

Does Consumer Spending Matter?: A Macroeconomic Experiment

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I. INTRODUCTION

This work is a continuation of a macroeconomic classroom experiment initiated in the mid 1990's. The experiment when first written was neither timely nor convenient. A discussion of unemployment did not seem germane for an economy experiencing the robust growth the U. S. enjoyed in the later part of the 1990's. And, while the experiment did convey potential macroeconomic problems, unemployment and inflation, it did require significant instructional resources. While the authors do not claim any credit for the economic malaise of the current economic climate, we have substantially eased the burden of conducting the experiment. Given economic conditions and a more self-contained model, it does seem appropriate to promulgate this experiment again, now in its enhanced form.

Our intent, in the original paper and now, is to demonstrate the importance of spending to the health of the economy. Spending decisions by individuals in the economy affect the purchasing ability of everyone in the subsequent period. Too little spending leads to lower incomes and potentially unemployment. Too much spending, too many dollars chasing too few goods, adversely affects real spending and raises interest rates. While not breaking new theoretical

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ground, the methodology does provide a stimulating pedagogy in which students learn for themselves the results of their spending decisions.

Although the number of macroeconomic experiments has increased over the past five years, there are still no other experiments of this type that model spending decisions in this manner. Therefore, the value of this experiment both in terms of its unique features and the relevance given the current economic conditions has encouraged us to simplify the mechanics of the experiment while increasing the scenarios that can be represented.

The paper proceeds with a brief summary of the initial paper and a discussion explaining the motivation to modify the analytical tools used.

II. THE ORIGINAL EXPERIMENT

This experiment simulates the income determination process in a two-sector macro model.¹ In the first round, students are allocated a percentage of GDP and must decide how much of this income they will spend. GDP for subsequent rounds is determined by summing the spending of each player (consumption spending) in the previous round and adding a fixed amount for investment spending. After any needed adjustments, aggregate income is allocated to players, based on the original distribution, which forms the basis for decisions in the subsequent round. The process is repeated for five to seven rounds.

¹ The details of this experiment can be found in Classroom Experiments Vol. 6(2), 1998.

There are several adjustments for GDP that may be needed. First, if spending levels fall too low, players randomly become unemployed and their income for the period was changed to zero, and what would have been their income for the period is reallocated among other players. Second, if the players' spending is too high then the value for GDP is adjusted downward (to reflect inflationary pressure). This specification reflects the familiar "L-shaped" Keynesian aggregate supply curve. This simplified aggregate supply curve enables the student to more easily see the results of deficient or excessive levels of spending since there may be a problem of either inflation or unemployment, but not a combination of both.

A. Incentives

The decision to spend more than the minimum amount is influenced by several incentives built into the game. First, the next round's GDP is calculated by summing the spending by the players and a fixed level of investment spending. So the more each player spends, the larger is the GDP pie and the more income each player receives in the next round. Second, high levels of spending are rewarded individually. This second incentive reflects the concept of conspicuous consumption; the real world phenomenon that wealthier individuals are able to buy more "toys".² Finally, the risk of unemployment is reduced with higher levels of aggregate spending.

² The form of the reward varied during the semesters the experiment was run. Initially, and in a more recent (third) version, candy was used as the reward for surpassing various threshold levels of spending. In the second version, points were used as the reward, but rewards were also given for spending a high percentage of income. This reward for spending a large percentage of income was used in the subsequent version of the experiment, however the prize

Two incentives are also built into the game that directly influence the amount saved. First, savings earns an interest payment of 5%. Second, the players' rankings at the end of the game are based on their increase in savings. Each player's percentage of the total savings is compared to their initial allocation of GDP. Players are ranked and points earned based on the difference in these percentages.

B. Results

As illustrated in Table 1, each time the experiment was conducted, except once, the class quickly drove the economy into a recession.³ Persistence of reduced income levels and unemployment were observed in each case. For a generation who has become accustomed to instantaneous remedies to most conditions, it was intriguing to see their reaction to prolonged sub optimal outcomes. Interesting classroom discussions, either during the experiment or afterwards in a debriefing, were the rule and not the exception. The one time the experiment did yield inflationary outcomes was in large part due to the lack of incentives to save used for that class.

The results from the first version of this experiment suggest that the savings and spending incentives were not compatible; there was too strong of an incentive to save and receive points.

The incentives for the second version were changed to make the incentives more compatible.

Students did appear to respond differently to the incentive structure; confirming the very basic

reverted back to candy.

³ The decline in GDP for V1.1 and V1.3 for the last rounds is likely the result of a last period problem. Given the relatively short amount of time remaining in the class period, students chose to increase their savings to increase the points received for participating.

economic principle that individuals do respond to changes in incentives.

Several students commented during the experiment that this must be what the Great Depression was like and that maybe the government is needed to push their economy back toward full employment. They easily saw the relationship between changes in consumer spending and the overall health of the economy. This experiment opens the door for a discussion on the possible role for an active monetary or fiscal policy to correct deviations from full employment.

