



Department of Economics and Business

Chair of Money and Banking

The Effects of the Underground Economy on Monetary Policies

Prof. Paesani Paolo

Ludovica Florenzano

Matr. 200361

ACADEMIC YEAR 2017/2018

TABLE OF CONTENTS

Introduction	4
1.0 THE SHADOW ECONOMY AND THE MONETARY POLICY	5
1.1 <u>Definition of the Shadow Economy</u>	5
1.2 <u>Major Causes of the Shadow Economy</u>	7
1.2.1 <i>Tax Burden and Social Security</i>	7
1.2.2 <i>Regulations</i>	8
1.2.3 <i>Public Sector Services</i>	9
1.3 <u>A Better Understanding of the Shadow Economy</u>	10
1.3.1 <i>Tax and social security</i>	11
1.3.2 <i>Regulations</i>	11
1.3.3 <i>Public Sector Services</i>	12
1.4 <u>Estimation of the shadow economy</u>	12
1.4.1 <i>Monetary Indicator</i>	12
1.4.2 <i>Labor Market Indicators</i>	13
1.4.3 <i>State of the official economy</i>	13
1.4.4 <i>Estimation Methods</i>	14
1.5 <u>Size and development of the shadow economy</u>	14
1.6 Monetary Policy	15
1.7 <u>Monetary Policy Definition</u>	15
1.7.1 <i>Monetary Policy Expansion</i>	16
1.7.2 <i>Monetary Policy Contraction</i>	16
1.8 <u>Monetary Policy Tools</u>	17
1.8.1 <i>Open Market Operations (OMOs)</i>	17
1.8.2 <i>Standing Facilities</i>	19
1.8.3 <i>Required Reserves Regime (RRE)</i>	20
1.8.4 <i>Discount Rate (DIS)</i>	20
1.8.5 <i>Quantitative Easing (QE)</i>	21
1.9 <u>Monetary Strategies</u>	21
1.9.1 <i>Inflation Targeting</i>	21
1.9.2 <i>Monetary Targeting</i>	22

1.10 The Relationship between the Shadow Economy and the Monetary Policy	22
1.11 <u>Effects of the Shadow Economy on Macroeconomic Variables</u>	22
<i>1.11.1 Unemployment Rate</i>	22
<i>1.11.2 Inflation Rate</i>	23
<i>1.11.3 Other Macroeconomic Variables</i>	23
1.12 <u>Effects of these distortions on Monetary Policies</u>	23
2.0 ANALYZING THE CASES	24
2.1 <u>Colombia</u>	26
2.2. <u>Australia</u>	29
2.3 <u>South Korea</u>	33
2.4 <u>Comparing our results</u>	35
<i>2.4.1. Output Gap</i>	39
Conclusions	43

Introduction

The following thesis studies the effect that the presence of the shadow economy in a country has on the efficiency of the monetary policies that are implemented in that same country by the Central Bank.

The underground economy is an argument of growing importance in the world due to the fact that an increasing number of countries worldwide, especially the developing ones, are facing it. Since the presence of this phenomenon is becoming “routine” for these countries, it is important to analyze the various effects that it has on their economies. We will analyze specifically the effects that a black sector of an economy has on the official indicators that are in turn used by the Central Banks for the process of implementing a monetary policy.

The first part of the paper concentrates on the general explanation of both phenomena individually: the shadow economy and the monetary policies, in order to gather a better understanding of what causes them and how they work. The first part also allows us to understand in general terms what kind of relationship arises between monetary policies and the underground economy.

The second part focuses on the actual research of data on the relationship between the Central Bank’s activities for the achievement of goals through the regulation of the money supply, and the black economy. In fact, in this part of the thesis a sample of three countries with different characteristics have been analyzed in order to see if there actually is evidence on the lower efficiency of the monetary policies in a country with a high presence of shadow activities in their official GDP (gross domestic product). We have done this by calculating the volatility of the inflation rate and the output gap of these countries, two indicators of major importance for the implementation of the monetary policy; and then comparing them to see whether the ones with a higher shadow economy tend to have more volatile indicators. At the end of our study we can notice that there actually seems to be a positive relationship

between a considerable amount of underground economy and how volatile the indicators are.

1.0 SHADOW ECONOMY AND MONETARY POLICY

1.1 Definition of the shadow economy

The shadow economy, also called underground or black economy, refers to all those activities that have the nature of economic transactions but that are not registered as such in the official economy and in the official calculation of the GDP, but contribute to adding economic value for a specific country. Many economists tried to provide a clear-cut definition of this phenomenon: Smith (1994, p.18) defines it as “market-based production of goods and services, whether legal or illegal, that escapes detection in the official estimates of GDP.”¹. Others such as Johnson, Kaufmann and Zoido-Lobaton (1998a, 1999b) refer to it as simply the production of goods and services that are intentionally obscured from the public authorities in order to avoid the payment of taxes, the payment of social security contributions, specific legal labor market standards (like minimum wages etc.) and having to adhere to certain administrative procedures.

From a definition perspective, there still is no proper one for this kind of economy, and this is due to the fact that it continuously develops adapting to the constant changes in the government regulations and taxes. Among the other reasons for this,

What we know for sure is that it does not only consist of illegal activities, but also of legal ones. According to Friedrich Schneider and Dominik Enste we can in fact separate it into two different sectors: the illegal one (irregular and criminal sector), consisting of activities like drug dealing and prostitution; and the legal one (household and informal sector) which comprises activities such as unrecorded income generated from fair production, either from monetary or trade transactions.

¹ Schneider, F., Buehn, A. and Montenegro, C. (2010). New Estimates for the Shadow Economies all over the World. *International Economic Journal*, 24(4), pp.443-461

The table below is taken from Friedrich Schneider and Dominik Enste’s IMF Working paper “Shadow Economies Around the World” and it helps us analyze better the various nature of underground activities

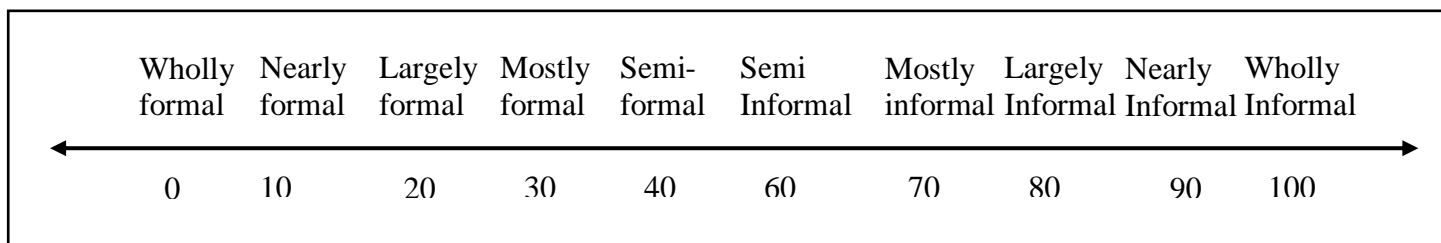
Table 1: A taxonomy of types of underground economic activities.

Type of Activity	Monetary Transactions		Nonmonetary Transactions	
ILLEGAL ACTIVITIES	Trade in stolen goods; drug dealing and manufacturing; prostitution; gambling; smuggling, and fraud		Barter: drugs, stolen goods, smuggling etc. Produce or growing drugs for own use. Theft for own use.	
	Tax Evasion	Tax Avoidance	Tax Evasion	Tax Avoidance
LEGAL ACTIVITIES	Unreported income from self-employment; Wages, salaries and assets from unreported work related to legal services and goods	Employee discounts, fringe benefits	Barter of legal services and goods	All do-it-yourself work and neighbor help

Source: Friedrich Schneider and Dominik Enste: IMF working paper “*Shadow economies around the world*”

Another important variable that needs to be taken into consideration when looking at the underground economy is the intensity of it in each country. The figure below studies the different ways to classify the degree and character of this sector, showing the various stages an economy can go through. These stages are not in a temporary sequence, meaning that an economic cycle does not have to pass through all ten of them, but each economy takes part of at least one stage.

Figure 2: Type of economy depending on the size of the underground sector as a % of the Gross domestic product.



Source: Williams V, University of Sheffield, UK

1.2 Major causes of the shadow economy

1.2.1 Tax burdens and social security

The constantly increasing matter of the “underground economy” has stimulated many studies on the evasion of taxes and on the income that is not registered. Economists have noticed from most of their examinations that higher taxes and social security contributions burdens imply an increase in the activities of the shadow economy. Their studies show that taxes have a very big impact on the labor-leisure choice, which in turn stimulates the untaxed sector of the economy.

This is a concern of major importance, since it has been proved that the bigger the spread between the cost of labor in the official economy and the total earnings once taxes are detracted, the greater people are motivated to take part of the underground economy.

Moreover, studies carried on by Schneider and Johnson, Kaufmann and Zoido-Lobatón all provide statistically significant evidence proving the relationship between shadow economy and both direct and indirect taxation.

It would be reasonable to think that a solution to these events is the reduction and the adjustment of tax rates, or the implementation of major tax reforms, but unfortunately this would only lead to a stabilization of the black economy avoiding the further increase of the phenomenon.

