

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

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Table of Contents

Abstract.....	1
Introduction.....	2
Literature Review.....	2
What is the Shadow Economy?	2
Developed vs. Transition Economies	3
Problems in Greece.....	4
Corruption.....	6
Methods of Estimating the Shadow Economy.....	8
Attempts by the Greek Government.....	9
Theories on Cultural Analysis	11
Methodology.....	13
Philip Cagan (1958).....	13
Vito Tanzi (1983).....	15
Initial Model.....	15
Problems and Adjustments to Final Model.....	18
Results.....	19
Conclusions.....	20
Hofstede's Framework.....	20
Final Conclusions.....	22
Appendices.....	23
Appendix A – (The Model).....	24
Appendix B – (Results from Initial Model).....	25
Appendix C – (Results from Adjusted Model).....	26
Appendix D – (Shadow Economy Estimate Results).....	27
Appendix E – (Data Points).....	28
References.....	31

ABSTRACT

This capstone investigates the impact that tax policy has on the shadow economy in Greece. Greece has one of the largest shadow economies in the world and the largest in the European Union, with tax evasion being one of the main drivers. While previous research has provided measures of the shadow economy, none matches the shadow economy estimations with policies, laws, and agencies enacted by the government, specifically over the period in time of 1990-2012. This study contributes to the literature by connecting the policies implemented by the government with the size of the shadow economy in Greece, along with providing a new model based on prior versions of the currency-demand model. The study concludes by considering, a piece of cultural analysis to help explain why the people of Greece are so prone to evade taxes and enter the shadow economy. Research of Dr. Geert Hofstede's work on cultural dimensions shows that Greeks have high levels of power-distance, collectivism, and uncertainty avoidance, all which can be used to explain why they are susceptible to keep evading taxes.

Using an adaption of the currency demand model, the regression results show that the shadow economy increased with 1) an increase in the amount of people that are self-employed 2) decreases to the middle income tax rate 3) and with increases in the lowest income tax rate. These results suggest that the tax system needs a combination of stronger oversight and penalties because of the extremely high levels of uncertainty avoidance that Greeks possess. The results also show that revenue can be captured by raising the middle income tax rate, and that raising the tax rate on the lowest bracket will tend to force those people into the shadow economy. This study provides useful conclusions on the Greek shadow economy from both an economic perspective and a sociological perspective.

INTRODUCTION

For almost three decades now, Greece has been infamous for having a very large shadow economy and having a population that is one of the worst perpetrators of tax evasion in the world. The government of Greece has attempted to curtail this problem by implementing policies that target tax evaders, and also changing other policies to try and capture more revenue, but often these methods prove unsuccessful. What aspects of the economy of Greece are so prone to tax evasion? Who are the main contributors to the shadow economy? While many studies have been done on this topic, none provide a definitive way to measure the shadow economy and identify the main contributors to the problem. This study fills a void in the literature and matches changes in public policy to changes in the size of the shadow economy in Greece from 1990-2012. Regression analysis is used to provide estimates of the shadow economy based upon a currency demand model developed by Vito Tanzi in 1985. The results are then explained with an element of cultural analysis using the Cultural Dimensions model developed by Geert Hofstede.

This paper will begin with a literature review, followed by an in-depth look at the model used to estimate the impact of various factors on the size of the shadow economy in Greece. The results are discussed and policy implications are drawn. Finally, the impact of cultural factors on tax evasion is evaluated.

LITERATURE REVIEW

What is the Shadow Economy?

To understand this topic it is important to first define what the shadow economy is and what activities are included in it. It is a term that has been loosely defined in the past, but as research continues it has become more and more consistent. Dr. Friedrich Schneider of Johannes Kipler University is known as one of the leading researchers on the shadow economy, and his measurements and estimations are often used by governments around the world. He defines the shadow economy as “all market-based legal production of goods and services that are deliberately concealed from public authorities” to avoid payment of taxes, avoid payment of

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

Senior Capstone Project for Nils Thompson

social security contributions, avoid meeting legal labor standards, or to avoid complying with binding administrative procedures (Schneider, 2004). These types of activities include unreported income from self-employment, and also the wages, salaries and assets from unreported work related to legal goods and services.

Professor Schneider identifies six main causes for an increase in shadow economy activities in any country. According to his paper “Shadow Economies of 145 Countries all over the World: What do we really know?” the six main causes are:

- 1) Increase of the Tax and Social Security Contribution Burdens
- 2) Intensity of State Regulations
- 3) Social Transfers
- 4) Specific Labor Market Regulations
- 5) Public Sector Services
- 6) Tax Morale

These conclusions are based off accumulations of empirical data gathered by Schneider and his colleagues over many years. These categories are very general and cannot be applied to every nation’s economy, but some elements of these categories can be found within the economy of Greece.

Developed vs. Transition Economies

Stavros Katsios talks about the difference between developed and transition economies in his paper “The Shadow Economy and Corruption in Greece.” Developed nations such as the United States, Switzerland, and Japan have some of the lowest shadow economies as a percentage of their GDP. In developed nations such as these, the shadow economy has stayed low and stable “mainly as a result of decreased direct and indirect tax burden, of government deregulation, and of a liberalization of the labor markets” (Katsios, 2006). Transition economies however show much higher figures when it comes to shadow economy. The numbers are higher in these economies because “before liberalization most day-to-day products were produced in the underground...[because] there were very few options in the official planned economy” (Katsios, 2006). As these states entered the transition stage of development, new government regulation

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

Senior Capstone Project for Nils Thompson

along with higher direct and indirect taxation forced people into the shadow economy in order to maintain the economic way of life that used to be in place before development of the market economy.

Although Greece is ranked amongst developed economies, Katsios argues that its economy shows many signs of a transition economy that is susceptible to higher levels of shadow activity. These signs include “high levels of regulation leading to a significantly higher incidence of bribery, high effective taxes on official activities, and a large discretionary framework of regulations leading to a large shadow economy” (Katsios, 2006). Since Greece shows signs of a transition-type economy, the solutions for its problem are much different than those used in developed economies. The shadow economy in Greece is very sticky because of “the high profit from irregular activities, the associated investments, the strong personal relations, and the relative low cost of operating,” so once citizens enter the shadow economy, it is very unlikely that a change in tax policy will bring them out of it. From a public policy perspective, it becomes very difficult for policy makers to enact major reform to the current tax code, knowing how difficult it is to bring citizens back out of the shadow economy. It is also very difficult to make a reform that has a goal of lowering the shadow economy, but having that reform completely change the tax system for the legitimate tax payers as well. This is a major policy issue in Greece.

