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DISSERTATION

SHADOW ECONOMY AND THE PORTUGUESE SOCIAL SECURITY SYSTEM.

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Glossary

BBVA – Banco Bilbao Vizcaya Argentaria

CEGEA – Centro de Estudos de Gestão e Economia Aplicada

FEFSS – Fundo de Estabilização Financeira da Segurança Social

GDP – Gross Domestic Product

IGFSS – Instituto de Gestão Financeira da Segurança Social, I.P.

INE – Instituto Nacional de Estatística

ISS – Instituto da Segurança Social, I.P.

OECD – Organisation for Economic Co-operation and Development

PAYG – Pay-As-You-Go Pension Scheme

VAT – Value Added Tax

Abstract

Despite the existence of many studies regarding shadow economy, literature dedicated to study the relation between it and social security systems is almost inexistent, partly explained by the hard measurement of the former one and the uncertainty of its impact. Thus, this study intends to explore the relation between shadow economy and the Portuguese social security system, discussing what kind of influence they can have on each other and what consequences arise from it. Using data from 1983 to 2015, an econometric model that relates shadow economy size with social security expenditure was built. From this study, it was possible to conclude that there is statistical evidence to affirm that in Portugal, during this period, a growth of social security expenditure exerted a negative impact in the shadow economy size.

Resumo

Apesar da existência de diferentes estudos sobre a economia paralela, a literatura dedicada ao estudo da relação entre esta e os sistemas de segurança social é praticamente inexistente, o que pode ser, de certa forma, explicado pela sua difícil medição e incerteza do seu impacto. Como tal, este estudo pretende explorar a relação entre a economia paralela e o sistema de segurança social português, abordando as mútuas influências e as consequências que daí possam advir. Utilizando dados do período 1983-2015, foi construído um modelo econométrico que relaciona o tamanho da economia paralela com os gastos da segurança social. De acordo com este estudo foi possível concluir que existe evidência estatística para se poder afirmar que em Portugal, durante o período em análise, um aumento dos gastos da segurança social exerceu um impacto negativo no tamanho da economia paralela.

Classificação Jel: E26, H55, K42, O17.

Palavras-chave: economia paralela, segurança social, Portugal.

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This dissertation represents the end of a great two-year journey. The opportunity to study an issue I was really curious about and being able to do it as part of my Master degree was the culmination of a truly learning-enriching period.

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1. Introduction

Shadow economy is considered to be a phenomenon that is present in all economies, regardless of their development level, and remains as a major problem in terms of fiscal, economic and social reasons. Measuring the shadow economy proves to be a really challenging task, with a long list of studies using different methods to estimate its size and development, being quite difficult to judge their reliability since it does not exist any common methodology for estimating its dimension. In fact, Amendola & Dell'Anno (2010) give a special warning about the difficulty of measurement of this issue, stating that "empirical analysis of the shadow economy must be valued very carefully".

Besides that, the (un)sustainability of the Portuguese social security system has been more and more discussed in the last decades. The pension system has faced increasing financial challenges thanks to a combination of several economic, social and demographic factors such as unemployment, low fertility rates and an increase of the life expectancy, in economies that are increasingly exposed to globalization. Overcoming these adversities has been an effort for the major part of the developed economies like Portugal, with a mature social security system based on a model that is today considered by some authors as financially feasible (Rosa, 2013) while some others question its future sustainability (Bravo, 2016). However, one of the major nefarious factor to the social security systems is the shadow economy. Shadow economy, escaping labor regulations, is seen by many as a way of earning higher wages while providing employment to a sizable portion of the labor force, representing millions of contributions lost by the social security system, every year.

This paper will focus on the Portuguese case, and more specifically on the relation between shadow economy and the Portuguese social security system. Even though there are several studies regarding the effects of the shadow economy to the State revenue, they end up neglecting its effects on social security systems. Therefore, this study pretends to be an important contribution to fill an existent gap in the literature, regarding this issue.