Many government's target consists of fighting this irregular behavior through discipline measures, but Schneider and Enste's studies show that this approach is costly, weak and not successful. What governments should do, instead of increasing the social security contribution and the taxes, which are methods whose only result is the actual increase of the shadow economy; is to change institutions and regulations to trim the stimulus that individuals have for illicit activities and tax evasion. A better solution would be for the government to build a relationship with the people relying on confidence rather than on rigid control and authority.

1.2.2 Regulations:

As we have said, the intensity of regulations also has a big influence on the shadow economy. First of all, we need to provide a proper explanation for them. In order to estimate the magnitude of regulations and the influence they have on the decision to go underground, a "business freedom as a casual variable" is used and it calculates the temporal length and efficiency of government regulation of businesses. These regulations include:

- Labor market regulations (ex. minimum wages)
- Trade barriers
- Labor market restrictions for foreigners

Let's now analyze the relationship that arises between these regulations and the underground economy. According to Johnson, Kaufmann and Zoido-Lobaton, - regulations cause the labor costs of the official economy to increase, which consist of a heavy weight on the shoulders of workers and of firms, that in order to avoid these costs are more directed towards the shadow economy. The economists supported this theory with empirical evidence showing that those countries with narrower and more specific regulations are the ones that tend to have a lower share of the unofficial economy in the total GDP. In fact, a 1-point increase in the regulation index is corresponds to an 8.1 percentage point increase in the share of the underground economy in the GDP.

The conclusion that arises from Johnson, Kaufmann and Zoido-Lobaton's (1998b) study is that the most important element to reduce the weight on individuals and firms is the enforcement of these regulations, and not the addition of new ones which would only guide firms deeper in the shadow economy. Their findings show that every accessible measure of law has a positive correlation with the presence of underground economy and that the link that exists between these two factors is significantly positive, leading us to the conclusion that the higher the regulation the larger the phenomenon of the black economy. Friedman et al. (2000) also achieved an analogous solution analyzing this relationship.

Summarizing what we have said, according to these economists and their studies, governments should focus more on enforcing laws and regulations rather than increasing the amount of them. Nevertheless, most of the time, the increased number of rules and regulations seems to be the best choice for governments since it provides them more authority, it is less difficult to implement and more appreciated by the public.

1.2.3 Public sector services:

As the shadow economy continues to evolve, the income generated by the state suffer from this, and as a consequence they decrease. This leads in turn to a great reduction of the quality and quantity of the goods and services offered to the public or to an increase of public debt if the expenses don't decrease. All these movements cause the tax rate for firms and consumers to rise, which mixed to the decline in the quality of goods causes a huge shift towards the black economy.

Johnson, Kaufmann and Zoido-Lobaton (1998a/b) came up with an explanation for this, stating that countries that have higher tax revenues due to their lower tax rates, less regulations and corruption, are the ones that usually have a smaller shadow economy. In fact, transition countries are the ones that have a higher number of regulations, leading to a greater presence of crime, greater amount of taxation and an inevitably higher amount of shadow economy.

Their findings have provided empirical evidence showing that those countries like Latin

America, where there is low respect of laws, high criminality (corruption), very high taxes and regulations are exactly those ones that have less stabilization have a higher rate of shadow economy. At the same time, according to their studies "wealthier countries of the OECD, as well as some in Eastern Europe, find themselves in the 'good equilibrium' of relatively low tax and regulatory burden, sizeable revenue mobilization, good rule of law and corruption control, and a [relatively] small unofficial economy."².

1.3 A Better understanding of the shadow economy:

To gather a better understanding of the phenomena, there are various studies of these unlawful activities. Many economists have tried to collect information about the breadth and significance of the shadow economy, about the individuals that are involved in these activities, and how frequently these operations take place. This was done through the estimation based on macroeconomic methods, but the results differ largely due to the various measurement techniques that are different in each country.

An example of difference among countries rises in the estimation of the underground economy through the "direct method", which consists of gathering information through well prepared surveys. This type of method has been applied by Haigner et al. (2013) and Enste and Schneider (2006) for Germany, Northern countries and the Netherlands. The effort of the European Commission (2007), to analyze this data among the different member states encountered many comparability issues. Indeed, the interviews become very difficult to evaluate depending on the ideas and values of the different countries regarding the shadow economy.

At the same time, this kind of economy is very difficult to calculate due to the fact that it is in its nature to be kept a secret, especially because individuals that are involved in these affairs try to do their best not to be recognized. Moreover, nowadays there are so many methods that it is very difficult to estimate the reliability of each one.

² Schneider, F., Buehn, A. and Montenegro, C. (2010). New Estimates for the Shadow Economies all over the World. *International Economic Journal*, 24(4), pp.443-461

To get accurate information about these events, all the different causes of the black economy need to be carefully analyzed.

1.3.1 Tax and social security:

Measurement of tax and social security burdens are very difficult to identify due to the big differences among the organizations of various countries. Some variables that could help are:

- Share of direct tax over the total amount of taxation
- Share of government expenditures as a percentage of GDP
- Degree of fiscal burden of an economy measured by the “economic freedom index”

All of these indicators except for the fiscal burden of the economy are expected to have a positive result.

1.3.2 Regulations:

As we already said, apart from taxes, also institutional frameworks and state regulation have a big impact on elements like unemployment, economic growth, production and investment possibilities. It has been proved that rules of law that are made focusing on high quality are able to create a solid and strong environment for firms, that as a consequence can improve the official economy. At the same time though, a high level of regulation can become a hinder for individuals and enterprises, affecting negatively the behavior of the market.

This is why the assessment of regulation needs to be done with a lot of caution, taking into consideration both the qualitative and quantitative aspect of laws: if there is poor quality, and the volume of regulation is very high, enterprises and individuals try to escape diving into the informal economy.

An equilibrium needs to be found: the right amount of regulations to reduce risk and uncertainty, but without falling into over-regulation which has a bad influence.

In order to capture an accurate degree of the influence that regulations have on the shadow economy, the business freedom variable is analyzed. This variable indicates the time and effort that a business activity deploys.

1.3.3 Public sector services:

If the citizens are not satisfied with the public services they are entitled to have with the amount of taxes that they pay, they can emigrate either in the underground or in foreign countries. This possibility of moving in the underground part, limits the authority of taxation that the government has, obliging them to upgrade institutions.

Government effectiveness is the variable that is used to measure the impact of public sector services on individual's decisions to approach the shadow economy. This indicator describes: the quality of public services, a country's dependence from political pressures, the efficiency of the implementation of policies, and the credibility of the government's promise towards reaching and achieving those policies.

1.4 Estimation of the shadow economy:

The shadow economy is very difficult to measure directly, through approaches such as polls and questionnaires that are often incorrect due to the impartiality and omission of data that arises from the sample chosen. Because of this, economists use indicators of three kinds to make a correct estimation of this phenomenon: monetary indicators, labor market indicators and official economy indicators.

1.4.1 Monetary indicators:

As we already said, individuals involved in these kinds of underground transactions do not wish to be identified, and the only method to not leave evidence is to use cash. The indicators used to recall to those cash transactions are called monetary aggregates and they are referred to as M0 and M1. In fact, there are different evaluations of the money supply, which can be arranged in different classes.

M0, also called narrow money, is the measure of money supply that includes any liquid or cash asset held within the central bank, and the amount of currency that circulates in the economy.

M1 on the other hand, includes currency (M0) and adds deposits with a maturity up to two years and deposits that are redeemable at a period of notice up to three months.

There are also other kinds of monetary aggregates:

- M2: which comprises M1 and short-term saving deposits and daily money market funds
- M3: which comprises M2 and long-term bank deposits and money market funds
- M4: which comprises M3 plus other deposits.

1.4.2 Labor market indicators:

Indicators that represent the labor market are: the labor force participation rate and the growth rate of the total labor force. The former represents the number of people in the population that is active economically, that is, all the people who provide labor for producing goods and services. The latter, indicates how much the rate of people aged 15 years or older that are economically active according to the Internal Labor Organization (ILO) grows over time.

The reason why these indicators are crucial to evaluate the level of shadow economy is that the labor market conditions often influence the decision to shift towards the underground sector. In various OECD countries, the costs of giving work to new people in the labor market are way higher than the actual money that the workers make, incentivizing employers to go underground. In fact, the shadow market and the labor market are considered substitutes. According to Kucera and Roncolato (2008 p.321) the exhaustive labor market conditions are one of the main reasons of informal work and the authors found meaningful evidence on the repercussions of labor market circumstances on the presence of the shadow economy.

1.4.3 State of the official economy:

The actions of the underground economy, are also reproduced in the state of the official economy. The indicator that is used in this case is the growth rate of the GDP per capita, measured annually based on the Purchasing Power Parity (PPP). This is an important factor because as studies from Schneider and Enste (2003) and Feld and Schneider (2009) tell us, the status of the official sector has a big influence on the shadow one.

If the economy is growing, the chances of workers to acquire higher wages and “extra money” are bigger in the official economy, lowering employees’ desires to go

underground. If the opposite occurs and the economy is having a decline, more people will want to balance the income deficit by engaging in shadow economy activities.