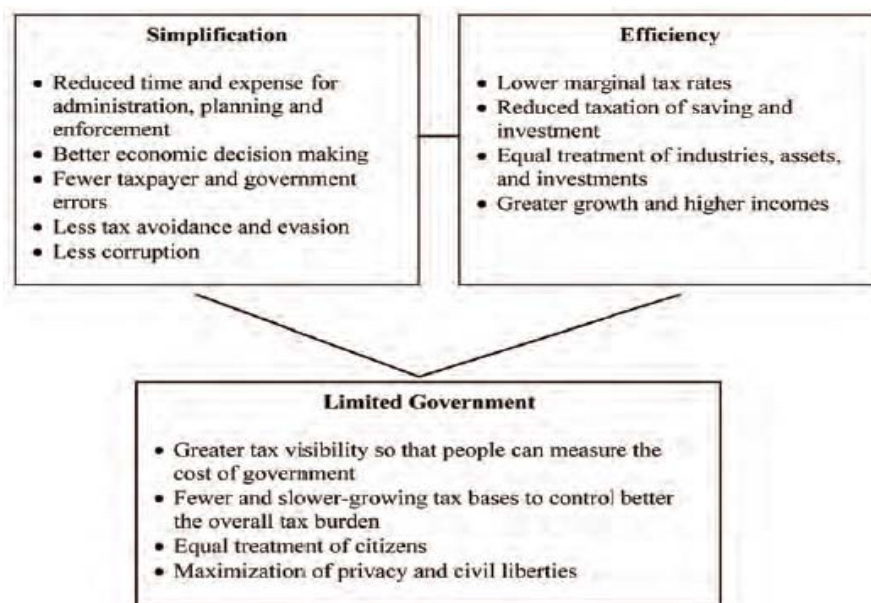
Problems in Greece

Katsios’s further explains the policy problems that arise when the Greek government cannot tax all the shadow activities in its economy. First of all, the initial short-term reaction of the government is always to raise tax rates, which of course apply to only legitimate tax payers, in an attempt to capture the revenue that cannot be obtained from shadow activities. The result is that the tax burden shifts further onto the legitimate sector of the economy, putting the pressure onto them rather than the illegitimate sector. In essence, these tax increases act as an “implicit subsidy” to the shadow economy that is “particularly ironic and troubling” considering that it creates more of an incentive for legitimate taxpayers to enter the shadow economy. With this in mind, policy changes that are made cannot just simply be reforms that either increase the burden or complicate the taxation process for those that are already paying. The solution must come from major institutional reform that focuses on increases to simplification, efficiency, and

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

Senior Capstone Project for Nils Thompson

limited government presence in the tax system. The following diagram taken from Katsios' paper outlines some of the goals of major institutional reform.



Categories of Major Institutional Reform

Even though some major attempts at reform have been attempted, the Greek tax system “remains terribly complex and inefficient [with] no progress towards making the tax code simpler or making the burden more equal and visible to help limit the government’s growth (Katsios, 2006). Another major problem in Greece that has very obviously emerged in the recent past is that any kind of tax cut that has been made has never been matched by cuts in government spending, also making it very difficult to justify further tax reform from a policy perspective. Katsios explains how the Greek tax system is so complex that it creates very high administrative and compliance costs, along with susceptibility to bribery. Tax payers “spend millions of hours annually filling out tax forms, keeping records, and learning hard to interpret tax rules.” Special documentation is required by tax authorities for almost everything including “mortgage records for the mortgage interest deduction, education records for education tax breaks etc., promoting an overall invasion of personal privacy by the government” (Katsios, 2006). The complex rules of the tax system can be interpreted in so many ways that the people are often confused and subject to make errors. Katsios explains that because of this Greeks will often risk trying to deceive tax authorities or offer bribes to them so that their tax situation will be enforced in the interpretation most

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

Senior Capstone Project for Nils Thompson

favorable to them. The system is very inefficient and unproductive, and forces a lot of legitimate tax payers to enter the shadow economy.

Corruption

Another one of the reasons why the shadow economy is so large in Greece is because of the presence of corruption in the public sector. Corruption occurs when interactions and economic transactions between the public and private sector violate the arm's-length principle. The arm's length principle states that all economic transactions must be made without some type of special relationship between the two parties that may affect the price, requirements, and conditions of the transaction. These types of transactions are commonplace in Greece, and in fact are generally accepted.

Transparency International is an international organization created to take a stand against corruption and expose governments and institutions who are involved in corrupt activity. They do this through gathering data and providing an international platform for complaints involving corruption all over the world. After compiling this information and data, Transparency “engages in strategic advocacy to bring about systemic change in public policy and practice.” Their website contains country specific sections on corruption, and the page on Greece contains much information on kinds of corruption that is occurring there. Within Greek government, public officials “have acted without transparency or effective oversight for decades.” This has created an environment where it has become the norm for public officials to demand and accept bribes, especially because there is little risk of penalty for those that are caught. Transparency has obtained a Greek report showing that in 2010 “only 2% of misbehaved civil servants are subject to disciplinary procedures” (Transparency International, 2012). In 2011 TI-Greece issued its annual National Survey on Corruption in Greece and the following table shows the results outlining the “Corruption Pricelist” for activities that can be paid for with a bribe. These types of payments are known as “speed money,” which helps to get a process done quicker through payment.

Has Government Tax Policy in Greece Led to a Large Shadow Economy?
Senior Capstone Project for Nils Thompson

CORRUPTION PRICELIST 2011				
		<i>Type of Service</i>	<i>From</i>	<i>Up to</i>
PUBLIC SECTOR	PUBLIC HOSPITALS	Procedure/Surgery	€100	€30.000
		Speeding up of case	€30	€20.000
	TAX OFFICES	Arrangement for financial records audit	€100	€20.000
		Issuing of documents	€15	€1.000
	LICENSE CONSTRUCTION BODIES	Issuing of a construction licence	€200	€8.000
		Settlement of illegal building	€200	€5.000
PRIVATE SECTOR	HEALTH SERVICES (HOSPITALS, CLINICS)	Procedure/Surgery	€150	€7.000
		Medical tests	€30	€500
	VEHICLES	VTCC inspection	€20	€100
		Driver's License	€40	€500

Corruption Pricelist in Greece for 2011-Transparency International

*This is the fifth year (since 2007) that TI-Greece conducts the National Survey on Corruption in Greece, which presents the size of petty corruption that burdens the Greek households. The 2011 Survey occurred in four waves over the period November-December 2011, using a structured questionnaire addressing to a sample of 12,000 people (www.transparency.org).

The fact that a survey like this is able to successfully produce results alone gives insight to how large the problem is in Greece. Bribery for petty services that should be expected of government workers is the norm in Greece. It is so much the norm that a de facto price list was created by Transparency International through their corruption survey. Of course only those citizens that are willing to pay can afford to pay, and only those that have connections to the central government are able to participate in these corruptive bribery activities. Those that are not able to do may instead to enter the shadow economy as a substitute for corruption, in order to avoid the tax

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

Senior Capstone Project for Nils Thompson

authorities altogether. Therefore “the shadow economy is complementary to a corrupt state” and both of them create incredible inefficiencies in the Greek economy (Katsios, 2006).

A major contributor to the shadow economy in Greece is the high percentage of the working population that is self-employed. Workers that are self-employed have a lower probability of detection and oversight from tax officials, and have the ability to perform undetectable cash and M1 transactions through business partners that they have close relationships with. The self-employed population in Greece is very high compared to most other countries. In 2011 the percentage of self-employed to total employed was 37% and it has been as high as 48% in 1990. The government of Greece finds it extremely difficult to monitor this group and therefore lots of evasion, corruption, and other shadow activities tend to go unnoticed.

Methods of Estimating the Shadow Economy

In order to really understand the impact of the shadow economy on a nation, it is important to be able to measure it. However, there is difficulty in measuring the shadow economy because as the name suggests, it is something that is not brought out into the light of the public sphere.

Therefore, estimations and econometric models must be used to estimate the size of the shadow economy. Historically there have been various ways of attempting to do this. One way to estimate the shadow economy is to take GDP using both the income and the expenditures methods. If there is a large gap between the two figures, then this can be assumed to be attributed to the shadow economy, because there is more spending occurring than there is declared income. A second way to estimate is to use the labor force statistic. The labor force is assumed to be sticky over time and not susceptible to large fluctuations. Therefore if there is an unexpected drop in the labor force that has not been accounted for, this can be assumed to be attributed to the shadow economy increasing.