The paper is organized as follows. Chapter 2 presents some of the literature review with some insights about the guiding principles of the Social Security Systems, with a historical perspective and a general overview about the Portuguese system, with a special emphasis on the system sustainability. Chapter 3 is dedicated to the shadow economy, in which is studied its definition, the reasons for its existence, its causes and consequences and possible mitigation solutions. Chapter 4 gives a theoretical resume about the relation between the two studied variables, while chapters 5 and 6 do it empirically, through an inferential statistical analysis and an econometric study. Finally, chapter 7 is dedicated to the conclusions taken about this study and suggestions for future research.

2. Social Security

2.1. Why do Social Security Systems exist?

The idea of social security and the protection against social risks like unemployment, illness or work accidents, was based on family structures and religious solidarity, which still subsist nowadays (Matias, 1999).

Matias (1999) considers that the first social assistance initiatives were the mobilization of resources seeking to help individuals with poor means of livelihood. These were put in practice in XVI Century, in England and France. Back in those days, "being protected" meant to be inserted in a certain territorial area or own land, and those who were more exposed to social insecurity factors could be supported by different institutions. Until XIX Century, the principle of property was basically the dominant way of being protected, since the individual who owned some sort of land was considered "socially protected". Along the years, the conceptualization of the social security system and its existence reasons suffered several changes. The principle of property started to be considered ineffective, as precarious jobs and unemployment started to rise, which Matias (1999) refers as problems that were not being solved by the mechanisms used until XIX Century, since they were only oriented to problems regarding work incapacity.

With the industrial revolution and the rise of salaried workers, Bismark imposed a social insurance program in Germany, in order to promote the well-being of German workers, increase their productivity and begin the construction of the welfare state concept as we know nowadays.

Arcanjo (1991) and Matias (1999) refer that the insufficiency regarding the mutualist sector associated with the expense of the private sector led individuals to become less protected or even excluded from any protective system against social risks.

Bismarck created the notion of *commutative social protection*, by State intervention. This concept was mainly focused on protecting personal income and was the decisive step that broke with the property principle. By this time, the worker started to contribute to a system that protected him instead of saving to become an owner of land or property (Matias, 1999). Throughout the years, the Bismarckian concept of social protection starts to be recognized as being too limited, since it only protected those who were employed instead of giving special concern to their social needs. With the need of an increased social protection, United Kingdom instituted a mandatory social insurance, in 1911, with what was known as "Nation Insurance Act". The British version was more extensive, even though it preserved the Bismarckian concept of social security. With this, the *distributive social protection* concept arises, by increasing public protection and risk sharing (Matias, 1999). In 1942, Beveridge wrote a report entitled "Social Security and Allied Services", also known as "Beveridge Report", in which he mentioned that a social security system should be projected to "create a better world and ensure all the individuals the satisfaction of their basic needs". In this report, Beveridge expressed three guiding principles. Arcanjo (1991) enumerates them with a brief explanation: the principle of universality, considering that all the individuals should be covered by some kind of protection, independently of their professional situation; the principle of integration, by which a uniform wage should be given in form of lump sum benefits; and the principle of unity, seeking the

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simplification of the benefit mechanisms and the management by a single institution.

Two reasons are appointed by Garcia (2013) as the main factors that explain the existence of a social security system nowadays: the first one is related to the paternalist role that the State adopts, given the fact that it considers itself as more informed and rational than the common citizen, who normally suffers from *myopia*[1]; the second one is the *distributive justice* aspect, seeking the maximization of the social welfare, which Arcanjo (1991) considers to be the main goal of this protection mechanism.

2.2.   Social Security in Portugal

In 1919, emerges the first attempt to create a mandatory social security system, intended to promote the public protection of employees who had low wages, by creating an entity intended to protect workers in case of illness, invalidity, unemployment, oldness and accidents. However, only in 1935, the foundations of the current social security system started to be built, even though the system coverage was still too limited. The incapacity of the system to deliver an adequate retirement income for the elderly led to the introduction of the pay-as-you-go (PAYG) financing method (Garcia, 2017).