III. CHANGES

The model has been modified for several reasons. Some are due to ease of use, enabling one instructor to conduct the experiment. Other changes are to add increased realism to the experiment. First, the model is now programmed in Excel, since this seems to be a more widely used spreadsheet. At the start of the experiment the instructor has to make several choices for parameters in the model. Once this is done, the experiment is self-contained and works well. Parameter values may be changed during the experiment should the desire arise.

At the start of the experiment the instructor decides what percent of income accrues to the unemployed. A number between 0, unemployed individuals receive no income in the round in which they are unemployed, to 1, wherein there is no reduction of income when becoming unemployed. Neither extreme seems realistic, but the experiment works well with values between .35 and .5. This would represent a form of social safety net, or unemployment

insurance, for lost wage income. Upper income workers probably have non-wage income, which would not disappear should they become unemployed. A second choice is the value for the interest rate. If the experiment is run for seven rounds, each round can be thought of as a decade. As such, a value for the interest rate between .2 and .3 allows the students' savings to double twice in their lifetime and encourages savings while still young. A third decision must be made regarding the degree to which the interest rate is adjusted for changes in the price level. In periods when other participants are spending heavily, and hence pushing up the price level, the reward for savings is increased. This would add a loanable funds market to the analysis. A fourth parameter is the amount of "autonomous spending". This too can be changed throughout the experiment.

Another change was done with mixed emotions. In the current version, a macro "decides" who will be unemployed in a random fashion. While this does accelerate the experiment, it does remove a part of the experiment that had been humorous. The sorting hat, to Harry Potter fans, was used to draw the participants who became unemployed, should spending not be sufficient. By drawing letters out of a hat, it did create some anticipation and gleeful discussion. Moreover, it can allow the instructor to cook the books; to "name" an especially recalcitrant spender among those selected to become unemployed.⁴ In every class, when the under-spending free rider became unemployed, there was a loud and vocal cheer at the news. Thus students did seem to be encouraging their peers to spend freely in the hope of avoiding unemployment. But, as in many experiments, private actions (the spending decision) are not always consistent with the popular

⁴ Neither author is encouraging dishonesty or deception, but it can prove useful.

sentiment conveyed in public rhetoric.

It is often thought that without incentives participants in an experiment will not compete forthrightly. Further, it is thought that rewards should be tangible. Thus earlier versions of the experiment provided candy as a reward for consumption and points toward the semester grade for saving. Both rewards were readily observable in each round, with candy being distributed between rounds, and accrued savings shown on the spreadsheet.

Incentives have always been a time consuming portion of the experiment. Distributing spending rewards in each round was cumbersome in the classroom. And, end of game rewards, in spite of various ways of treating savings, were never well articulated or understood. The current version recognizes those conspicuous consumers, albeit by highlighting their actions. In each round, individuals can earn up to five “spending stars”, and these are visible to all participants. Stars are earned for both spending a large percentage of income (one star for 80% of income and two stars for 90% of income), and for high levels of spending (thresholds of \$18,000, \$23,000 and \$32,000 are established with an additional star earned as each threshold is crossed). The savings incentives are now couched in terms of the quality of life in retirement.

With these changes, the experiment can move at a more rapid rate. This will allow the experiment to be run multiple times in a class setting. Changing parameter values then becomes a viable option. For example, the level of autonomous spending could be changed to represent either a one-time shock or a permanent change in investment or government spending.

A. Running the Experiment⁵

In a prior class period, the student information sheet (see the Appendix for a copy) should be handed out and reviewed. Additionally, the instructor should determine which values are desired for the various parameters. After parameter values have been entered the experiment can commence. Students are assigned, or draw, a participant card, which identifies which of the twenty individuals they represent and, therefore, their income level. Each player must decide how much to spend, bounded on the lower end by \$3,000 (the program works correctly even if students spend less) and their individual income level on the upper end. Once spending decisions are entered, the program calculates aggregate income, the number of people who will become unemployed and any change in the price level. Players see their spending rewards (the stars on the spreadsheet) after the spending information is entered in the spreadsheet.

Based on aggregate income, the program also calculates each participant's income for round 2. Before beginning round two, one quick step must be completed. If 1 or more people have lost her/his job, double click on the unemployed column header. This will randomly generate who becomes unemployed by inserting a dummy variable indicating that person is unemployed. While this does not have quite the drama as a draw from the hat, this step can be dramatized to provide almost the same impact. The program then adjusts, or recalculates, income for round two. At this point, players would decide their level of spending for round two, with again the

⁵ A copy of the spreadsheet can be obtained from the authors.

need to determine who, if anyone, becomes unemployed. The experiment continues for the remaining rounds.