A third method is the currency-demand approach. This approach is built off of the assumption that all shadow economy activities run on cash transactions that are undetectable by tax authorities. This method uses regression analysis with the currency to total money supply ratio as the dependent variable, and the assumption is that as shadow economy activity increases, the currency to total money supply ratio increases. This is the method that was used to help create a

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

Senior Capstone Project for Nils Thompson

specific model for the purpose of this study and the steps to get this model will be explained in the methodology section. The following graph shows past estimates of the shadow economy done by Dr. Friedrich Schneider using the currency demand method.

		Shadow Economy (in % of off. GDP) using the DYMIMIC and Currency Demand Method		
		1999/00	2001/02	2002/03
1	Australia	14,3	14,1	13,5
2	Austria	9,8	10,6	10,9
3	Belgium	22,2	22,0	21,0
4	Canada	16,0	15,8	15,2
5	Denmark	18,0	17,9	17,3
6	Finland	18,1	18,0	17,4
7	France	15,2	15,0	14,5
8	Germany	16,0	16,3	16,8
9	Greece	28,7	28,5	28,2
10	Ireland	15,9	15,7	15,3
11	Italy	27,1	27,0	25,7
12	Japan	11,2	11,1	10,8
13	Netherlands	13,1	13,0	12,6
14	New Zealand	12,8	12,6	12,3
15	Norway	19,1	19,0	18,4
16	Portugal	22,7	22,5	21,9
17	Spain	22,7	22,5	22,0
18	Sweden	19,2	19,1	18,3
19	Switzerland	8,6	9,4	9,4
20	United Kingdom	12,7	12,5	12,2
21	United States	8,7	8,7	8,4
Unweighted Average		16,8	16,7	16,3

Estimations of the Size of the Shadow Economy in 21 OECD Countries

Attempts by the Greek Government

As shown by these past estimates for OECD countries, Greece is estimated to have the highest shadow economy as a percentage of its GDP from 1999 to 2003. The time period being analyzed in this study is 1990 to 2012 and during this time the government of Greece has made efforts to try and reduce and stop the problems of tax evasion and the shadow economy. The Economist Intelligence Unit has produced annual Country Commerce reports on Greece from 1996 to 2012 and these reports contain information on the kinds of laws, agencies, and policies that the Greek government has implemented from 1990 to 2012. There are three categories that the government attempted to reform during this time period. First the government tried to create enforcement agencies that would have greater oversight over financial crimes that take place in both the legal and illegal sectors of production. Secondly, the government attempted to update its auditing and database technology in order to have better cross-checking and detection abilities. Lastly, the government attempted frequently to reform the tax code on personal income, corporate income, and self-employed income.

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

Senior Capstone Project for Nils Thompson

There were two major agencies created over the time period of 1990 to 2012. In 1997 the Pasok government created an agency called the Financial Crimes Investigation Office. This agency was aimed at reducing illegal activities such as tax fraud, contraband, money laundering, drug-trafficking, and illegal lending. In 2005 the New Democrat government replaced this agency with the Service for Special Audits. They claimed that the Financial Crimes Investigation Office had been corrupted and compromised as early as one month into its existence and therefore needed to be replaced. The Service for Special Audits was given extensive powers to confiscate physical and digital data, as well as to freeze bank accounts. Finally in 2010 under guidance of Troika, five task forces were created that aimed at creating better tax-collection techniques.

The Greek government began to update its administrative tax software and database technology in 1997 through the purchase of TAXIS hardware and software. This system was implemented into almost all tax offices by January of 2001 and it is used to keep records of transactions and cross-check them against tax returns submitted by citizens. It has become mandatory for merchants and the self-employed to file value-added tax returns electronically so that they can be constantly monitored by the TAXIS system. It has even been linked to the cash registers of most major stores in Greece, with the intent of linking it to every cash register, so that transactions are instantly recorded and accounted for. This technology and its cross-checking abilities were able to catch a high number of evaders almost instantly after it became fully functional in January of 2000.

There have also been attempts to reform the tax codes aimed at personal, corporate, and self-employed income to try and increase revenue and bring people out of the shadow economy to pay their taxes. Changes in the personal income tax code have been aimed at reforming and adjusting rates to make them more favorable to taxpayers, while also adjusting the tax-free income threshold to accommodate the people in the lowest tax bracket and either increase or decrease their tax burden. Changes to corporate taxation have been aimed at harmonizing tax rates for certain business entities in order to create consistency in the system. Government has also tried to simplify bookkeeping for corporations in order to make auditing and detection easier for government tax authorities. The Greek government has also created amnesty periods to allow companies that have been in the shadow economy to emerge and pay their evaded taxes at a

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

Senior Capstone Project for Nils Thompson

much lower rate than they would have, without any penalty. Finally, there have been attempts made to reform the self-employed tax system by attempting to remove loopholes and treat them the same as any other individual taxpayer that is not self-employed. Compared to the other categories, not nearly the same amount of action has been done here. For this project, many of these specific laws and policies will be compared to an estimation of the size of the shadow economy in order to see if they had a negative, positive, or neutral impact on it during the time that they were implemented. This process will be shown in the results section of this paper.

Theories on Cultural Analysis

The final pieces of literature that were researched for this topic are frameworks of cultural analysis that are used to describe cultures of a nation and categorize them for comparison's sake. For this study there is a need to have a cultural framework in place that can help to draw conclusions that explain why the people of Greece are so prone to evade taxes and enter the shadow economy.

One of the frameworks that can be used to analyze cultures is that developed by Parsons in 1951 which states that all people have personal pre-dispositions that enable them to make choices a certain way in their lives. There are four classifications of "relationships that an individual within a society maintains with the environment" (Todeva, 4). People are predisposed to make decisions that are:

1. Emotionally charged vs. emotionally neutral
2. Multidimensional vs. specific
3. Universalistic vs. particularistic (refers to application of rules/laws)
4. Ascription vs. achievement oriented
5. Self vs. collective orientated

In 1961 Kluckhohn and Strodtbeck developed another cultural framework using the concept that there are "five common human problems to which nations collectively are searching for solutions" (Todeva, 3). These problems are:

1. The nature of the human being: (good/mixed/evil)

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

Senior Capstone Project for Nils Thompson

2. Human relationship with the world: (dominant/harmonious/submissive)
3. Primary mode of activity: (doing/becoming/being)
4. Individual relationship with other people: (individualism/collaterality/lineality)
5. Temporal orientation: (past/present/future)

While these frameworks could most definitely be applied to Greece and the shadow economy, the framework that is the most applicable to this study is that of Dr. Geert Hofstede which was developed in 1980. This framework was developed with the intent of being a “commonly acceptable, well-defined, and empirically based terminology to describe cultures” (Hofstede, 1983). Hofstede developed five dimensions of culture that can be used to describe differences in national cultures. These dimensions are defined by Hofstede as:

1. Power-distance: To what degree do the people of a society accept and respect hierarchy and the power held by those of high status?
2. Individualism vs. collectivism: Do the people of a society look out only for themselves and their immediate families or are they part of a protective and loyal in-group that helps all members of it?
3. Masculinity vs. femininity: Does the culture of a nation possess more masculine or feminine characteristics. Masculine societies emphasize competition, heroism, and achievement. Feminine societies emphasize cooperation, caring for the weak, modesty, and quality of life.
4. Uncertainty avoidance: How comfortable are the people of a nation with ambiguous and uncertain situations?
5. Long-term vs. short term orientation: Are the people of a nation focused more on the short term or long term future of their society?