Half of a century later, in 1984, the First Social Security Act was published (Law no. 28/84), creating a contributive and a non-contributive regime, and a social action scheme. The main goal of the contributive system was seeking the protection of the employees and their families in case of unemployment, illness, incapacity to work and the protection of the population in need, providing them

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[1] Myopia is referred by Garcia (2013) as the situation in which an individual ignores future events or, assuming their probable occurrence, do not give it due importance.

the required means of subsistence. While the non-contributive regime had the objective of protecting individuals who were not covered by the former one. Article 63 from the Constitution of Portugal establishes that the State is charged with organizing, coordinating and subsidizing a unified and decentralized social security system, with the participation of the trade unions, other organizations that represent workers and associations that represent the other beneficiaries. According to the same article, the social security system shall protect citizens in illness and old age and when they are disabled, widowed or orphaned, as well as when they are unemployed or in any other situation that entails a lack of or reduction in means of subsistence or the ability to work.

In 2000, the Second Social Security Act is published (Law no. 17/2000), renewing the right to the Social Security for everyone, by reinforcing the effectiveness, the efficiency and the financial sustainability of the system. The system started to be divided in 3 sub-systems: social protection; family protection; and welfare. It got revoked in 2002 (Law no. 32/2002), with no major changes. In 2007 was published the Forth Social Security Act (Law no. 4/2007), which is still in effect. It changed the composition of the system, with 3 divisions: citizenship social protection, social welfare and complementary. It also introduced the sustainability factor related to the increasing life expectancy, which was later aggravated in 2013 by the Decree-Law no. 167-E/2013 that also starts to take as reference the evolution of the average life expectancy at 65 years.

Portuguese Social Security is financed through contributions from employers and employees, and through government or other public entities' transfers. The non-contributive system is financed by government transfers, as is most of the social action (Welfens & Ryan, 2011).

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2.3. Pension systems in Portugal

Blake (2006) divides pension systems into two different schemes: an unfunded state scheme and a private funded pension scheme organized by the employer. The former one operates on a PAYG basis[2] – employees pay a contribution (out of their labor income) that intends to pay for the pensions of retired people, in return of a promise that the next generation will do the same, in what is called as an *intergenerational contract*. The latter one consists in the case where employees save (out of their labor income) for their future pensions in a specific fund, that can be managed and invested in diverse ways, according to each individual risk profile/aversion or through corporate pension plans.

It is difficult to mention which system is more sustainable or effective, considering that both present advantages and disadvantages. Brown (2008) confirms it – neither system is guaranteed to be more stable than the other. Both systems are always dependent on a next generation of workers to produce goods and services and pay their own contributions. Alexandre et al (2017) suggests that PAYG systems become more advantageous in periods with high economic and demographic growth, while fully-funded schemes can become financially sustainable in periods of economic stagnation or decline. According to Mendes (1995), PAYG systems are especially advantageous in certain conditions – when they allow intergenerational transactions and risk-sharing that can create Pareto welfare improvements.

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[2] The required contribution rate is given by Brown (2008) as: $C = \frac{P_t}{A_t} * \frac{B_t}{AW_t}$, where P_t is the number of pensioners, A_t is the number of active workers (in the formal sector), B_t is the average pension benefit, and AW_t is the Average Wage upon which contributions are made.

Bravo (2016) refers to the Portuguese pension system as a mix between the two pension systems referred by Blake (2006), with a dominant mandatory PAYG earnings-related defined benefit public scheme, comprising of two separates, but convergent schemes, with "incipient voluntary occupational and personal funded schemes" that only covers 3.7% of the country's workforce. Contributory pensions are financed on a PAYG basis by social contributions, which besides the contributions from the employer and employee, are also complemented by a small fraction of the VAT tax. The general scheme establishes a single contribution rate at 11% for employees and 23.75% for employers (includes 0.5% to cover employment-related illness).