1.4.4. Estimation Methods

There are various estimation methods that can be taken into consideration, but the most common one is called the MIMIC (multiple indicator multiple causes) method. This approach models the shadow economy as a variable that is unobservable (called the latent variable), and its aim is to dig on the link between this latent variable and its causes through a model of structural form. This structural form defines the relationship between the unobservable variable and a number of observable variables. The observable variables are the indicators and causes of the latent one, so of the shadow economy.

This model is considered to be one of the most efficient because compared to the other ones such as the direct and indirect approaches, it takes into account the determinants of the black economy (causes), and the actual effects of these determinants on the phenomena (indicators).

1.5 Development and size of the shadow economy over time:

In the last twenty years, the growth of the shadow economy has become one of the major concerns all around the world, increasing the attention of lawmakers, social experts and officials.

As we know, there have been encountered many difficulties in the calculation of the size of the shadow economy, and until now there is still no precise estimation of the actual magnitude of it, since there are different estimation methods in each country.

Friedrich Schneider has developed a study on the size and the growth of the shadow economy of thirty-one European and five other OECD countries in a range of time that goes from 2003 to 2013.

“If we compare the average of 31 European countries, in 2003 the size of the underground economy was 22.4% of the GDP, decreased to 19.4% in 2008, increased to 19.9% in 2009 and decreased again to 18.5% in 2013. If we consider the development

of the shadow economy in Australia, Canada, Japan, New Zealand and the USA, we find a similar movement over time”³.

Schneider’s findings showed that the size of informal economies between 2012 and 2013, compared to the average size between 2008 and 2009, had decreased a lot both in capacity and in growth. This is assumed to be caused by the recovery of economies all around the world from the financial and economic crisis.

From these studies, it has been proved that the most important reason for the slowdown of the underground economy is the booming or recovery of the formal economy, since people have less incentives to earn extra illegal money.

So, the breadth of the underground economy relies on the future evolution of the global financial crisis. We have seen that during the crisis, the proportion of this kind of economy becomes very big, since it functions as an “economic buffer” that offsets the unfavorable consequences of the crisis.

1.6 Monetary Policy

1.7 Monetary policy definition

Monetary policy, is that part of macroeconomics that consists of the Central Banks trying to reach two or more macroeconomic goals through the impact they have on the monetary and financial conditions. The primary goals that are discussed are usually: price stability, and unemployment followed by other important objectives such as financial stability.

The Central Bank does this through the management of actions that regulate the size and the expansion of the money supply, which as a consequence also have an impact on the interest rates. These actions could be: adjusting the interest rates, buying or selling government bonds, or changing the amount of money that banks are obliged to keep (bank reserves).

³ Schneider, F. (2010). *Size and Development of the Shadow Economy of 31 European and 5 other OECD Countries from 2003 to 2015: Different Developments*. [online] Econ.jku.at.

Monetary policy focuses on decisions that are enacted by a country's monetary authority, whether it is the Central Bank or the currency board, in order to influence the cost and availability of money in an economy. It manages the cost of short-term borrowing or it controls the "monetary base", often setting a "target inflation rate" or a "target interest rate" in order to guarantee steadiness of prices and reliance on the currency. Other objectives of the monetary policy are to lead to the solidity of the GDP (Gross Domestic Product), reach and sustain a low amount of unemployment workers, and to preserve expected exchange rates with different currencies.

There are two different kinds of monetary policies that can be implemented: an expansionary one in the case in which the economy needs to be stimulated, and a contractionary one when the economy needs to be slowed down a little.

1.7.1 Monetary policy expansion

Monetary policy expansion is a method which is taken into consideration when the Central Banks wants to stimulate and reactivate the economy during a contractionary phase of the business cycle. The effects of an expansionary monetary policy implemented by the central bank, are the increase in the money supply, the decrease in the interest rates, and an increase in the aggregate demand. This in turn has an effect on the Gross Domestic Product (GDP), which increases as well. This type of monetary policy also has an effect on the value of the currency, causing a depreciation which in turn has a dampening effect on the exchange rate.

1.7.2 Monetary policy contraction:

The contractionary monetary policy, also called restrictive monetary policy, has on the other hand the opposite effect. It is in fact designed to fight distortions such as high inflation that comes from the enlargement of the money supply. At the beginning, the effect of this kind of monetary policy may result with a decrease in the Gross Domestic Product (GDP), but the finished result provides a higher growth of the economy and a smoother business cycle.

Monetary policy restrictions need to be put in act very carefully because if not done so, they might result into an economic recession.

1.8 Monetary policy tools

The Central Bank affects interest rates by the expansion or contraction of the currency which circulates in the economy (monetary base) and the amount of money that is obliged to keep as reserve from the deposits it receives.

In order to achieve its targets, and to make a correct implementation of the monetary policies, the central bank makes use of the MP tools. These instruments are divided into:

- conventional monetary policy tools: such as Open Market Operations (OMOs), Standing Facilities and Required Reserves
- unconventional monetary policy tools: such as Quantitative Easing (QE), Negative Interest Rates and Forward guidance

Usually the conventional tools, which are aimed at changing the monetary base and the interest rates are sufficient for finding an equilibrium in the economy, but when the financial conditions are really bad these don't seem to work. The reasons why these instruments are not a solution in extreme cases are because the financial system breaks up to a level that it becomes incapable of using capital productively, and because sometimes the collapse in the economy can lead to a "zero-lower-bound problem". This kind of problem occurs when the Central Bank is powerless in front of reducing the policy interest rates since they have already reached zero.

When this occurs, the Central Bank turns to tools that don't need interest rates: unconventional monetary policy tools.

1.8.1 Open Market operations (OMOs)

OMOs are the most commonly used tool of monetary policies, and they are put in act by the Central Bank in order to increase the amount of liquidity that banks have at hand and to have an impact on the money market interest rates.

These kinds of conventional monetary policy tools play a very important role in guiding interest rates, controlling the liquidity situation in the market and signaling the monetary policy stance.

Open Market operations can be of two types: defensive open market operations and dynamic open market operations. The defensive one's aim is to cancel out shifts in other factors that influence the monetary base and the reserves; the Dynamic open market operations on the other hand are meant to directly change the level of the monetary base and of the reserves.

To enact an open market operation, the Central Bank buys or sells securities from the banks, according to what kind of policy it wants to implement.

In the US, when the Federal Reserve buys the securities it usually engages in a repurchase agreement, which is a purchase with the promise of the seller to rebuy them after a predefined time lag. While when it sells the securities it usually does so through a reverse repurchase agreement, with the promise to sell the back to the Central bank later on.

When the Central Bank wants to apply a monetary policy expansion it buys the securities, from the banks, simultaneously increasing the amount of bank reserves and of deposits in the banking system. This increase in the reserves provides more money to lend, so it increases the loan supply as well.

Essentially, the purchase of bonds increases the amount of reserves because the Central banks pay for those bonds with the reserves. Simultaneously, since the monetary base is composed by the currency plus the banks reserves, it will increase by the same amount reserves do. At the same time, an expansionary open market operation will make the money supply rise, due to the increase in the bank deposits.

To summarize: an expansionary open market operation increases the reserves and the bank deposits which in turn increase the money supply and monetary base.

When instead, it wants to apply a monetary policy restriction, it sells the securities to the banks, decreasing the size of bank reserves. This leads to a reduction in the loan supply, in the monetary base and in the money supply.

For what regards the effects of this kind of tool on the money market rates, we see that there is a fall in them in the case of monetary policy expansion, and an increase in the case of monetary policy restriction.

Open Market operations can be divided into four kinds, differing in terms of objective, form and precision:

- Main Refinancing Operations (MROs): one-week liquidity provisions which consist of buying or selling eligible assets “under repurchase or credit operations against eligible assets as collateral”
- Longer-Term Refinancing Operations (LTROs): liquidity provisions like MROs that usually have a maturity of 3 months
- Fine Tuning Operations (FTOs): have no-standardized maturity in order to smoothen the effects of unexpected fluctuations in liquidity
- Structural Operations (SOs): outright purchases and sale of assets, issuance of ECB debt certificates and FOREX swaps

1.8.2. Standing Facilities

Standing Facilities are kinds of MP tools whose main objective is to take or provide overnight liquidity, signal the monetary policy stance and to restrict overnight interest rates.

They are divided into:

- Marginal Lending Facility (MR): are used to obtain overnight liquidity from the National Central Banks against the qualified assets.
- Marginal Deposit Facility (MD): are used to make overnight deposits of liquidity with the National Central Banks

It mainly consists of the national central banks making a loan to banking institutions, which borrow these “overnight loans” at a “marginal lending rate”. An additional type of standing facility is the deposit facility, where depository institutions receive a payment of a fixed interest rate.

The marginal lending rate works as a ceiling in the corridor of “overnight market interest rates” in the European Monetary Union, while the depository interest rate acts as a floor.