This model was selected for this study for the purpose of explaining why Greek people tend to evade taxes and enter the shadow economy. Specifically, the dimensions of power-distance, individualism vs. collectivism, and uncertainty avoidance are the most relevant when looking at Greek culture and its shadow economy. This framework will be discussed further in the conclusions section.

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

Senior Capstone Project for Nils Thompson

Therefore after reviewing the literature, the two methods that will be used in this study are the currency-demand method to estimate the size of Greece's shadow economy, and Hofstede's dimensions of culture to explain why Greeks evade taxes and enter the shadow economy.

METHODOLOGY

Researchers have used many different methods to estimate the size of the shadow economy in a nation. For the purpose of this study, the currency-demand model was chosen as the best framework. The currency demand model is based upon information and data that is widely available to the public. It also allows for easy substitution of variables in and out of the model allowing for different specifications of the regression model. This study uses a unique currency-demand model that includes variables that have not been tested for in prior research.

Philip Cagan (1958)

The concept of currency demand has been a topic of economic discussion for some time. In 1958, Philip Cagan of the University of Chicago wrote a chapter in the National Bureau of Economic Research called "The Demand for Currency Relative to Total Money Supply." This paper mentioned numerous variables that affect the ratio of currency to the total money supply. They are as follows:

- 1) The cost of holding currency: as interest rates rise, the cost of holding currency increases therefore people tend to hold less currency and the ratio goes down
- 2) Expected real income per capita: holding balances in the checking deposits of reputable banks is preferred over holding currency as income rises. The services of deposits are safer than that of holding currency, therefore as income rises the currency to total money supply ratio declines
- 3) The volume of retail trade: the use of currency predominates because of its wide acceptance, cash-and-carry transactions, assumes a constant fraction of retail transactions uses currency, as retail transactions increase so does the currency ratio
- 4) The volume of travel per capita: travelers often have a high need for currency, so "the number of miles of intercity travel per capita by passengers on all forms of transportation should reflect the major changes in the demand for currency arriving from the inconveniences of paying by check when away from home"
- 5) The degree of urbanization: urbanization causes people to trade where they are not known, reducing the use of checks, impersonal nature of urban trade discourages the use

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

Senior Capstone Project for Nils Thompson

of checks and credit, so the growth of urbanization will increase the demand for currency and increase the ratio, conversely living in an urban environment encourages the banking lifestyle and increases wage payment by check, decreasing the currency ratio, net effect is unknown, not played a dominant role

- 6) Rate of tax on transactions: “some people evade taxes by making as many transactions as possible with currency and not reporting them to the tax collector, evasion will occur on a large scale if the tax rate is high enough to create a sufficient incentive, so as the tax rate increases so does the currency ratio

Cagan concludes that there is not enough strong evidence to prove the relationship between the amount of retail trade and the amount of travel to the currency ratio. He also states that urbanization may have a small effect, but it is unknown as to what direction it moves the currency ratio. He concludes that the three most important variables are interest on deposits, real income, and the tax on transactions. Cagan’s methodology used time series data to look for multiple correlations between the currency ratio, the expected net rate of return on deposits, the expected income per capita, and the percentage of personal income taxed over a time period of 1919 to 1955. The results showed a close correlation between the rate of return on deposits and the currency ratio. Regression calculated that the rate of return on deposits accounted for 79% of the variance in the currency ratio, while 11% of the variance was split between expected income per capita and the percentage of personal income taxed. Therefore Cagan’s model concluded in this period that the expected net rate of return on deposits was the key variable that drove changes in the currency ratio.

So what does Cagan’s model have to do with the shadow economy? Cagan and other economists used this currency to money supply relationship to develop models that estimate the size of the shadow economy in a nation under one major underlying assumption: Shadow Economy transactions tend to be made with cash so that they are undetectable from tax authorities, therefore as the size of the shadow economy increases, so will the currency to money supply ratio. This assumption is the base of all currency-demand models that estimate the size of the shadow economy

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

Senior Capstone Project for Nils Thompson

Vito Tanzi (1983)

In 1983 Vito Tanzi took the methodology of Cagan and developed it further to create his own currency demand model to make shadow economy estimates. In Tanzi's model, "the currency to M2 ratio is expressed as a function of the tax rate, the income of the representative taxpayer, the probability of audit, the penalty rate, the interest rate, the inflation rate, consumption, urbanization and the education level" (Ariyo,2011). This model includes the probability of audit, the penalty rate, and the tax rate to explain r changes in the currency equation. The model has been changed depending on the country of study, availability of data, and preference of the researcher. For example, in a study done on the shadow economy in Nigeria (Ariyo and Bekoe), the currency to M2 ratio is expressed as a function of the tax rate, GDP per capita, household consumption expenditure per GDP, the inflation rate, the interest rate, the education level, and urbanization.

Once the set of independent variables are chosen, a regression analysis is conducted to determine the impact of these variables on the dependent variable, the currency to M2 ratio. The next step is to take the predicted currency to M2 ratios derived from the initial regression and compare them to results derived from a second regression that does not include the tax rate variable. Then by taking the difference between these two results and multiplying it by the M2 aggregate, the amount of illegal money (IM) in an economy is found. Legal money (LM) is then calculated by subtracting illegal money from the M1 money aggregate. This legal money number is divided into the GNP of an economy to find the velocity of money (V). Illegal money is then multiplied by the velocity of money to find the size of the shadow economy for the nation. This model can be seen in equation form in Appendix A.

Initial Model

This study selects a distinct set of variables to measure the size of the shadow economy in Greece from 1990 to 2012. Some of the variables are borrowed from the initial Tanzi model and others were chosen specifically for their relevance to Greece. Some of the variables were chosen because of their relevance to the time period of 1990-2012. Internet usage, for example, was something that became very relevant and increased at an extremely high rate during this time

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

Senior Capstone Project for Nils Thompson

period. The older models used by Cagan and Tanzi provide a great framework, but for this study new variables needed to be chosen in order to better fit the time period in question. The largest adjustment was made to the dependent variable, changing it from the currency-M2 ratio to the M1-M2 ratio. The following is a step by step explanation of each of the variables chosen.

- 1) **M1/M2 ratio:** In prior studies, the currency to total money supply ratio was always used as the dependent variable. This is also known as the M0/M2 ratio. M0 refers to all the physical currency circulating in an economy while M1 refers to all physical money plus checking accounts. For the purpose of this study M1 is assumed to be a more relevant measure because of the universal increase in the use of checking/debit accounts as the primary method of transaction in modern economies. While many tax-evading activities still run on a cash-only basis, it is also very likely that money can be hidden and spread amongst multiple checking accounts without detection by a government tax fraud agency. It is quite easy for a person to hold multiple checking accounts with many banks ranging from large national institutions to local credit unions. Therefore M0 is no longer the relevant aggregate when talking about a driver of the shadow economy, as illegal money can just as easily flow through the aggregate of M1. All of the following variables are a function of the M1/M2 ratio.
- 2) **Total Tax to GDP (TTGDP):** This variable is taken as a measure of the average tax rate for all GDP producing entities in an economy. It is the proxy used to measure for tax evasion by determining legal and illegal cash which will be outlined in a later section. This variable is taken from the original Tanzi model. Under the assumptions and results made by previous research, the expectation is that an increase in Total Tax to GDP will increase the M1/M2 ratio.
- 3) **Household Final Consumption Expenditure per GDP OR GDP per capita (undecided, have regressions for both)(HFCE or GDPcap):** This is another variable borrowed from the Tanzi model which accounts for changes in income. Prior research stated that as income rises, the demand for deposit accounts increases and the demand for physical currency decreases. For the time period being analyzed in this study, the same theory may hold true using the M1/M2 ratio. As income increases, more money flows out of physical currency and deposit accounts into numerous financial products and investment opportunities that are not included in the M1 aggregate. Therefore it is expected that as income rises, the M1/M2 ratio will decline.
- 4) **Inflation Rate (I) and Interest Rate (r):** These variables were also borrowed from the Tanzi model to capture the cost of holding money. The expectations are that increases in inflation and decreases in interest rates will increase the M1/M2 ratio.
- 5) **Education Rate (EDU):** This is the final variable borrowed from the Tanzi model. This is the percentage of the employed population that has obtained a secondary education. This variable was used by Tanzi under the assumption that people who have higher education will use less cash and put their money into deposit accounts. The same assumption holds true under this study's M1/M2 ratio as people with higher education are