It is also important to mention the existence of another funded scheme component. To capitalize any surplus that might occur, the Government created the Social Security Reserve Trust Fund (FEFSS), in 1989. Whenever this happens, the excess funds are transferred to the Trust Fund which currently[3] manages around €14,100M in assets, financed through benefit system surpluses and a percentage of between 2% and 4% of obligatory contributions paid by employees to the social security system, until the level of assets of the fund attains the equivalent value of two years of social security benefits (Garcia, 2014). The current asset value corresponds to 119.9% of the annual pension spending in Portugal, and 7.9% of the Portuguese GDP (IGFSS, 2017). Garcia (2014) emphasizes the importance of the creation of these kinds of pension reserve funds to the sustainability of the social security system in the long term, while still considering the need for further reform.

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[3] Data from 31/12/2015.

As previously mentioned, in 2007, Portugal negotiated a pension reform package with social partners. It included higher pension decrements for retirement before age 65 and strengthened financial incentives to continue working beyond that age, the indexing of pensions in payment was debased, the normal retirement age of public service workers rose from 60 to 65 and a sustainability factor was introduced (Hinrichs, 2015) to ensure financial sustainability of the system in the face of adverse demographic and economic changes (Garcia, 2014). In order to obtain the full old-age benefit, one must have contributed for 40 years and fulfil the minimum age requirement. The full old-age benefit consists in a weighted calculation of all remunerations throughout a life-time career. The minimum age requirement is revised each year and is directly related to the average life-expectancy so, whenever it increases in a certain year, also increases the minimum age to be entitled to the full benefit. In 2017, the minimum age for retirement is 66 years and 3 months. Moreover, one can require the benefit before the normal age, with a minimum of 60 years old and 40 years of career, although with a penalty linking the level of newly awarded pensions to increases of longevity.

According to ISS (2017), the formula of the sustainability factor is the following:

$$Sustainability\ Factor = \frac{EMV_{2000}}{EMV_{2016}}$$

EMV_{2000} corresponds to the average life expectancy in 2000. EMV_{2016} corresponds to the average life expectancy in 2016. Hence, the sustainability factor represents the ratio between the average life expectancy in 2000 and the year before the retirement decision year.

There is also a component called Global Formation Rate, which is the number of civil years with relevant remunerations to record multiplied by the accrual rate presented in Table I which can vary between 2 and 2.3%.

In sum, the total benefit formula is given by the following whenever before the legal retirement age:

$$\textbf{Total Benefit} = Reference\ Remuneration * Global\ Formation\ Rate * Sustainability\ Factor$$

2.4. The (un)sustainability of the Social Security System

According to Pereira (1998), a social security system can be considered unsustainable if the current level of social security benefits cannot be financed given the current social security tax base and contribution rates. Alexandre et al (2017) adopts another perspective – In the long-term, the sustainability of a social security system can be measured through the concept of implicit debt. Considering that workers pay a contribution seeking for a future pension, this can be considered as a government bond, in which there is a promise made by the State to deliver a certain amount of money in the near future[4].

Demographic factors represent a huge challenge to the sustainability of the Portuguese social security system. Life-expectancy has grown substantially from 67 years in 1970 to 80 years in 2014 and the growth is expected to continue with the projection of 90 years by the end of the century. Total fertility rate fell from above 3.0 in 1970 to just 1.3 in 2015. While the potential sustainability index, which measures how many people between 15 and 64 years exist per each elderly, fell from 6.6 in 1970 to 3.2 in 2015. All this combined with a negative

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[4] The authors affirm that if the pension system was calculated through this perspective, it would correspond to several times the current GDP.

migration balance since 2011, accelerating even more this process of demographic erosion. INE (2017) projections estimate that the Portuguese population will fall from 10.3 million to 7.5 million in 2080, with the ageing index[5] doubling from the current ratio of 147 elderlies per 100 youth to 317 elderlies per 100 youth, in 2080. In addition, the dependency ratio[6], which is directly linked to the potential sustainability index, is projected to rise rapidly from the current 31.8% to an impressive 73% in 2080.