1.8.3 Reserve Requirements (RRE)

RRE refer to the amount of money that banks must hold, either in the form of vault cash or deposit, as a shield against its deposit liabilities. Modifying the reserve requirement influences their demand: a rise in the requirement means that depository institutions must hold more money as reserves, a reduction of it means that it must hold a lower amount.

Changes in these requirements are meant to affect directly the money multiplier, and *ceteris paribus* also the money supply.

The aim of the minimum reserve requirements is to reach objectives stabilizing money market interest rates and creating structural liquidity shortage.

A low rate of RRE implies that there are more loans to make from their deposits, so it consists of an expansionary monetary policy since it creates credit.

On the other hand, a high rate of RRE is contractionary, since it implies that there is less money that can be lent out.

This type of monetary policy tool is the less common one, because it can create troubles of liquidity for those depository institutions that have a small amount of excess reserves. Also, constantly changing requirements for reserves may affect the credibility of banks and make the administration of liquidity harder.

1.8.4 Discount rate (DIS)

The discount rate, is an interest rate that suited depository institutions have to pay in order to borrow short-term funds from the Central Banks which normally discount the securities in their possession.

1.8.5 Quantitative easing (QE)

Unconventional MP tools were introduced as a response to the crisis, which caused a sharp drop in the GDP and inflation, since conventional ones didn't seem to be working well; and as time passes, they are becoming more and more common.

Quantitative easing is the most common one, and it consists on the purchase of varying assets like asset-based securities, covered bonds, and government securities bought in the secondary markets. The purchase of these kinds of assets lowers the interest rates for specific kinds of credit, and it leads to an increase of the balance sheet of the Central Bank and in the monetary base.

Its aim is to break the liquidity trap in order to provide liquidity not only to banks but also to the financial markets and non-monetary financial intermediaries.

1.9 Monetary Policy Strategies

As we have already said, the main objective of the Central Banks all around the world is the achievement of price stability, also defined as low and stable inflation. This is considered to be the most important issue because a high percentage of inflation causes the economy to become uncertain, negatively affecting its growth.

Even though price stability is the priority for most Central Banks there are also other goals which need to be taken in consideration: a low unemployment rate, economic growth, financial stability, interest rate stability and stability Forex markets.

In order to achieve these goals, there are different monetary policy strategies which are implemented according to the objective that needs to be reached.

1.9.1 Inflation Targeting

The belief that price stability shall be the main goal of the monetary policy, brought to a monetary strategy called inflation targeting. Inflation targeting consists of the “public announcement of medium-term numerical targets for inflation, as an information inclusive approach that increases transparency by communicating with the public and the markets about the plans and objectives of policy makers”. According to this strategy, the Central Bank defines a specific objective of inflation rate and tries to

maintain the actual level of inflation around that target. Moreover, the Central Bank is committed to the public to increase transparency in order to reduce uncertainty on the execution of the monetary policy strategy.

1.9.2 Monetary Targeting

Another type of monetary policy strategy is the monetary targeting one. According to this strategy, for the Central Bank to maintain a low level of inflation rate it must have a good control of the monetary aggregates. Differently from the inflationary targeting one, it does not provide with a public announcement of the Central Bank. The latter should in fact focus only on its intervention on the monetary aggregates. Usually the Central banks decides the interest rates to manage the monetary aggregates, since they are the main components of inflation. The theory behind the monetary targeting strategy is the: “quantity theory of money” described by the equation $MV = PY$, where M is the money supply, V is the velocity of the circulation of money, P is the level of prices and Y is the aggregate output.

1.10 RELATIONSHIP BETWEEN SHADOW ECONOMY AND MONETARY POLICY

1.11 Effects of the Shadow Economy on Macroeconomic Variables

It has always been a major concern whether the growth of the underground economy was having a positive or negative effect on the real economy, and there are many theories developed by economists that support both options.

What has been proved for sure is that the presence of the underground economy creates big threatening implications for the: appropriate analysis of the macroeconomic variables, the pursuance of economic policies and for the correct functioning of the economy.

1.11.1 Unemployment Rate

For what regards the calculation of the macroeconomic variables, the one which is directly affected by the existence of this phenomena is the unemployment rate. Indeed,

the data on the amount of workers committed to the economy only includes those employees that take part of legal economic activities, and not those one that work in the informal sector. Moreover, there is a big percentage of the population that is considered unemployed in the official statistics but that is actually working, which causes the unemployment rate to be less accurate.

1.11.2 Inflation Rate

Some economists have argued that another macroeconomic variable that is affected by the phenomena of the black economy is the inflation rate. This estimate is considered to be overstated since the prices in the shadow economy are expected to be growing at a rate that is lower than the one in the official economy. This event also explains the incentive that people have to move from the formal to the informal zone, especially in those sectors where the two economies are in competition.

1.11.3 Other macroeconomic variables

Apart from these two very important variables for the stability of an economy, which are also considered to be the main objectives to be reached by central banks all over the world, other consequences of the informal sector on the macroeconomic component of a country's economy are:

- the wrong measure of the real growth rate of the economy
- the twisted data on the population's distribution of income and on the incidence of taxes
- the exaggerated calculation of the magnitude of the public sector either measured as a proportion of expenses or of taxes to the GNP

1.12 Effects of these distortions on Monetary Policies

As we know, most of the time, economic policies are implemented as a response to the alarms that come from these indicators and in order adjust the macro-economic conditions of a country. The miscalculation of these variables due to the persistence of

the shadow economy, may lead to the wrong pursuance of these policies, who's implementation may cause more harm than benefits.

If for example the unemployment rate is biased upwards, meaning that there are more employed workers than the economy calculates, policy makers may put in act policies that might be too expansionary with respect to what the economy really needs, increasing inflation.

Due to all these distortions in the actual indexing clauses and in the expectations on inflation, the effects of the latter will aggravate.

These effects could be increased if the monetary authorities, take action expanding the money supply based on the rate of change of the consumer index. In this way, they will try to fix a rate of inflation that is higher than the actual one, expanding the money supply at a faster speed than needed.

Therefore, policy makers need to be very careful in considering that under a continuously increasing shadow economy, due to its distorting effects on the official indicators, the efficiency of the intended policy measures may be questionable.

2.0 ANALYZING THE CASES

This hypothesis is based on the theory that the higher the percentage of the shadow sector in a country's economy, the less reliable the values of the official statistics of that country. This whole process has in turn a negative effect on the Central Banks, making their jobs more difficult and altering the efficiency of the implemented monetary policies.

One of the biggest consequences that the presence of the underground economy has on a country, is the alteration of its official indicators such as the inflation rate, the output gap, and the unemployment rate. As we know, the latter indexes are fundamental for Central Banks to maintain an equilibrium in the economy, and an inaccuracy of these indicators may lead to two negative effects: the diminishment in the efficiency of the monetary policies, and the increase in the probability of the Central Banks to put in act the monetary strategy which may not be the best one.

In those countries where the underground economy is particularly high, the estimation of the inflation rate might not be precise, so an inflationary targeting strategy might not be the best one. In fact, this strategy consists of the Central Bank setting an inflation target as primary objective and trying to keep the actual inflation constant around this value.

The implementation of this strategy, would imply to rely on indicators such as the inflation rate and the output gap, that are easily biased by the existence of the submerged economy, causing the Central Banks power to become null, or even worse, to have the opposite of the desired effect.

On the other hand, strategies such as monetary targeting and exchange rate targeting are more likely to move towards the aspired direction.

Monetary targeting consists in keeping a low inflation rate with the management of monetary aggregates. In this strategy, the Central Banks only exercise their power on the aggregates, which is of crucial importance since they are substantially more trustworthy than the other indicators.

In order to get a clear understanding of how these mechanisms take place, we will take into consideration three countries of different areas of the world: Australia, Colombia and South Korea.

These countries have been chosen expressly for their characteristics:

- medium sized economies
- each having their own currency
- their own monetary sovereignty
- that are open to trade

Another important factor that characterizes these three countries is the fact that all of them are inflation targeters, meaning that they all implement an inflationary monetary policy strategy.

We will now analyze the countries individually in order to see if there actually is evidence suggesting a possible negative relationship between the shadow economy,

the high volatility of inflation and of the output gap, and the low impact of the inflationary monetary policy regime implemented by the Central Bank.

Among these countries, it is important to know that:

- Colombia is the country with the highest percentage of shadow economy;
- Australia is the country with the lowest percentage of shadow economy;
- South Korea is the country with a medium sized percentage of shadow economy

2.1 Colombia:

Over the past twenty-six years, the shadow economy of Colombia has always been among the highest, with a percentage of around 33% of the official “gross domestic product” of the economy.

This phenomenon started around the 1970s, when the first calculations of a survey in Bogotá found that a minimum of 43% of the population was involved in these kinds of black activities. Since then, surveys were made frequently and they all resulted with very high estimations of around 40 to 60% of the official GDP.

Despite the Colombian government’s effort to manage the shadow activities, even nowadays, its size continues to grow.

There are three main causes for this phenomenon in Colombia: evasion of taxes, labor informality such as road vending, and its prosperous participation in the drugs and crime business. The latter two have in fact always existed in this country, occupying around 7% of Colombia’s GDP and 70% of its exports.