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

Senior Capstone Project for Nils Thompson

more likely to put money into investment products that are not part of the M1 aggregate. The expectation is that an increase in education will lead to a decrease in the M1/M2 ratio.

- 6) **Exchange Rate (E):** The exchange rate of Greek Drachmas to German Marks was chosen as a unique variable to account for the flow of imports and exports across the borders of Greece. This rate is used because Germany has traditionally been Greece's closest trading partner. This variable was also chosen to capture the effects of the switch to the Euro in 2001, because the exchange rate is held constant after that point in time. It is expected that as the Drachma strengthens against the Mark, currency will flow out of the country and the M1/M2 ratio will decline.
- 7) **Self Employed (SE) (% of Total Employed):** This unique variable was chosen to capture the effects of the self-employed population in Greece on the size of the shadow economy. Greece has a high proportion of self-employed relative to most other countries and it is easier to evade taxes in this environment where there is less regulation. It is expected that as the self-employed percentage rises, so will the M1/M2 ratio.
- 8) **Personal Income Tax Brackets(Low, Mid, High):** Low, median, and high income tax brackets are used as independent variables to see which has the greatest impact on the shadow economy. These variables are also unique to this study and it is expected that all of them will have a positive impact on the M1/M2 ratio.
- 9) **Unemployment (U):** This unique variable was chosen to see if a change in the unemployment rate had an effect on the shadow economy. The expectation is that an increase in the unemployment rate will increase the M1/M2 ratio.
- 10) **Value Added Tax Rate (VAT):** This is a tax rate that is uniquely different from country to country so it was included (at the 1st tier) to see if a change in it affected the size of the shadow economy. The expectation is the same as that of the income tax brackets in that an increase will also increase the M1/M2 ratio.
- 11) **Corporate Tax Rate (T):** This is the rate that is applied to all corporations listed on the Athens Stock Exchange. This variable was included to capture effects that may not have been absorbed by the personal income tax variables alone. The expectation is the same in that an increase in this rate will result in an increase in the M1/M2 ratio.
- 12) **Internet Usage (I):** This statistic was chosen to see if the growing usage in internet from 1990-2012 had an impact on the shadow economy. The statistic is internet users per 100 people and the prediction is that as internet usage rises the M1/M2 ratio will fall. This is under the assumption that internet usage has created less of a need for transactions to be made with cash and checking accounts because of secure online payment utilities such as PayPal.
- 13) **Tariff Rate (T):** This variable is an applied weighted mean on all products. The purpose of this variable is to see what the effect is of imports and exports on the shadow economy. The prediction is that a rise in the tariff rate will result in an increase in the M1/M2 ratio.

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

Senior Capstone Project for Nils Thompson

14) M1 Dummy (M): When Greece switched to the Euro in 2000 there was a tremendous reclassification of its currency aggregates, particularly the M1 money aggregate, therefore a dummy variable was put in place at the time of this switch to capture the effects of the reclassification.

Problems and Adjustments to Final Model

After running the initial regression with all of these variables, some problems emerged. The specific results of the initial regression can be seen in Appendix B. The first problem is that many of the initial variables came out insignificant and some of the coefficients came out unexpected. Secondly, the initial model produced a very high R-square suggesting that there may be high degrees of correlation amongst variables.

Further investigation of this was done by running a correlation matrix on the model. This test showed that there was a high degree of correlation amongst many of the variables in the initial setup. The correlation matrix can also be seen in Appendix B. This evidence shows the presence of multicollinearity in the model, which is when two or more variables are highly correlated. While this problem does not reduce the predictive power of the entire model, it does affect the results that are produced for individual variables. In order to fix this problem the variables need to be adjusted. Often multicollinearity must be accepted as part of the model because it cannot be completely removed. The first adjustments made to try and remove the correlation were to drop the insignificant variables, along with three additional selections:

- 1) **Unemployment:** This variable was dropped from the equation because after further thought, a “chicken-and-egg” type of dilemma came to be where it is unclear whether or not the shadow economy is a result of unemployment, or if unemployment is a lagging variable that is a result of the shadow economy increasing.
- 2) **Value Added Tax Rate:** The VAT is highly correlated to that of the Total Tax to GDP variable therefore it may be creating some multi co-linearity issues within the model. It is likely that any changes that were made by the VAT would be captured by the Total Tax to GDP variable. Therefore this variable was dropped.
- 3) **Internet Usage:** This variable also showed a high degree of correlation with other variables in the model. In order to remove some of the correlation in the model this variable was dropped.

Another problem that was found to be present in the model was autocorrelation. Autocorrelation is a problem that occurs in time-series data where a piece of data is correlated and dependent to

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

Senior Capstone Project for Nils Thompson

some degree upon the prior period's value. In order to test for autocorrelation the Durbin Watson test was ran on the variables. A critical value range of 1.494 -1.827 was needed in order to reject the presence of autocorrelation. The test produced a value of 1.08 showing that autocorrelation was present in the model. To try and control for the autocorrelation, a lag variable was added to the model. This variable is the log of the prior quarter's M1/M2 ratio and can be seen in the final equation shown in Appendix A.

The final problem that needed to be tested for was the presence of a unit root in the time-series. If a unit root is present then a shock in the data can have permanent effects on the growth rate of the predicted M1/M2 variable. The Dickey-Fuller test was run on the model to test for the presence of a unit root. The test needs to generate a number that is more negative than -4.04 in order to deny the presence of a unit root.

The refined regression was ran after removing the unwanted and insignificant variables, adding the lag variable for autocorrelation, and running the Dickey-Fuller test. The results of the refined model can be seen in Appendix C. The regression produced no insignificant variables, as shown by the low P-values for each variable. The R-square value remained very high suggesting that correlation may still be present in the model. Another correlation matrix was used to see how much correlation remained. The matrix can be seen in Appendix C as well. The matrix still shows that some variables are strongly correlated, but the presence of correlation is much lower than in the original model. The Dickey-Fuller test produced a value of -7.2009, so the presence of a unit root can be denied which is very good. The Durbin-Watson test produced a value that was closer to the critical range but still outside of it, suggesting that autocorrelation is still present in the model, but to a lesser degree than in the original setup of the model. Therefore multicollinearity and autocorrelation must be accepted in this refined model. Even though it is still present after adjustments, it is present to a much lesser degree than in the original model.