Besides the demographic risks, Schneider (2015) calculated that shadow economy had a size of 17.6% in terms of the official GDP, in Portugal, in 2015. This represents thousands of people whose contributions are not being made to the social security system, with all the economic and social risks that it implies. As time passes, more retirees will receive benefits, while there will be relatively fewer workers who contribute to the system through payroll taxes on earnings. This is particularly serious considering that a major part of the population is heavily reliant on their future pension benefits, with only 17.2% of the households that have the financial capability to have some sort of financial asset (the savings rate was only 4.4%, in 2016), investing in a voluntary pension fund, according to a survey carried out by Banco de Portugal (2016). This is partly explained by the low wages of a major part of the population and, consequently, low social security contributions during their working life — the average old-age monthly pension in Portugal was only €357[7] in 2015, according to PORDATA.

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[5] Ageing index is the ratio of the number of elderly persons of an age when they are generally economically inactive (aged 65 and over) to the number of young persons (from 0 to 14)

[6] The ratio of the number of elderly persons of an age when they are generally economically inactive (aged 65 and over) to the number of persons of working age (from 15 to 64).

[7] This amount is below the Portuguese at-risk-of-poverty threshold, which was €5269 per year, in 2015, according to INE.

Overcoming these adversities has been an effort for the major part of the developed economies like Portugal, with a mature social security system based on a model that is today considered by some authors as financially feasible (Rosa, 2013), while some others question its future sustainability (Bravo, 2016). Given the mechanism of the system, this led some authors like Tanner (2011) to even compare it to a Ponzi scheme.

In Figure 1, the gap between the social security revenue and expenditures since the beginning of the millennium reveals some sustainability improvements. However, contributions represent a decreasing share of this revenue, in the last decades, as shown in Figure 2, possibly explained by a growth of the unemployment and labor force that moved to the informal sector.

However, the contributive system was still financially solid in 2015, since Total Revenue more than covered Total Expenditure, according to Table II. In 2014, total pension expenditure accounted for 15.7% of GDP and almost 75% of all social security expenditure (Bravo, 2016). Meanwhile, shadow economy in 2015 was 17.6% of GDP, which in absolute figures would be enough, for instance, to pay the total contributive system expenditure for approximately two years. Table III shows the dimension of the shadow economy in Portugal and how it can negatively affect public institutions quality, by decreasing potential tax revenue.

In terms of sustainability, even though Matias (1999) considered that the system was becoming more mixed than before, he also considered that it would have to quickly move to a more funded based system and do not rely so much on a PAYG system which was (and still is) predominant, to become less exposed to the adverse effects of low economic growth periods. However, funded pension

systems are not immune to economic crises as well, since these suffered considerable losses in recent crises like the one in 2008, by being subject to financial markets volatility and, consequently, may not be a viable option for policymakers when redesigning a social security pension system (Garcia, 2014). Nonetheless, Bijlsma et al (2014) concluded that larger funded pension systems had a positive effect on economic growth in OECD countries, during the period 2001-2011.

The possible unsustainability of the system can be mostly explained by the disappearance[8] of the additional revenue collected during the demographic transition when the working-age population grew rapidly, which is referred by Góra (2014) as the demographic dividend, and the proper way of putting aside excess contributions in public pension reserves funds. The activities in the shadow economy have also a deep impact on the pension system sustainability, by reducing the basis for calculating pension contributions and leading to their decline, since the unreported employment causes lower bases for calculating the pension contributions during the labor activity which lead to a lower initial size of the pension. If the increased activities in the black market cause a lower demand for workforce in the official economy, and thus a less pay rise and a higher unemployment rate, then the rate of pension increase for all pensioners will be lower and the dynamics of expenditure will be relaxed (Gankova, 2015).