At the experiment's end each player's retirement status is shown. The level of savings that has been acquired by "retirement" determines the retirement status. If the savings is not above a minimum threshold, then the status comment reflects the player's inability to retire. The degree to which a player's savings as a percentage of total savings deviates from their percentage of income received at the start of the experiment determines the level of comfort for retirement. A larger percentage for savings indicates that the player may have a very comfortable retirement – although many of the comforts during the working years may have been forgone. A lower percentage for savings indicates that while able to retire, the standard of living the player enjoyed during the working years will likely diminish.

IV. CONCLUSIONS

If your experience resembles the previous uses of this experiment you will have an enjoyable learning activity which actively engages your students. Numerous follow up questions augment the depth of thought and analysis this experiment motivates. Several questions of an individual nature are obvious. For the big spenders, who see the quality of life decline in retirement, the question is why did you spend so much of your income? For those individuals who see their quality of life increases in retirement, the appropriate question is why did they postpone consumption for so long? If a recession does occur the group can be asked about any persistence

of unemployment. What, if anything, can be done to get people back to work, and how long will it take? Time permitting, you can rerun the experiment. At this time you can change the level of “investment” to trigger a recession, and then observe the pattern of adjustment back toward full employment. In one class period you can reinforce most of the lessons relevant to short run macroeconomic fluctuations.

TABLE 1

Experiment Results: GDP at the Beginning of Each Round

Rounds	Version 1			Version 2	Version 3	
	V1.1	V1.2	V1.3	V2.1	V3.1	V3.2
	GDP	GDP	GDP	GDP	GDP	GDP
1	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000	\$400,000
2	\$321,000	\$286,500	\$286,000	\$272,300	\$345,300	\$338,000
3	\$341,063	\$263,453	\$272,101	\$313,647	\$347,717	\$340,486
4	\$336,093	\$290,685	\$289,471	\$378,684	\$340,221	\$298,570
5	\$341,778	\$299,274	\$333,440	\$415,194	\$305,271	\$341,008
6	\$359,007	\$291,341	\$321,740	\$432,499	\$266,671	\$361,048
7	\$327,746	\$282,188	\$301,752			\$359,219
8		\$267,653				

Student Instruction Sheet: Macroeconomic Experiment

This experiment simulates the spending and savings decisions made at the macro level. Your objective, as in real life, is to make yourself as best off as possible. Each player will be given an initial specified amount of wealth. In each round, you must decide how much to spend. There are incentives/rewards built into the game for certain behavior.

Spending: You are required to spend a minimum of \$3,000 in each round. (As in real life you must buy food, shelter and clothing.) All spending is based on the player's current income. You can not spend out of your savings unless you are unemployed. Two factors should be kept in mind when deciding how much to spend:

Your income level for the next period is determined by the total level of spending (GDP) in the economy. The total amount of spending by the players (consumption spending) will be added to a fixed (autonomous) level of investment spending (\$100,000) to determine GDP for the next round. This figure is then adjusted to reflect the level of spending in the economy. If consumption spending is too high – more than \$300,000 – then the value for GDP is adjusted downward. Think of this as a change in real GDP. This is the concept of full employment income. If people spend too much than this “excess” demand results in inflation.

If spending is too low some people will randomly become unemployed. For every \$20,000 that consumer spending falls below \$300,000 an additional person (randomly determined) will become unemployed. (An unemployed person does not earn any income during the periods in which he/she is unemployed.) If unemployment persists for the next period, the players currently unemployed will be re-employed and new players will be drawn. (Although those currently unemployed could potentially become unemployed again.)

There will be a reward for high levels of spending out of current income. If a player spends at least \$18,000 in a round, one piece of candy is earned, and if spending is at least \$23,000 two pieces of candy are earned. In addition, points are earned for the percentage of income spent in a round. If a player spends 80% of income one piece of candy is earned, and if 90% of income is spent two pieces of candy are earned. There are two types of candy rewards that can be received: hard candy and peanut butter cups. When receiving these rewards, no more than $\frac{1}{3}$ of the candy received may be peanut butter cups. Additionally, for every two retained (uneaten) hard candies, you can opt for a peanut butter cup in the next round for which you receive a spending reward.

Savings: A reward is also given for savings. Savings earns an interest payment equal to 5%. You are required to spend at least \$3,000 out of your savings if you become unemployed. You can dissave as much as you like, however, keep in mind that you can remain unemployed for more than one period or become unemployed later in the game.

End of the Game: At the end of the game the amount of savings you have accumulated will be determined. Savings accumulated throughout the game (which earned interest) will be added to savings that results from turning in uneaten savings rewards (candy). Each uneaten peanut butter cup gives you an additional \$1000 in savings and each uneaten piece of hard candy gives you an additional \$200 in savings. **You will be rewarded for the growth in your wealth from the initial allocation to this final level.** The initial percentage of the total income available will be compared to your final percentage of total savings. These changes in percentages will be ranked and homework points will be distributed based on your ranking. $\text{Points} = (5 + \text{ranking})/2$.

REFERENCES

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