Turning to the volatility of the official indicators, not only the presence of the shadow economy is very high in Colombia, but also the volatility of the inflation and of the output gap are among the highest of the sample, being of the average of $\sigma_{\pi} = 1.11\%$ and $\sigma_{\text{output gap}} = 1.31\%$, in the period that goes from 2009 to 2017. This could represent a big obstacle for the well-functioning of an inflationary targeting strategy.

In fact, as far as monetary policy is concerned, the Bank of Colombia's strategy is an inflationary targeting one. Their aim is *“to maintain a low and stable inflation rate and to reach output growth in line with the potential capacity of the economy”*⁴. They want their accomplishments to be price stability and growth of the GDP and of the employment rate as much as possible.

Actions regarding the monetary policy are decided after a deep analysis of the ongoing status and expectations of the economy, and by looking at the inflation expectations compared to the target. Indeed, if the inflation differs from the target that has been set, the authorities will change their policy regulating their main tools.

Therefore, monetary policy's primary objective is to grant price stability and economic growth that increases the total welfare of the population. In fact, among the reasons why it is crucial for the Central Bank of Colombia to hold the inflation at a small number, we find that:

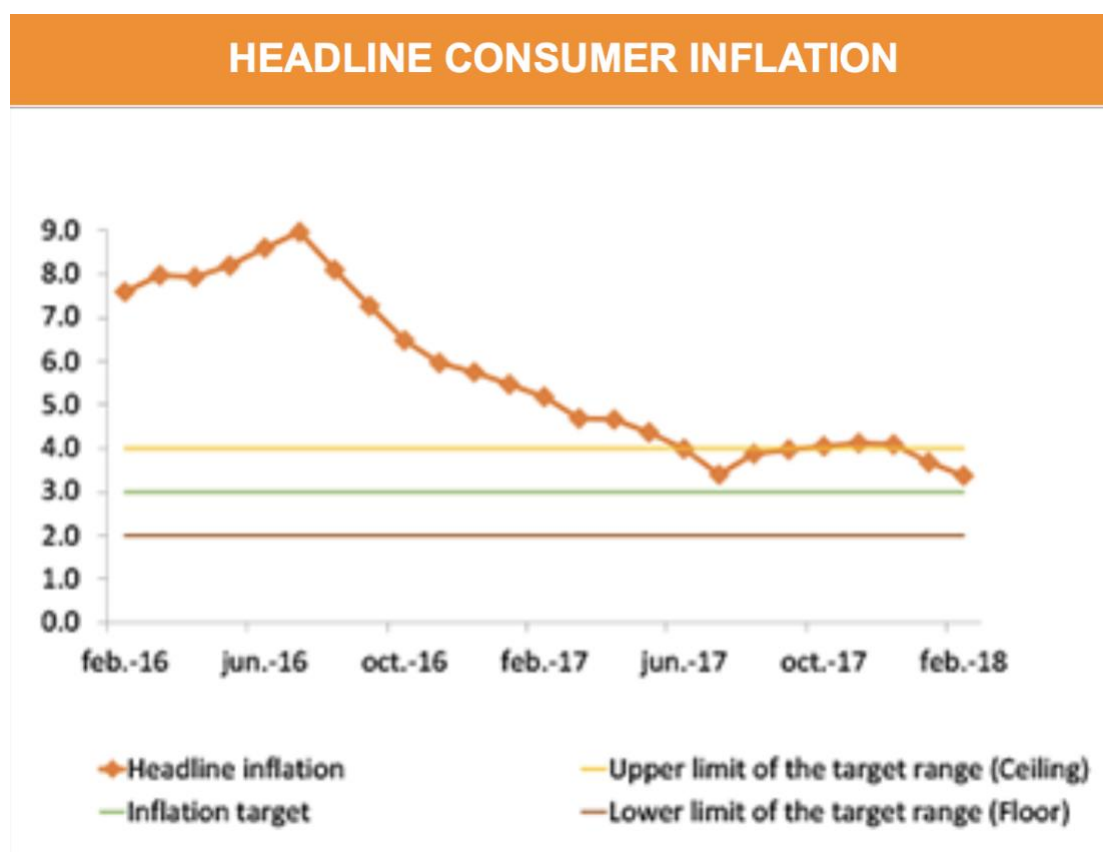
- “Low inflation promotes the efficient use of productive resources”⁴
- “Low inflation reduces uncertainty”⁴
- “Low inflation encourages investment”⁴
- “Low inflation avoids arbitrary redistributions of income and wealth, especially against the poorest people in the population”⁴.

In 2010, the Board of Directors of the Banco de la República (BDBR) established their inflation target, depending on the consumer price inflation, at an annual rate of 3.00%, admitting a margin of only 1.00% both in increase and decrease.

Their target has remained the same throughout the following years, but as we can see from Figure 3, in 2016 and the first half of 2017 they were not able to maintain their target inflation around the value they had set. The results were instead better in the second half of 2017.

⁴ *Banrep.gov.co. (2018). Banco de la República (banco central de Colombia). [Online]*

Figure 3: headline consumer inflation in Columbia in 2016-2017



Source: Banrep.gov.co. (2018). Banco de la República (banco central de Colombia).

In the figure, the orange dotted line represents the headline inflation, so the actual inflation between February 2016 and 2018. The green line represents the target inflation rate set by the Central Bank as monetary strategy in order to achieve its price stability; and the lines above and below represents the margins of an increase or decrease in the inflation target.

As we can see, the actual inflation at the beginning of 2016 did not comply with the target that the Central Bank had set, but actually exceeded it of a big amount: especially in June when it reached up to 9%, overrunning the aim of around 6%. From February 2017 on, it started slowing down, entering in the range of the inflation target.

It is very clear from the figure above that the volatility of inflation in this country is very high, fluctuating from values of 9.00% to 3.00% in just a few months of the period analyzed.

Other findings on the inflation rates of Colombia in the past 10 years show us that it has never been very steady, and that an important share of volatility has always been present.

Figure 4: % of Inflation rate in Columbia from 2008 to 2018



Source: It.tradingeconomics.com. (2018). Colombia - Inflation Rate

Moreover, from this figure we can deduct that the only period where the policy target was more or less met, with an inflation rate around 3.00%, was from 2010 to 2014. Before and after these years, it has always been higher, returning in the range in 2017.

2.2 Australia:

The Australian economy has always been considered as one of the most advanced, and among the biggest in the mix markets of the world.

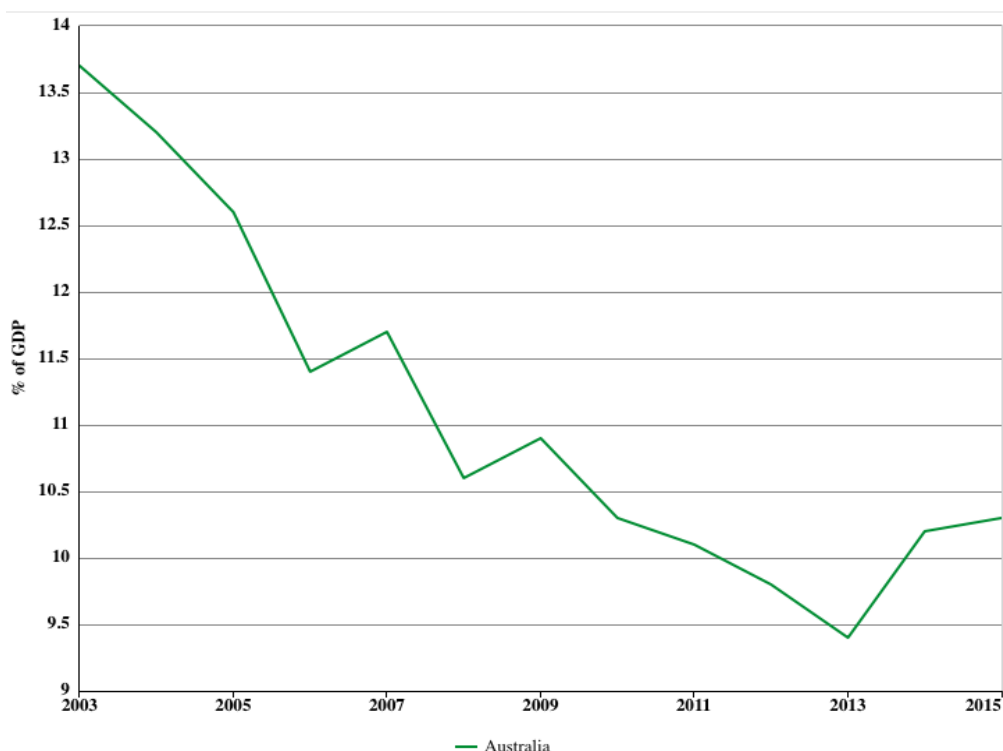
In the last two decades, the Australian growth rate continues to register results higher than all the other OECD countries. In fact, data from FMI shows evidence about a percentage of GDP ranked at the fifth place in the whole world.

Australia is one of the countries that has less suffered from the world crisis of the last years, being considered the second nation with the highest wealth. Also, it achieved the longest “gross domestic product” development with no interruptions in March 2017, celebrating twenty-six years without an economic recession.