Góra (2014) enumerates several possibilities of adjustment to the pension system to maintain a proper sustainability which might involve an increase in the retirement age or an increase in the contribution/tax rate to finance pension expenditures, however, these measures will eventually lead to an increase of the

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[8] As a result of the change of the demographic structure.

unemployment and fiscal burden, which, as can be seen further in this study, are main driving forces of the shadow economy. Moreover, Silva et al (2004), assume that in order to ensure the Portuguese system's financial sustainability beyond 2050, it will be necessary to implement modifications such as the introduction of an obligatory complementary pension, either in individual or group schemes, combined with an establishment of a ceiling for the state pension. All these changes imply a high political cost, which is the main reason why politicians postpone these kind of decisions, especially when most people know little about the mechanisms influencing performance or about the reforms needed to make the systems sustainable, making it hard for them to understand why they should pay higher contributions or receive lower benefits, while still demanding the same level of benefits, leading to what Góra (2014) considers as *inflated expectations*. Nevertheless, these changes should be made on a gradual rate, since too many changes in a short period put a strain on the system and are not a solution to the financial sustainability problem. Instead, they will probably raise more problems, which is particularly explained by an inappropriate level of retirement income (Garcia, 2017).

3. Shadow Economy

3.1. Definition

Shadow Economy, or *Underground Economy*, is considered to have different definitions. Studies that measure and analyze the shadow economy use to have some difficulty to find a proper definition and there is no single definition that can be considered as the most accurate one. One of the broadest reads as follows: *"Market-based production of goods and services, whether legal or illegal, that*

escapes detection in the official estimates of GDP" by Smith (1994), or by Dell'Anno (2003) as *"those economic activities and the income derived from them that circumvent government regulations, taxation or observation"*, and finally by Schneider (2014) as *"all currently unregistered economic activities that contribute to the officially calculated Gross National Product"*.

It is possible to observe a clear division between the several components of the shadow economy, by looking at Table IV, published by Lippert & Walker (1997), where the authors divide the shadow economy into two types of activities, legal and illegal, both being divided between monetary and non-monetary transactions and differentiating those with tax evasion and tax avoidance. Sam (2010) does a similar division, dividing the shadow economy by tax-paying and non-tax-paying activities, with the former ones being divided between legal and illegal ones. Bairrada & Martins (2008) followed the path of the previous authors, making a clear distinction between tax evasion and tax fraud, thus considering that both represent some sort of tax avoidance. So, while tax fraud is the adoption of an illegal procedure by an individual through ways that are reprehensible and punishable, tax avoidance includes all the procedures adopted by the taxpayer to minimize taxes, seizing the opportunity of the existence of loopholes in the tax law without breaching it.

It is important to mention that the concept of shadow economy considered in this study will only consider the legal production and provision of goods and services that are deliberately concealed from public authorities (Schneider, 2013). As so, illegal underground economic activities, crime activities (such as drug dealing, robbery, etc.) and all household services and productions are excluded from shadow economy. These kinds of activities are also often excluded

from nation accounts, due to the difficulty of estimation, which could limit international comparability (Dell'Anno, 2007). This also leads us to the existence of overlapping areas, such as prostitution and do-it-yourself activities, which are considered by Schneider (2013) as one of the difficulties in presenting estimations of the size and development of the shadow economy.

To explain this issue, Schneider & Buehn (2017) developed the following equation:

$$SE = SE\ [p^-\ (A^+, F^-); f^-; B^+\ (T^+, W^+)]$$

Shadow economic activities (*SE*) negatively depend on the probability of detection (*p*) and potential fines (*f*), and positively on the opportunity costs of remaining formal, denoted as *B*. The opportunity costs are positively determined by the burden of taxation (*T*) and high labor costs *(W)*. Schneider & Buehn (2017) considers that individual income generated in the shadow economy is usually categorized as labor income rather than capital income due to labor market regulations. The probability of detection is defined as *p,* which is dependent on enforcement actions (*A*), taken by the tax authority, and on facilitating activities (*F*) accomplished by individuals to reduce detection of shadow economic activities.

