same locations can be applied to different information. A student who has practiced and is comfortable with moving through the five rooms in the schoolhouse scene may use it again for different things to be recalled, simply by substituting new images.<sup>14</sup> The list to be remembered could include fewer than five items (leaving the later locations in the house unused), or a longer list of items could allow the student to go from the four-location Main Street into the five-room schoolhouse (located at the end of Main Street). Vost (2006) has an example of recalling a list of 72 items in six different rooms, where the first four rooms get used a second time.<sup>15</sup>

<sup>14</sup> A referee wondered “if subjects will, over time, become confused when they mentally walk through their house and see items that are left over from previous exercises.” The purpose of the technique is not to remember the items *per se*, but to recall the underlying information the images represent. If the student is hoping to remember Ricardo (bowl of rice) but initially recalls an image of General Washington crossing the Delaware that was used in an American History class, the student will likely recognize that the Washington image seems “out of place.” As mentioned earlier, with practice students are able to “step back” and see the entire scene in one view, so if the student is used to seeing the entire entryway where there is an anvil, rice, Groucho, and wobbly coatrack, recalling the same entryway with General Washington will be less likely.

<sup>15</sup> The book itself includes dozens of pieces of information to be recalled, and uses the house throughout so that each room gets used several times.

## **Empirical Test of the Technique**

Based on personal experience using mnemonics techniques, and after reviewing the literature for techniques used in economics classes,<sup>16</sup> an exercise was developed for use in a Principles of Macroeconomics course. A preliminary test of the technique was conducted in the spring semester of 2011 and in two sections of the course the following fall semester. A “mnemonic sheet” was made available to students on the course webpage that described the technique and demonstrated it with relevant course material. A portion of this sheet is provided as Appendix A. The students were informed in class that reading the sheet would be helpful but doing so was not mandatory. On the first exam of the semester multiple choice questions related to this material were included on the test. The students were also asked on the exam whether they had read the mnemonic sheet. Of the thirty-five students in the spring 2011 class, nine students reported that they had read the mnemonic sheet, twenty-five reported that they had not, and one student did not respond. In the fall 2011 classes, thirty-two students read the mnemonic example, forty-one did not, and again, one student did not respond to the question. Thus, combining all classes, forty-one students read the sheet and sixty-six did not.

The empirical test is whether students who read the mnemonic sheet had higher scores on those relevant questions than the students who did not. The average score on the mnemonic related questions was .825 for the students who read the mnemonic sheet and .771 for the students that did not. This direct comparison, however, does not take into account whether the students who opted to read the mnemonic sheet were better students generally and would have earned a higher average on those questions without having read the mnemonic sheet. If so, then the better students, who happened to read the sheet, should also do significantly better on questions unrelated to the mnemonic sheet. In order to control for this possibility, a paired means test was used to compare each student’s score on the mnemonic-related questions to his or her own score on the non-mnemonic-related questions. The average score on the non-mnemonic-related questions was .719 for the students who read the sheet and .737 for the students who did not.

If reading the mnemonic example improved students’ scores, there should be a statistically significant difference between the mean scores on the mnemonic-related questions and non-mnemonic-related questions for those students that read the example, but not for the students who did not read the example. Table 1 shows that the difference in mean score for the students that read the example was .106, which is statistically significant with a one-tailed p-value of .0048. The difference in mean score for the students that did not read the example was .034, with a one-tailed p-value of .1436. Therefore, as expected, the empirical evidence indicates that there is a difference in the mean score on the mnemonic-related questions for students that read the example but we are unable to reach the same conclusion for the students that did not read the example.

**Table 1: Paired t-Test for Difference in Mean Scores**

	<b>Mnemonic related questions</b>	<b>Non- mnemonic questions</b>	<b>Difference</b>	<b>p-value (one-tailed)</b>
Read mnemonic example (n=41)	.825 (.039)	.719 (.027)	.106	.005
Did not read mnemonic (n=67)	.771 (.034)	.737 (.016)	.034	.144

*Note:* standard errors are given in parentheses

## **Conclusion**

The intent of this paper is to introduce a mnemonic technique that has been well-studied, and whose effectiveness is demonstrated in psychological research, into the literature on economic education. The existing literature on mnemonic devices in economic teaching is quite limited and basic, and thus it may not be surprising that students have difficulty with long-term retention and recall of economic information.

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<sup>16</sup> The previously cited examples from the economics literature do not include empirical evidence to determine whether they are effective, with the exception of Emerson and Taylor (2004).

This difficulty may be especially pronounced if students have not had practice applying information through, for example, active learning exercises or critical observation of economic phenomena in the real world. Though there have been many advances in the implementation of active learning techniques in economics, the mnemonic technique described here is useful for many types of information that students need to comprehend and remember and incorporates many active learning techniques to facilitate this recall. The preliminary empirical results indicate there is evidence to suggest the mnemonic technique can be successfully employed by students studying economics.