RESULTS

The results of the regression analysis generated three results that stood out. The first is that the self-employed population is the greatest driver of the shadow economy in Greece, as predicted. The second result that stood out was an unexpected result showing that as the middle income tax

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

Senior Capstone Project for Nils Thompson

rate rises, the size of the shadow economy actually decreases. The third result that stood out was that raising the lowest income tax rate increases the size of the shadow economy, which came out as predicted.

According to the Tanzi-style model of measuring the shadow economy, the regression was ran a second time without the TTGDP variable in place. Using residual outputs in Microsoft Excel, the predicted M1/M2 ratios were taken from both regressions, and the difference between the two was multiplied by M2 in order to find the amount of illegal money in the Greek economy.

Instead of subtracting this amount from M1 to get legal money as in the Tanzi model, illegal money was subtracted from M2 in order to stay consistent with the shifts upwards in money aggregates that had been used throughout the model in this study. Legal money was then divided into GDP to get the velocity of money, which was then multiplied by illegal money to calculate the size of the shadow economy. This was divided by GDP in order to show shadow economy as a percentage of GDP. This process is explained in more detail in Appendix A and the results are shown in Appendix D in graph format.

CONCLUSIONS

As mentioned in the literature review, the Greek government has attempted to stop the shadow economy problem in Greece numerous times from 1990 to 2012 through numerous laws, policies, and agencies. The graph in Appendix D has specific data points shown on it which are matched to specific laws, policies, and agencies shown in Appendix E. A breakdown of each data point and the implied effects of each situation are also shown in Appendix E. The data shows slow growth of the shadow economy from about 13% to 20% from 1990 to about 2000. In the year 2000 there is a strong increase in the shadow economy, going as high as 28% of GDP in 2003. After this point in time there is a consistent decline in the size of the shadow economy down to about 15% in 2010. In 2012 there seem to be signs of another sharp increase occurring but it is too soon to tell if this is actually happening. The estimates generated by the model in the study produce estimates very similar to that of Dr. Schneider which were done for 1999 to 2003. This is encouraging and gives confidence that the model produced fairly accurate results.

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

Senior Capstone Project for Nils Thompson

Hofstede's Framework

In order to draw conclusions as to why the people of Greece are so prone to enter the shadow economy and evade taxes, Hofstede's dimensions of culture are used as a cultural framework.

Three of Hofstede's dimensions were chosen for the purpose of this study:

1. Power Distance: Greece is a nation that has a high score when it comes to power-distance. This means that the people of Greece believe that power holders have more benefits than those without power, and that this inequality should be respected and accepted.

There are some policy implications that go along with Greece having a high power-distance score. Since people accept inequality and hierarchy in Greece, government officials have no problem demanding bribes and the citizens have no problem paying the bribes demanded of them. Those that demand bribes will never be questioned by those below them since this behavior is accepted as a part of the hierarchy in Greek society. This means that policy makers must increase oversight on tax officials that demand bribes, and increase penalties for those that are caught so that the officials must respect the power that has been placed upon them and accept it without question. Without policies like this the government officials will continue to demand bribes and corruption will continue to run rampant in Greece.

2. Individualism vs. Collectivism: Greece is a collectivist culture. People are born into strong in-groups that protect one another in exchange for loyalty. More powerful members of in-groups are expected to help those that are less fortunate within the in-group. In-groups expand much further than just immediate family and friends. They can include coworkers and business relationships as well.

In collectivist cultures everybody "knows a guy" that can help them in some way by giving them a favorable situation that not everyone has access to. For example, if an in-group of Greeks includes a powerful tax official, it is expected that the official will help members of the in-group get favorable tax situations in exchange for bribes. The implications of making policies in a collectivist culture are that people will not hesitate to bend and break the law in order to help out those within their in-group. Deterrents must be stronger so that the fear of punishment is stronger than the need to help a member of an in-group. If punishment and oversight is strong enough, then shadow activities may actually put the entire in-group at risk of detection, therefore putting pressure on them to emerge the entire in-group from the shadow economy.

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

Senior Capstone Project for Nils Thompson

3. **Uncertainty Avoidance:** Greece has the highest score in the world for this dimension. Greeks are not comfortable in ambiguous and uncertain situations. They crave peace of mind and therefore will bribe and pay to have their worries taken care of when things are not certain.

Greece's extremely high uncertainty avoidance level means that the people are always uneasy and worried about the future. This is why they bribe officials to take care of their problems for them quickly. The official gets paid, the worry is taken care of, and both parties walk away with peace of mind. If the Greek government can continue to update its monitoring and cross-checking capabilities in the tax system, it will make citizens that evade and participate in the shadow economy uneasy because of the higher probability of detection. Institutional reform will make the future uncertain for those that are in the shadow economy, especially if penalties increase along with oversight. If this happens, Greeks may become less likely to participate in the shadow economy because the future results of doing so will become much more risky, ambiguous, and uncertain.

Final Conclusions

Yes, government tax policy has led to a large shadow economy in Greece. There is not nearly enough oversight and punishment to government officials that demand bribes and perform other acts of corruption. The penalties for individual and corporate tax evasion are still not strong enough to stop people from participating in the shadow economy. There is an exceptionally low amount of oversight placed on the self-employed sector, even though it has been proven that they are the greatest driver of shadow economy activities.

The solutions to this problem are not easy, especially with all of the political turmoil that is occurring currently in Greece. But this study shows that if the shadow economy is going to be decreased then the government is going to have to increase punishment and oversight in order to take advantage of the extremely high levels of uncertainty avoidance that the people of Greece have. If the government can find a way to make Greeks in the shadow economy uncertain enough about their future that they will emerge and pay their taxes, then the revenue that has been lost in the shadow economy will begin to appear.

APPENDICES

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

Senior Capstone Project for Nils Thompson

Appendix A - The Model

$$\ln(M1_t/M2_t) = \beta_0 + \beta_1 \ln(TTGDP_t) + \beta_2 \ln(HFCE_t) + \beta_3 \ln(D/M_t) + \beta_4 \ln(SE_t) + \beta_5 (\text{low}_t) + \beta_6 (\text{mid}_t) + \beta_7 (M_t) + \beta_8 \ln(M1_{t-1}/M2_{t-1})$$

Variables

Dependent variable = M1/M2: Ratio of M1 money aggregate to total money supply (M2)

TTGDP: Total tax to GDP, the proxy for changes in the size of the shadow economy

HFCE: Household final consumption expenditure

D/M: Exchange rate of Greek Drachmas to German Marks, Greece's closest trading partner

SE: % of total employed that are self-employed in Greece, most notorious tax evaders

Low, mid: Lowest and median personal income tax rates

M: M1 "dummy variable used to capture the revaluation of M1 that occurred in 200 because of the switch to the Euro common currency

(M1_{t-1}/M2_{t-1}): The lag variable to control for autocorrelation. It is the predicted (M1/M2) from the previous period

Finding the Shadow Economy (Tanzi 1983)

1. **Illegal Money (IM):** Take the predicted M1/M2 values for each period using the equation including the TTGDP variable. Then find the predicted M1/M2 values using the equation without the TTGDP variable. Take the difference between the two values for each period to find the amount of illegal money in the economy.

$$(IM) = [EXP(M1/M2)_{TTGDP} - EXP(M1/M2)_{\text{no TTGDP}}] \times M2$$

2. **Legal Money (LM):** Take M2 and subtract (IM) from it to find the amount of legal money in the economy.

$$(LM) = M2 - (IM)$$

3. **Velocity (V):** GDP divided by legal money gives the velocity of money. Velocity of money is the rate at which money is exchanged from one transaction to another. Measures robustness of an economy.