Among the countries that we are analyzing, Australia is the one with the lowest percentage of shadow economy, considering its amount of 12.06% relative to Colombia’s one which is of 33%. If we look at the trend that this phenomenon has followed in Australia during the years, we can notice that it has always been this low, following more or less always the same decreasing pattern.

Figure 5 shows us the path that this country’s shadow economy has followed from 2003 to 2015.

Figure 5: Size of Australia’s shadow economy as a % of the GDP in the period that goes from 2003-2015



Source : Knoema. (2018). *Size and Development of the Shadow Economy of 31 European and 5 other OECD Countries from 2003 to 2015* - knoema.com.

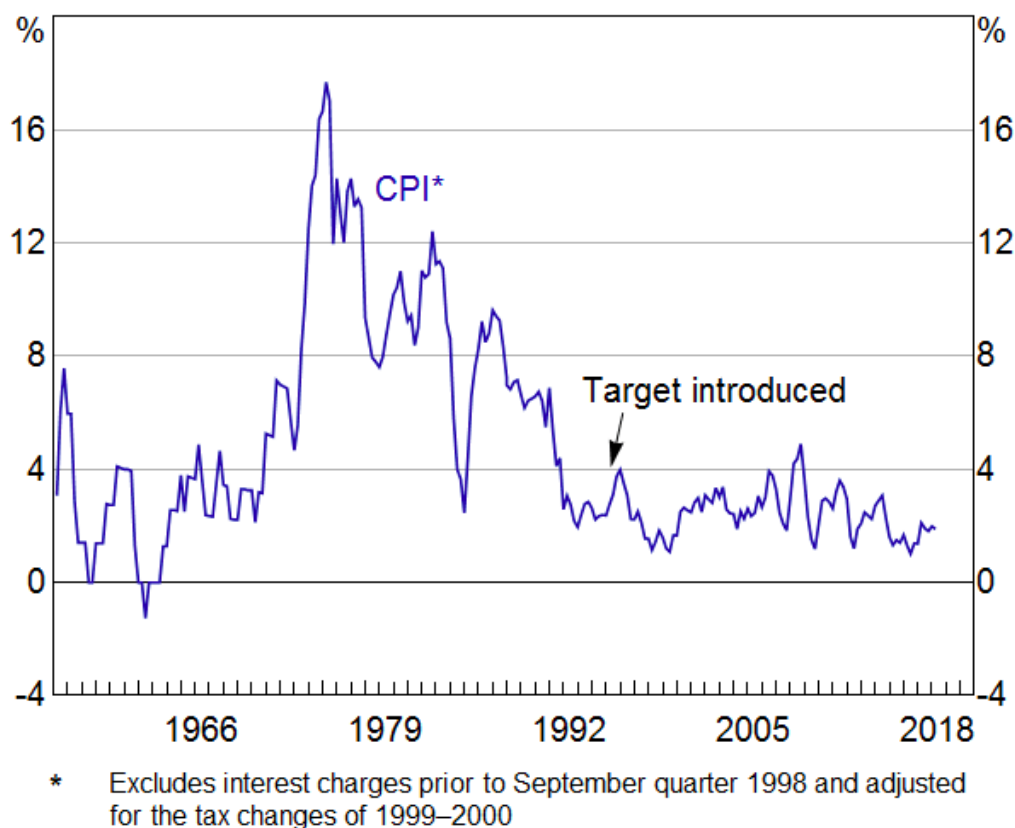
As we can see from the graph above, the component of shadow economy in this country has always been very low and throughout the years it has generally followed a decreasing pattern. This factor distinguishes Australia from the other countries we are analyzing.

As far as monetary policy is concerned, Australia is also an inflation targeter. It's central bank "*has the duty to maintain price stability, full employment, and the economic prosperity and welfare of the Australian people*"⁵. In order to accomplish these important goals, the Governor and Treasurer of the Reserve Bank of Australia have set an inflation target of around 2-3% over the medium run. According to them, keeping a well-managed inflation around this value is the solution to achieve a continuous growth of the economy in the longer term.

Figure 6 displays the inflation in Australia over the long run, showing the big difference between the trend that the inflation rate followed before and after the Reserve Bank enacted the inflationary targeting strategy.

⁵ 2018-14, M. (2018). Reserve Bank of Australia. [online] Reserve Bank of Australia

Figure 6: Inflation rate's evolution in Australia over time



Source: Reserve Bank of Australia. (2018). *Inflation Target* / RBA [online]

This graph shows that the inflation targeting strategy in Australia was implemented around the early 1990s, and that before those years the inflation rate experienced huge fluctuations, going from a negative sign up to more than 16%. Moreover, after the target was set at around 2-3%, it is evident from the graph that the monetary policy had a dampening effect on the variations and that the inflation rate stayed constant around the target.

Unsurprisingly, the efficiency of the monetary policy regime in this country is a lot higher than in a country like Colombia, where the shadow economy represents a much bigger component of the economy.

2.3 South Korea:

Until now, we have analyzed one of the countries with the highest size of underground economy (Colombia) and one of the countries with the lowest one (Australia). In order to complete our analysis, we will now turn to South Korea which has a medium-sized underground economy.

South Korea is a country which has experienced a growth of the economy in the last four decades. In 1960's its Gross Domestic Product was of the same degree of some of the most underprivileged countries of Africa. It was subject to a high level of economic instability after the crisis in Asia in 1997-1998, and in the following 10 years the economy of this country grew of about 4% annually, until it was stroked by the worldwide economic fall in 2008.

In the years that go from 2012 to 2016 the economic expansion decelerated, and among the various reasons, the high presence of unemployment rate in this area of the world is certainly an important one.

As far as the monetary policy is concerned, the Central Bank of Korea's aim is *“to contribute to the sound development of the national economy by pursuing price stability through the formulation and implementation of efficient monetary policy”*⁶. Their major ambition is to maintain price stability because according to them if prices are unstable, the economy as a whole and its activities are damaged. But they also use policy measures in order to pay careful attention to the financial stability of the country.

The Bank of Korea's monetary policy regime adopted is also an inflation targeting one: agreeing with the Ministry of Strategy and Finance on a mid-term inflation target. The aim from 2016 forward has been set at around 2% as a calculation of the Consumer Price Index.

⁶ Bok.or.kr. (2018). *The Bank of Korea*. [online]

If the inflation exceeds the target by more than 0.5% both as an increase or a decrease for a period of time that goes beyond six months, the Central Bank will publish a report explaining the causes of the alteration and the variations to the monetary policy to be implemented in order to go back to the inflation target.

The current inflation target of 2% has a due date at the end of 2018; if needed, the Central Bank will negotiate with the Ministry for a new one to adjust it after this period.

Figure 7 will allow us to see if during the period that goes from 2016 to 2018, when the inflation target was implemented at 2.00%, inflation has actually been steady around this rate.

Figure 7: % of Inflation rate in South Korea from 2016-2018



Source: It.tradingeconomics.com. (2018). *South Korea - Inflation Rate*.

As shown in the figure above, when the inflation target was first introduced it did not stay constant at 2.00% but it actually assumed a lower value, going beyond the range of +/- 0.5%. But from the second half of 2016, the rate elevated and it remained constant around the desired target. It seems from the table that between the end of 2017 and the beginning of 2018 it begun to have another small downturn.

Once again, in this country where the size of the shadow economy is of a moderate size, we analyze fluctuations in the inflation rates over the period of two years since the inflation target has been set at a given value. So far, the fluctuations are not as big as the ones in Colombia, where the underground economy is extremely large, but this stability of South Korea still has to be confirmed in the long run, like in the case of Australia. In fact, in these last two countries, the reduction in the fluctuations have been significant since the target has been set, probably because the phenomenon of the underground economy is very small.

2.4 Comparing our results:

As we have discussed above, Australia Colombia and South Korea are all inflationary targeters, but as table 8 shows they are composed by different sizes of underground economies.

Table 8: Percentage of Average Shadow Economy in Country's GDP

Country	% of Shadow Economy
Australia	12.06
Columbia	33.31
South Korea	19.83

Source: IMF Working Paper – Shadow Economies Around the World

As we can see from the data above, an important element in the characterization of the countries we are analyzing is the big discrepancy among the sizes of their shadow economies. In fact, the difference between the country with the highest percentage of shadow economy in GDP (Columbia with 33.31%) and the one with the lowest percentage of shadow economy in the GDP (Australia with 12.06%) is of the considerable amount of 21.25%.

The fluctuations in the sizes of the underground economies of the different countries is crucial in order to analyze the distinct situations and effects that this phenomenon has on the different economies all over the world.

Our hypothesis is based on the idea that the presence of a higher percentage of underground economy causes those indicators such as the inflation rate and the output gap, which are crucial for the correct implementation of a monetary policy, to be less accurate. According to our theory, we would expect a country that has a higher underground economy like Colombia to have a greater volatility of inflation and of the output gap, compared to a country that has a lower percentage of underground economy such as Australia.