Future research needs to be done to measure the effectiveness of these specific techniques in the economics classroom. The methodology of experimental design on testing the usefulness of the method of loci mnemonic is well-established in psychological literature and could be relatively easily applied to measuring the ability to recall economic topics among students. Short- and long-term retention could be tested a week after material is presented using the loci technique and at the end of the semester.<sup>17</sup> Students' ability with the technique could be assessed by comparing how well they adapt it to information similar to, and then different from, the economic information discussed here; i.e., can a student use the technique for other material in an economics class for which you have not given them a pre-arranged scenario, and can they use it for material in a non-economics course?

An advantage of the method of loci technique is its applicability to any discipline, and students who discover the technique in an economics course likely will find it useful in any other course that requires some amount of memorization. It also is relatively low-cost for a professor, who typically will only need to demonstrate a few examples of how the technique works for students to understand it. Long-term recall is enhanced when the person memorizing the information has to create the images himself rather than being given an entire scene devised by someone else. Depending on a student's background, culture, or experiences, different images may be better suited to a businessman than the Rich Uncle Pennybags that is used in the above examples. The student uses those images that are more relevant and memorable to him to achieve the best results in this technique. With practice, the student should be better able to memorize and recall large amounts of information more easily, resulting in better classroom success and retention of economic knowledge. This technique, combined with the growing list of effective active-learning techniques, can enhance student retention, understanding, and appreciation of economics.

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<sup>17</sup> In our own empirical test, the time between introducing the material in class and the exam was approximately three weeks.

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## Appendix A

The following is an excerpt from the mnemonic sheet that was provided to students, as described above in the empirical test section. The examples are drawn from the first chapter of Gwartney et al's *Economics* (2008):

In this class, there won't be a great many times where you'll be asked to memorize a list of things, but it does come up every once in a while, and probably does more often in some of your other classes. There is an interesting and useful technique that will help you to build those skills, and I'll show some examples related to our course material. The technique is a mnemonic, which is just a trick to help you memorize something, and it's what's called the "loci visualization technique." You create a picture in your mind of a setting, room, or place with various locations and your mind moves sequentially from one location to the next. At each location you create an image of the thing you are trying to memorize.

### *Eight Guideposts of Economic Thinking*

Picture a living room with eight locations in it: 1) first, start in the center of the room; 2) look to the left wall to see a large bookshelf; 3) next to the bookshelf on the right is a large picture window looking outside; 4) looking back in the living room in front of the window is a couch; 5) in front of the couch is a coffee table; 6) next to the couch is a TV; 7) to the right of the TV on the adjacent wall is a fireplace; 8) on the wall opposite the picture window is a door to another room. (It may be easier for you to "rearrange the furniture" if you like; just make sure to have the eight locations in a way that "flows" easily from one to the next.)

1) In the center of the room, picture a lush **green tree** with a **big price tag** hanging from one of its branches. 2) As you turn to the bookshelf, you see not books, but **two dolphins** or **porpoises**, each on its own shelf. They also have **price tags** on them, and you look to see **which is cheaper** to buy. 3) As you look out the picture window, you see a kiddie pool in the yard and a little kid playing in it. But, it's not filled with water; it's filled with pennies or **cents!** 4) Back inside, there is a piece of notebook paper sitting on the couch, and the word "**THINK**" is written sideways in the **margin**. 5) On the coffee table is a **newspaper** with yet another **big price tag** on it. 6) On the TV, it looks like a baseball game is being broadcast, but instead of players on the field, you see a big "**1<sup>st</sup>**" running the bases. He is heading for second base but there is already a big "**2<sup>nd</sup>**" on that base. The "**1<sup>st</sup>**" keeps running and bumps into the "**2<sup>nd</sup>**". 7) In the fireplace is a large **sub sandwich**. It also has a **price tag** on it but instead of a price listed, it has a **big question mark**. 8) At the doorway to the next room, you see a **fortune-teller** gazing into a **crystal ball** with anxious students waiting on her answer, trying to **predict** what the next **test** questions will be.

To recap, we have 1) the **tree** in the center of the room; 2) **two porpoises** on the bookshelf; 3) kid outside playing **in** a pool of **cents**; 4) "**THINK**" written in the **margin** on the couch; 5) **newspaper** on the coffee table; 6) **1<sup>st</sup>** running into **2<sup>nd</sup>** on the TV; 7) **sub sandwich** with **question mark** price in the fireplace; and 8) **fortune teller predicting test** questions in the doorway.