$$(V) = GDP / (LM)$$

4. **Shadow Economy (SE):** Velocity multiplied by (IM) gives the size of the shadow economy. This is then divided into GDP to get a % of GDP number.

$$(SE) = (V) \times (IM)$$

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

Senior Capstone Project for Nils Thompson

Appendix B - Results from Initial Model

SUMMARY OUTPUT								
<i>Regression Statistics</i>								
Multiple R	0.996648595							
R Square	0.993308422							
Adjusted R Square	0.992750791							
Standard Error	0.054935849							
Observations	92							
<i>ANOVA</i>								
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	7	37.63106944	5.375867063	1781.299037	1.76126E-88			
Residual	84	0.253507594	0.003017948					
Total	91	37.88457703						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	12.83770601	1.986720032	6.461758979	0.00000	8.886895347	16.78851667	8.886895347	16.78851667
TTGDP	0.38371676	0.140939005	2.722573211	0.00788	0.103444092	0.663989428	0.103444092	0.663989428
HFCE	-5.660222124	0.307377584	-18.41455725	0.00000	-6.27147616	-5.048968089	-6.27147616	-5.048968089
D/M	-0.582860127	0.079937576	-7.29144105	0.00000	-0.741824764	-0.423895489	-0.741824764	-0.423895489
SE	1.561592649	0.260147322	6.002724281	0.00000	1.044261168	2.078924129	1.044261168	2.078924129
lowest	0.007083781	0.002381494	2.97451178	0.00383	0.00234792	0.011819642	0.00234792	0.011819642
middle	-0.018985581	0.003325245	-5.709529271	0.00000	-0.025598195	-0.012372968	-0.025598195	-0.012372968
M	1.054995207	0.03716381	28.38770351	0.00000	0.981090896	1.128899517	0.981090896	1.128899517

	TTGDP	HFCE	r	U	D/M	SE	Tar	EDU	I	1st	T	low	mid	high	IU	M
TTGDP	1.000															
HFCE	-0.368	1.000														
r	-0.701	0.796	1.000													
U	0.337	0.272	0.092	1.000												
D/M	-0.777	0.383	0.721	-0.516	1.000											
SE	-0.529	0.403	0.694	-0.356	0.868	1.000										
Tar	-0.517	0.348	0.615	-0.472	0.847	0.957	1.000									
EDU	0.612	-0.638	-0.918	-0.149	-0.721	-0.757	-0.639	1.000								
I	-0.819	0.291	0.665	-0.617	0.955	0.821	0.825	-0.643	1.000							
1st	0.035	0.372	0.207	0.748	-0.374	-0.497	-0.578	-0.109	-0.437	1.000						
T	-0.024	-0.064	0.109	-0.405	0.466	0.747	0.773	-0.233	0.432	-0.785	1.000					
lowest	0.254	-0.431	-0.644	-0.096	-0.555	-0.810	-0.705	0.762	-0.482	0.216	-0.613	1.000				
middle	0.061	-0.357	-0.445	-0.543	-0.083	-0.249	-0.115	0.529	-0.010	-0.308	-0.095	0.682	1.000			
highest	-0.427	0.735	0.826	0.212	0.595	0.705	0.599	-0.801	0.467	0.118	0.322	-0.758	-0.492	1.000		
I-USE	0.308	-0.049	-0.333	0.554	-0.719	-0.902	-0.914	0.439	-0.714	0.794	-0.921	0.672	0.063	-0.414	1.000	
M	0.542	-0.510	-0.670	0.365	-0.865	-0.910	-0.914	0.660	-0.775	0.435	-0.665	0.645	0.097	-0.688	0.799	1.000

Correlation Matrix

Has Government Tax Policy in Greece Led to a Large Shadow Economy?
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Appendix C - Results from Adjusted Model

<i>Regression Statistics</i>						
Multiple R	0.996973061					
R Square	0.993955285					
Adjusted R Square	0.993365556					
Standard Error	0.052256382					
Dickey-Fuller	-7.200929513					
Durbin-Watson	1.219067					
Observations	91					
<i>ANOVA</i>						
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	8	36.81997805	4.602497257	1685.446062	1.41488E-87	
Residual	82	0.223919818	0.002730729			
Total	90	37.04389787				
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	12.26977758	2.076745564	5.908175654	0.00000	8.138469094	16.40108607
TTGDP	0.411632504	0.134940653	3.050470682	0.00308	0.14319256	0.680072449
HFCE	-5.271341596	0.423085767	-12.45927424	0.00000	-6.112993964	-4.429689229
Dra/Mrk	-0.468695283	0.085570994	-5.477268196	0.00000	-0.638923249	-0.298467317
SE	1.42000133	0.25588207	5.54943661	0.00000	0.910970378	1.929032281
lowest	0.006002373	0.002355876	2.547830364	0.01271	0.001315785	0.010688961
middle	-0.01712606	0.003449688	-4.964524569	0.00000	-0.023988588	-0.010263532
M	1.001476467	0.057016399	17.56470929	0.00000	0.888052687	1.114900247
lagm1/m2	0.07262137	0.049280933	1.47362002	0.14441	-0.025414105	0.170656846

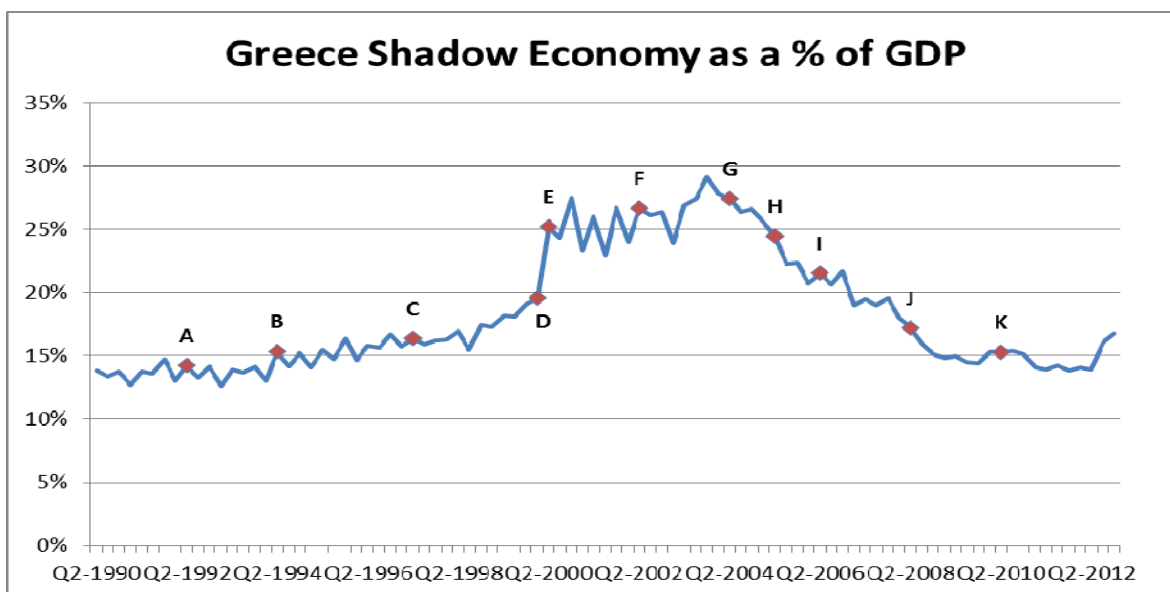
	<i>HFCE</i>	<i>TTGDP</i>	<i>Dra/Mrk</i>	<i>SE</i>	<i>low</i>	<i>mid</i>	<i>M</i>
HFCE	1						
TTGDP	-0.368351847	1					
D/M	0.383338547	-0.77738878	1				
SE	0.403034677	-0.52909585	0.867525553	1			
low	-0.431125522	0.254158994	-0.555231466	-0.810359147	1		
mid	-0.356826644	0.060657802	-0.083120777	-0.248876106	0.681782372	1	
M	-0.509860693	0.541659334	-0.864668657	-0.910211394	0.645404688	0.096620135	1