In order to confirm our hypothesis, we are going to calculate the inflation and output gap volatilities of the three countries through a time series analysis: a method for analyzing data in different time intervals to draw out important characteristics. Afterwards we are going to compare the volatilities of Australia, Colombia and South Korea in the same time periods, in order to see whether it moves parallelly with the underground economy.

The volatilities of inflation and of the output gap are calculated by applying the formula of the standard deviation on the annual inflation rates and output gap rates of a specific range of time. The formula for the standard deviation is:

$$\sigma = \sqrt{\frac{1}{N} \sum_{i=1}^N (x_i - \bar{x})^2}$$

Where:

- σ is the standard deviation,
- x_i is each value of the data set;
- \bar{x} is the mean of the data set
- n is the total number of data points

Going back to our sample of countries, the tables below display the calculated percentages of inflation volatilities in Australia, Colombia and South Korea during the period of time that goes from 2009 to 2017 as a time series of three years.

Table 9: Percentage of Inflation Volatility in Australia from 2009 to 2017 divided in time series of 3 years each

Time	σ_{π}
2009-2011	0.78
2012-2014	0.46
2015-2017	0.36

Source: Knoema. (2018). *Australia Inflation rate, 2009-2017* - knoema.com. [online]

Table 10: Percentage of Inflation Volatility in South Korea from 2009 to 2017 divided in time series of 3 years each

Time	σ_{π}
2009-2011	0.71
2012-2014	0.52
2015-2017	0.67

Source: Media, T. (2018). *Inflation South Korea 2018 – CPI inflation South Korea 2018*. [online] [Inflation.eu](http://inflation.eu).

Table 11: Percentage of Inflation Volatility in Colombia from 2009 to 2017 divided in time series of 3 years each

Time	σ_{π}
2009-2011	1
2012-2014	0.63
2015-2017	1.70

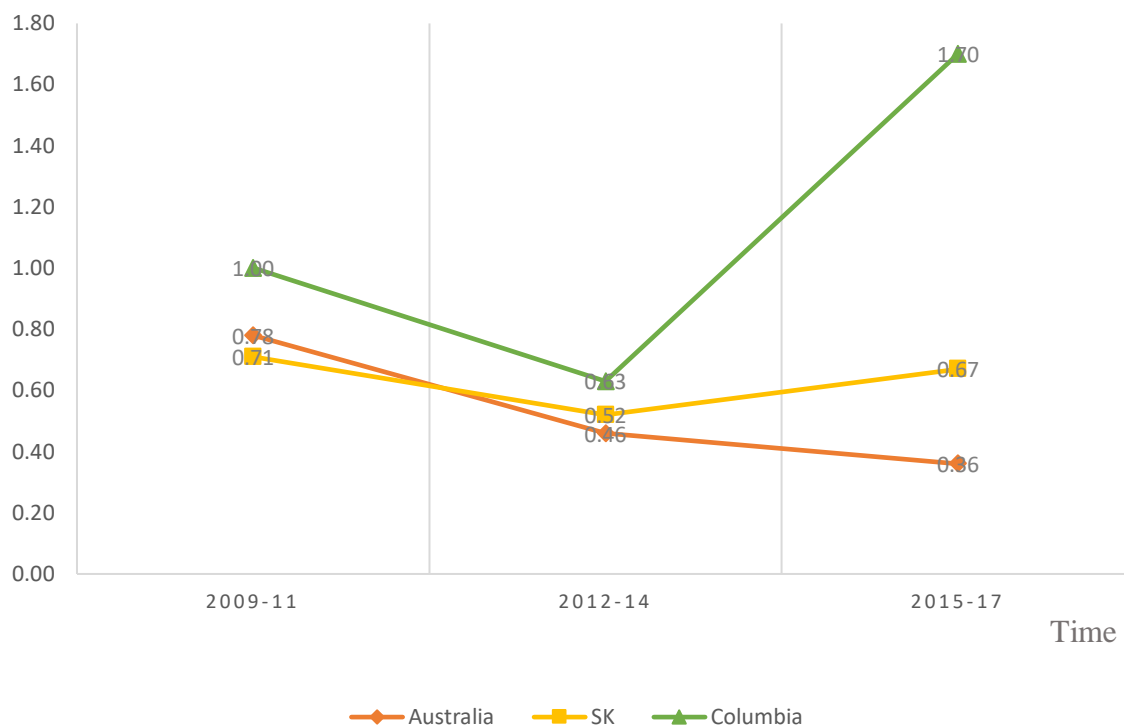
Source: Knoema. (2018). *Colombia Inflation rate, 2009-2017 - knoema.com*. [online]

As we can denote from the tables above, there actually seem to be a correlation between the volatility of inflation and the underground economy, which tend to move parallelly. Unsurprisingly, Colombia is the country with the highest amount of shadow economy (33.31% of the GDP) and is also the one with the highest volatility in the inflation rate among the time series (1%, 0.63% and 1.70%). Similarly, a country like Australia, where the shadow economy tends to be very small, also reaches very small values of inflation volatility.

This suggests that the phenomenon of the underground economy may actually have a negative effect on the official indicators such as the inflation rate, making them less accurate and more volatile.

This can be shown in Graph 12, which allows us to give a general look at the patterns that the inflation volatilities of the three countries, composed by different size of underground economy, are following over the same time periods.

Graph 12: Volatilities of Inflation Rate in the three countries as a time series from 2009 to 2017



As we can see, the green line represents Colombia's inflation volatility over time, the yellow one represents South Korea's and the Orange one Australia's. Just as we expected, the graph confirms that Colombia's trend is above all the other ones because it has the highest volatility of inflation, which may be due to the fact that it is the country with the highest shadow economy among the three. The opposite occurs for Australia, which is the country with the lowest percentage of underground economy, whose inflation volatility represents the floor of the three lines. Finally, we can note that South Korea's inflation volatility assumes an intermediate position, due to its medium sized underground economy.

2.4.1 Output Gap:

Another estimator which is crucial for gathering a better understanding of our study is the output gap.

As we already know, monetary policies are aimed at keeping a “close to the ground” and constant inflation, but there are various factors influencing the inflation rates in the future. The output gap is one of these indicators and it represents the extent to which the real amount of output in an economy differs from the potential one. It is also used as an estimate for the “volatility of activity in the economy, whether resources are alternating quickly between periods of substantial resource strains to periods of resource slack, or whether the economy is moving smoothly”⁷¹.

The tables below will show us the percentages of output volatility in the three countries of our subject, for the period of time that goes from 2009 to 2017, as a time series of 3 years.

Table 13: Percentage of Output Gap Volatility in Australia from 2009 to 2017 divided in time series of 3 years each

Time	$\sigma_{\text{output gap}}$
2009-2011	0.34
2012-2014	0.43
2015-2017	0.15

Source:

http://www.economywatch.com/economicstatistics/Australia/Output_Gap_Percent_of_Potential_GDP/

⁷¹ Citu, F. and Twaddle, J. (2018). The output gap and its role in monetary policy decision making. [online] Rbnz.govt.nz. Available at: <https://www.rbnz.govt.nz/-/media/ReserveBank/Files/Publications/Bulletins/2003/2003mar66-1citutwaddle.pdf>

Table 14: Percentage of Output Gap Volatility in South Korea from 2009 to 2017 divided in time series of 3 years each

Time	$\sigma_{\text{output gap}}$
2009-2011	1.62
2012-2014	0.36
2015-2017	0.84

Source: Economywatch.com. (2018). *Korea Output Gap, Percent of Potential GDP data, Output Gap, Percent of Potential GDP Korea*. [online]

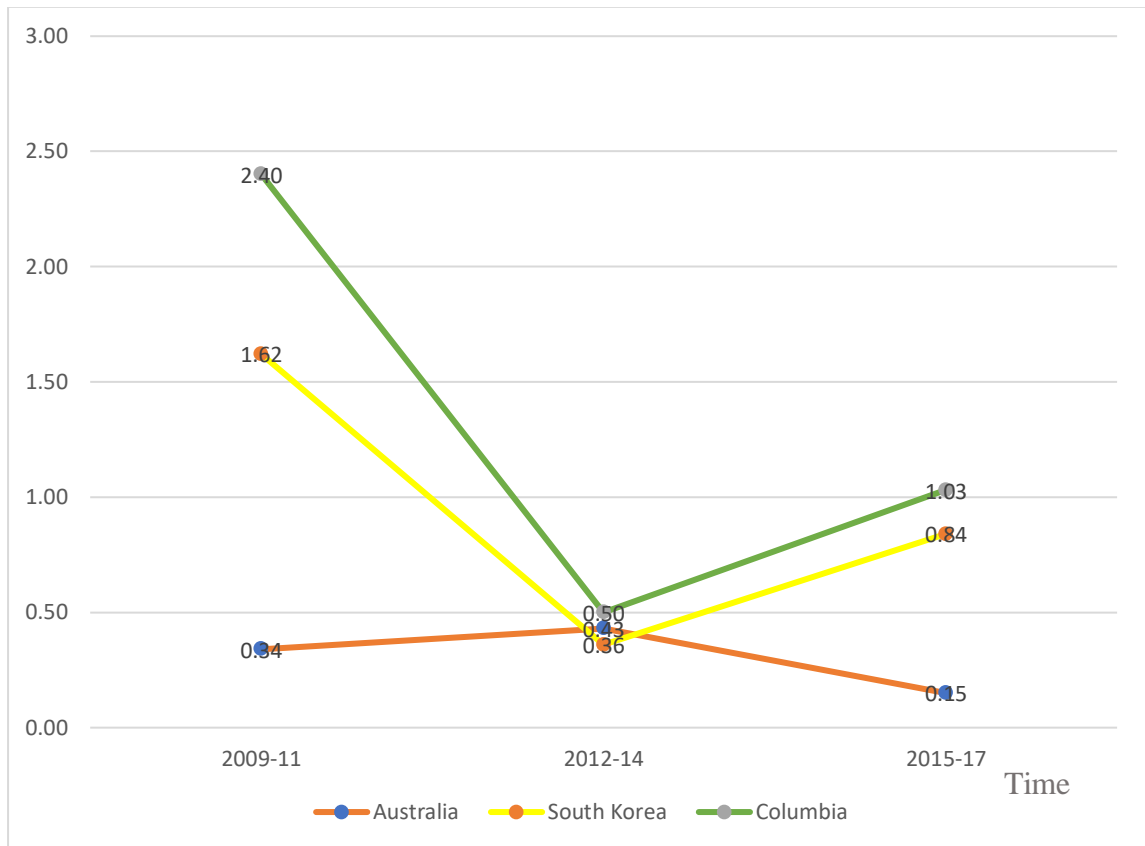
Table 15: Percentage of Output Gap Volatility in Colombia from 2009 to 2017 divided in time series of 3 years each