1) The **lush tree** should remind you of (natural) **resources**, and the **price tag** will remind you that **using resources is costly**. 2) The **two porpoises** with **price tags** remind you that **people choose purposefully** (sounds like porpoise) or economize. 3) The kid playing **in cents** makes you remember that **incentives matter**. 4) The paper with "**THINK**" in the **margin** reminds you that

**economic thinking is marginal thinking.** 5) The **newspaper** and **price tag** is for **information is helpful but costly to obtain.** 6) The “**1<sup>st</sup>**” running into “**2<sup>nd</sup>**” should help you recall that **actions often have secondary effects** (this one was a stretch to come up with so feel free to develop your own. An action generating secondary effects reminds me of Newton’s laws of motion where an action causes a reaction, or one ball hitting a stationary ball will cause that one to be in motion too. Hence the 1<sup>st</sup> bumping into the 2<sup>nd</sup>). 7) The **sub** sandwich with the **unknown price** reminds you that **value is subjective.** 8) The **fortune-teller** and **crystal ball predicting test questions** reminds you that **the test of a theory is its ability to predict.**

#### *Four Pitfalls of Economic Thinking*

I always think of the old Atari video game “Pitfall” when this topic comes up in class. If you don’t know, it was an Indiana Jones, run-through-the-jungle type of adventure game. The main guy was “Pitfall Harry,” and he had to jump over snakes, swing on vines over alligator pits, etc. But Harry can help us remember the pitfalls to avoid. They were 1) **violating ceteris paribus** (not keeping everything else equal); 2) **good intentions** don’t necessarily lead to **good outcomes**; 3) the **fallacy of composition**; and 4) **association is not causation.**

Picture Pitfall Harry in the jungle at a campsite. He is standing there, and he is holding a **cat** in his arm. The cat has its rear legs near the crook of his elbow so its face is near Harry’s **wrist**. The cat is looking in Harry’s hand, which is holding a **pair** of little Matchbox cars of **little buses** (two small school buses or the English red double-decker buses should work). The cat remarks how the **pair of buses** are **being held equal** in Harry’s hand (Harry’s not just holding one or the other; he’s holding them both equally).

Next, Harry decides to go into the **tent** at his campsite. The tent is strange, though, since it’s very easy to open the flap and go **in the tent**, but you can’t always **come out** of it. Imagine Harry going in a few times and getting stuck on the way out once or twice. The **tent** is **good** for going **in**, but **not always good for coming out.**

Next to the tent are **three compost piles**, with old leaves and grass that are biodegrading. When you look closer, though, you notice that the one in the middle isn’t actually real; it’s just a hologram or a projected image made to look like a real compost pile. The image flickers a few times, giving away that it is **false compost.**

Last, the campsite is on a beach, so Harry goes down to look at the ocean. There are actually **two oceans**, though, with a small strip of land shooting out to the horizon dividing the two (picture a really long dock). The ocean on the left is dirty and cold, so Harry thinks that it is only a “**so-so**” **ocean**. It’s not great; it’s just so-so. But the ocean on the right is clean, warm, and has fish jumping in it and people windsurfing. Harry is so fond of this ocean that he calls it his cousin, or his “**Cuz Ocean.**” He sees that, even though the two oceans are close to each other, the good aspects of “Cuz Ocean” don’t necessarily make the “so-so” ocean any good.

So, again, 1) Harry holding a **cat** at his **wrist**, looking at a **pair of buses** being held equally; 2) the **good tent** for going **in**, but **not necessarily good for coming out**; 3) the **three compost piles**, one of which is **false**; and 4) the “**so-so**” **ocean** and “**Cuz Ocean.**”

The **cat at wrist** should remind you of **ceteris** (they sound similar), and the **pair of buses** should remind you of **paribus** (and the cat remarking how **they’re held equally** should remind you of what *ceteris paribus* actually means). The tent good for going in but not necessarily good for coming out should remind you that **good in-tent-ions** don’t necessarily lead to **good out-comes**. The **false compost pile** should remind you of the **fallacy of composition** (“compost” sounds like “composition”). Remembering that one isn’t like the other two should remind you of the main idea of the fallacy of composition. Finally, the two oceans should remind you that association (“a so-so ocean”) is not causation (“cuz ocean”).

## Appendix B

The following is a sample illustration of images that could be used to recall the four different types of market structure in a microeconomics class, going from most competitive to least. The many tiny kittens having a purring contest represent perfect competition, which is made up of a large number of very small firms. The fight among Rich Uncle Pennybags represents monopolistic competition. The small number of

oily globs refers to oligopoly (and the prisoners help to recall the prisoner's dilemma, a classic oligopoly example). The single tall Rich Uncle Pennybags represents monopoly itself.

As discussed above, professors should refrain from providing too many similar examples for students. Retention is enhanced when students develop their own images.

## MARKET STRUCTURE

1. Perfect Competition
2. Monopolistic Competition
3. Oligopoly
4. Monopoly