Correlation Matrix

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

Senior Capstone Project for Nils Thompson

Appendix D - Shadow Economy Estimate Results



	Country	Shadow Economy (in % of off. GDP) using the DYMIMIC and Currency Demand Method		
		1999/00	2001/02	2002/03
1	Australia	14,3	14,1	13,5
2	Austria	9,8	10,6	10,9
3	Belgium	22,2	22,0	21,0
4	Canada	16,0	15,8	15,2
5	Denmark	18,0	17,9	17,3
6	Finland	18,1	18,0	17,4
7	France	15,2	15,0	14,5
8	Germany	16,0	16,3	16,8
9	Greece	28,7	28,5	28,2
10	Ireland	15,9	15,7	15,3
11	Italy	27,1	27,0	25,7
12	Japan	11,2	11,1	10,8
13	Netherlands	13,1	13,0	12,6
14	New Zealand	12,8	12,6	12,3
15	Norway	19,1	19,0	18,4
16	Portugal	22,7	22,5	21,9
17	Spain	22,7	22,5	22,0
18	Sweden	19,2	19,1	18,3
19	Switzerland	8,6	9,4	9,4
20	United Kingdom	12,7	12,5	12,2
21	United States	8,7	8,7	8,4
	Unweighted Average	16,8	16,7	16,3

Previous Estimations by Schneider

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

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Appendix E - Data Points

Data Point A: **Law 2065/1992**

- The personal income tax code was changed and reduced the number of income tax brackets from nine to five. The goal of this was to capture revenue lost from tax evasion. This law seemed to have no effect on decreasing the shadow economy according to data generated in this study.

Data Point B: **Law 2214/1994**

- This law was aimed at restructuring the tax code to combat tax evasion. The most significant change was that the self-employed became taxed upon deemed income rather than declared income, which was not favored by the self-employed population. This applied mostly to farmers and unincorporated entrepreneurs. Objective criteria such as professional qualifications, size of staff, location, size, and utility bills all determined the deemed amount of taxable income. The corporate tax rate for companies not listed on the Athens Stock Exchange increased to 40%. The data shows that this law was not successful in decreasing the shadow economy and in fact many businesses were able to abandon this method over this time period.

Data Point C: **Financial Crime Prosecution Force**

- In May of 1997 the Financial Crime Prosecution Force (SDOE) was created with help from the FBI. Its purpose was to crack down on contraband, money laundering, drug-trafficking, illegal lending, and tax fraud. This organization was found to be fraudulent and compromised within weeks of it being created

Data Point D: **TAXIS Hardware Implementation**

- TAXIS audit hardware was purchased and began to be installed. Its purpose it to be able to store information, link tax centers throughout the country, and conduct specific cross-checks on data. It was first implemented in 1997, not expected to be fully operational until 1999. In Q3 of 1999 only 50% of tax centers used the system, but it covered 85% of taxes. On January 1, 2000 it became fully operational and the cross checking system immediately caught many small taxpayers that had not been declaring parts of their income. According to the data generated in this study, there was still a 6% of GDP rise in the shadow economy over the next 3 years after full integration of the system, but after that point stabilization and steady declines occurred. TAXIS is a major institutional and technological change that needed to happen in order to have better recording and cross-checking capabilities.

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

Senior Capstone Project for Nils Thompson

Data Point E: Law 2873/2000

- This law harmonized the corporate tax rate at 35%, and 30% for general and limited partnerships. According to data generated by this study, the shadow economy seemed to stabilize around 20-24% of GDP after implementation of this law, suggesting it was effective in stabilizing the rapid growth of shadow economy that was occurring prior.

Data Point F: Law 3091/2002

- This law changed the personal income tax code by removing two of the tax brackets, increasing the taxable income threshold, and increasing the income threshold for all tax brackets. All taxpayers close to the bottom portion of their tax bracket would have been bumped into a lower bracket, or out of taxable income altogether. However, the lowest tax rates have been removed, so now the lowest earners pay 15% on earnings rather than 5%, and the threshold income for reaching 30% and 40% tax rates are much lower than previous. This study says that increasing the taxable income threshold would reduce the shadow economy, but it also says that increasing the rate on the lowest earners would increase it. Along with that the middle rate being raised could reduce the shadow economy as well, so it is unclear whether or not this policy was effective. The shadow economy stabilizes after this point and then begins to decline, suggesting that this policy may have been effective in combination with others.

Data Point G: Law 3296/2004

- This law was passed to step down the corporate tax rate to 32% from 35% by removing 1% each calendar year. The shadow economy is continuing to decline during this time period, showing that this law may have helped with this reduction
 - **Law 3301/2004** also passed during this time which forced all companies listed on the Athens Stock Exchange to use IFRS accounting standards, another major institutional change that was needed in Greece

Data Point H: POL 1087/2005

- This policy lists 15-point criteria that will trigger the audit of a firm or individual. While this list is not available to the public, the data shows that since the shadow economy is continuing to decline at this time, so this criteria most likely helped with the decrease by making it easier to identify those involved in shadow activities
 - The New Democrat government declared that the Financial Crimes Prosecution Force had become corrupt so it was replaced with the Special Controls Service (YPEE). The YPEE has extensive powers to confiscate data, confiscate property, and freeze bank accounts. This is another major institutional change that was done to remove corruption and decrease the shadow economy. The data shows decline during this time period so it can be argued that this was effective.

Has Government Tax Policy in Greece Led to a Large Shadow Economy?

Senior Capstone Project for Nils Thompson

Data Point I: Law 3522/2006

- This law changed personal taxation by first of all increasing the level of tax-free earnings. The reduced the tax burden on low income earners, which should lower the shadow economy. Secondly it consolidated and expanded rates into three rates of 29%, 39%, and 40% for the highest earners. The rates stepped down by 1% each year until in 2009 they were 25,%, 35%, and 40%. The data shows the shadow economy decreasing during this time period, most likely because of the decreased tax burden on lowest earners

Data Point J: Law 3697/2008

- This law continues the step-down of the corporate tax by bringing to down to 20% in 2014 through a 1% annual decrease
 - Law 3943/2011 accelerated this process by immediately dropping the rate to 20%. The shadow economy has been stable since this point according to the data

Data Point K: Major Tax Reform that has seemed to stabilize the shadow economy around 13%

- **Law 3888/2010:** This law provided an amnesty for those firms that have not yet been audited but would receive penalty if they were. They would receive lower tax rates than they are supposed to receive
- **Law 3900/2010:** Court cases involving bribery of tax, social security, and customs officials were to be accelerated since the process was very time consuming previously
- **Law 3845/2010:** A crisis levy was applied to profitable companies in order to generate revenue to help with the Greek austerity crisis
- **Law 3842/2010:** This was the most major tax reform of this time period by issuing a steeply progressive tax system that rises steeper as income increases. The tax free allowance has also been reduced. It is unknown yet from the data what the effect on the shadow economy has been.

Has Government Tax Policy in Greece Led to a Large Shadow Economy?
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