Time	$\sigma_{\text{output gap}}$
2009-2011	2.4
2012-2014	0.50
2015-2017	1.03

Source: IMF working paper – potential growth of Colombia by Sergi Lanau, José Daniel Rodríguez-Delgado, and Jorge Roldós

As the tables above tell us, the same relationship that rises among the volatility of inflation and the underground economy, seems to occur for the volatility of the output gap. In fact, Colombia still seems to be the one with the highest volatility, which may be due to its high component of underground economy, while Australia still seems to be the one with the lowest, thanks to its low underground sector. This relationship is confirmed in graph 16, which allows us to see the patterns that the volatilities for these three countries follow.

Graph 16: Volatilities of the Output Gap in the three countries as a time series from 2009 to 2017



Once again, Colombia's volatility for what regards the output gap estimator is shown to be the highest one of the three, South Korea is in the middle and Australia is the lowest one. In conclusion, the volatilities follow the same trend of the country's underground economies.

Conclusions:

The objective of this thesis was to see whether there exists any kind of evidence determining the presence of a relationship between the size of the underground economy in a general country and the efficiency of the monetary policies that are enacted by the monetary authorities.

We first took a look at the theoretical definition of the two phenomena that are at the basis of our work: the underground economy and the monetary policies.

Through the analysis of the various causes and mechanisms of the latter, our hypothesis was based on the idea that the underground economy might have an altering effect on the official indicators of a country's economy such as the inflation rate and the output gap. These are generally the indicators that are used by the monetary authorities to evaluate the status of the economy and the selection of the right monetary policy.

As a consequence, the indicators which are less reliable due to the influence of the underground economy, might provide wrong signals to the Central Banks inducing them to implement less effective monetary policy strategies.

In order to see if our hypothesis was correct, we made a deep analysis taking into consideration a sample of three countries from different areas of the world having specific characteristics: their own monetary sovereignty, their own currency and of medium size. The only main economic difference that characterized these countries is the distinct size of underground economy, which varied from country to country. Furthermore, all of these countries' monetary regime is an inflationary targeting one, based on the setting of an inflation goal around a specific number and trying to maintain it at that level.

We analyzed each country's volatility of inflation and of the output gap, the two major indicators used for the monetary policy implementation, in the years that go from 2009 to 2017 as a time series of three years. Afterwards, we compared them among the different countries.

As we can see from our scrutiny, it has been proved that those countries with the highest shadow economy such as Colombia seem to have more problems keeping their inflation target constant at the value that they decided, experiencing more inflation volatility rather than those countries where the phenomenon is less perceived. The same relationship can be noted from our studies for what regards the output gap: the country with the highest underground economy shows the greater amount of volatility in output gap.

These conclusions need further research, also due to the possible presence of many other confounding factors which may influence our analysis.

REFERENCES:

Blanchard, O., Amighini, A. and Giavazzi, F. (n.d.). *Macroeconomics*. 2nd ed.

Mishkin, F. and Eakins, S. (n.d.). *Financial Markets and Institutions, Global Edition*. 8th ed.

Tanzi, V. (1982). *The Underground economy in the United States and abroad*. Lexington, Mass.: Lexington Books.

Ahiabu, S. (2018). *Inflation and the Underground Economy**. [online] Homes.chass.utoronto.ca. Available at: <http://homes.chass.utoronto.ca/~sahiabu/research/moneyunderground.pdf>

Bank, E. (2018). Instruments. [online] European Central Bank. Available at: <https://www.ecb.europa.eu/mopo/implement/html/index.en.html>

Banrep.gov.co. (2018). Banco de la República (banco central de Colombia). [online] Available at: <http://www.banrep.gov.co>

Bok.or.kr. (2018). The Bank of Korea. [online] Available at: <http://www.bok.or.kr/eng/main/main.do>

Citu, F. and Twaddle, J. (2018). *The output gap and its role in monetary policy decision making*. [online] Rbnz.govt.nz. Available at: <https://www.rbnz.govt.nz/-/media/ReserveBank/Files/Publications/Bulletins/2003/2003mar66-1citutwaddle.pdf>

Economywatch.com. (2018). *Korea Output Gap, Percent of Potential GDP data, Output Gap, Percent of Potential GDP Korea*. [online] Available at: http://www.economywatch.com/economic-statistics/Korea/Output_Gap_Percent_of_Potential_GDP/

Imf.org. (2018). Economic Issues No. 30 -- Hiding in the Shadows: The Growth of the Underground Economy. [online] Available at:

<https://www.imf.org/external/pubs/ft/issues/issues30/>

It.tradingeconomics.com. (2018). *Colombia - Inflation Rate*. [online] Available at:

<https://it.tradingeconomics.com/colombia/inflation-cpi>

It.tradingeconomics.com. (2018). *South Korea - Inflation Rate*. [online] Available at:

<https://it.tradingeconomics.com/south-korea/inflation-cpi>

Knoema. (2018). *Size and Development of the Shadow Economy of 31 European and 5 other OECD Countries from 2003 to 2015 - knoema.com*. [online] Available at:

<https://knoema.com/SDSE2015/size-and-development-of-the-shadow-economy-of-31-european-and-5-other-oecd-countries-from-2003-to-20?tsId=1000360>

Quandl.com. (2018). Quandl. [online] Available at:

https://www.quandl.com/data/ODA/AUS_NGAP_NPGDP-Australia-Output-Gap-of-potential-GDP

Schneider F. (1994) Measuring the Size and Development of the Shadow Economy. Can the Causes be Found and the Obstacles be Overcome?. In: Brandstätter H., Güth W. (eds) *Essays on Economic Psychology*. Springer, Berlin, Heidelberg. Available at: https://link.springer.com/chapter/10.1007/978-3-642-48621-0_10

Schneider, F. (2010). *Size and Development of the Shadow Economy of 31 European and 5 other OECD Countries from 2003 to 2015: Different Developments*. [online]

Econ.jku.at. Available at:

<http://www.econ.jku.at/members/Schneider/files/publications/2015/ShadEcEurope31.pdf>

Shadow Economies All over the World: New Estimates for 162 Countries from 1999 to 2007. (2010). [PDF] Policy Research Working Papers. Available at: <https://openknowledge.worldbank.org/handle/10986/3928>

Shadow Economies Around the World: Size, Causes, and Consequences. (2000) [PDF] IMF Working Papers. Available at: <http://www.imf.org/en/Publications/WP/Issues/2016/12/30/Shadow-Economies-Around-the-World-Size-Causes-and-Consequences-3435>

Shadow Economies of 145 Countries all over the World: What do we really know?.(2005). <http://www.econ.jku.at/members/Schneider/files/publications/ShadEconomyWorld145.pdf>

Size and Development of the Shadow Economy of 31 European and 5 other OECD Countries from 2003 to 2013: A Further Decline. (2013). [PDF] Friedrich Schneider. Available at: http://www.econ.jku.at/members/schneider/files/publications/2013/shadeceurope31_jan2013.pdf

The Evolution of the Shadow Economy in Transition Countries: Consequences for Economic Growth and Donor Assistance. (2000). [PDF] Consulting Assistance on Economic Reform II. Available at: https://pdf.usaid.gov/pdf_docs/PNACK691.pdf

TheGlobalEconomy.com. (2018). Global economy, world economy | TheGlobalEconomy.com. [online] Available at: <https://www.theglobaleconomy.com>

2018-14, M. (2018). Reserve Bank of Australia. [online] Reserve Bank of Australia. Available at: <https://www.rba.gov.au>