3.2. Why does Shadow Economy exist?

Bairrada & Martins (2008) consider that the resistance from the individual to taxes goes back to the first civilizations, in a "permanent fight from the individual against the depreciation of his patrimony" that taxes can represent. To understand the dimension of shadow economy, Gonçalves (2016) compares it to a country, by affirming that if shadow economy was a country it would be the second biggest

economy in the world, following United States, moving more than 10 trillion dollars per year. The existence and growth of the shadow economy can be explained by distinct factors, that can differ between countries and economies. The main ones, cited by several authors (Schneider & Enste, 2000; Petersen et al, 2010; Schneider, 2013), are: the rise of the burden of taxes and social security contributions; increased regulation in the official economy; trust in the justice system and the parliament; earlier retirement; unemployment and self-employment; quality of State institutions; corruption; and *tax morale*. Williams & Schneider (2016) refer two major perspectives that can explain the level and nature of employment in the shadow economy in terms of the type of regulatory regime in a country. One is the neo-liberal perspective, which argues that employment in the shadow economy directly results from high taxes, corruption and state interference in the free market, while there is also the political economy perspective, which considers the deregulatory regime and inadequate levels of state intervention to provide social protection as the main causes for the existence of shadow economy, so it is always possible to consider a multitude of possible causes that explain the shadow economy, according to the analyzed country and one's perceptions. Moreover, Williams & Schneider (2016) also present a survey about the extent and nature of shadow employment in EU-27 to analyze whether shadow employment was carried out for exit or exclusion rationales[9], concluding that, in Portugal, 67% of shadow employment was driven by exclusion, while only 33% for exit rationales, which goes in line with other southern European countries results.

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[9] Exclusion rationales indicate that one could not find a regular job or had no other alternative, while exit means that the individual perceived the existence of too much bureaucracy or too high taxes/social security contributions.

Even though this study will be more focused on the influence that economic factors have on the shadow economy, it is also important to mention that these can only partly explain the existence and growth of it. The social and political factors are also determinant to consider when shadow economy is measured (Losby et al, 2002). Regardless the type of shadow economy driving force, it is noteworthy that these variables, in empirical terms, can be subject to endogeneity issues, therefore, they must be seen as an indicative evidence (Bovi, 2003).

The burden of tax and social security contributions

Tax burden can be defined as the ratio of State tax revenues over personal income. Social security burden is defined as the ratio of social security contributions over personal income. Taxes affect labor-leisure choices and stimulate labor supply in the shadow economy, so the bigger the difference between the total cost of labor in the official economy and the after-tax earnings, the greater is the incentive to avoid this difference and participate in the shadow economy (Schneider, 2002; Schneider & Klinglmair, 2004).

The burden of tax and social security contributions is often considered as the key determinant in the existence of the shadow economy (Frey & Schneider, 2000; Schneider & Enste, 2000; Schneider, 2002, 2013). Schneider (1994) says that the direct tax burden (including social security payments) had the biggest influence, from all factors, as the driving force for the shadow economy activities, nonetheless he also concluded that a major reduction in the direct tax burden would not necessarily lead to a similar reduction in the shadow economy.

Generally, if tax burden increases in a country, economic units move from formal economy to informal economy over time. This is partly explained by

Laffer[10]. After a certain point, which can vary across different countries, the optimal level is reached and the tax revenue starts to decrease.

Unemployment and self-employment

Unemployment is usually associated with a decrease in a country's GDP[11], imposing costs to the society and contributing to instability and less employment in the formal economy, which ends up driving people who have difficulty to find a job to engage in the shadow economy.

Feld & Schneider (2010) and Schneider & Williams (2013) assume that the higher the unemployment[12] and self-employment rates are, the more activities can be performed in the shadow economy, *ceteris paribus*. In fact, Schneider (2013) studied the average relative impact of the shadow economy determinants in 38 OECD countries (Table VII), concluding that self-employment had the biggest impact on the Portuguese shadow economy. However, the figures about unemployment cannot be considered only as a cause. The fact that one can observe such high and persistent unemployment in the EU throughout the years may be explained by a significant level of shadow labor market activity in these countries, as well (Schneider & Williams, 2013).

Corruption and Institutional Quality

OECD (2007) defines corruption as the "abuse of public or private office for personal gain", which is considered by United Nations (2008) as "the single greatest obstacle to economic and social development". An efficient and discretionary application of the tax code and regulations by the government plays

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[10] See Laffer's Curve (1974).
[11] See Okun's Law (1962).
[12] A deeper study about the impact of the unemployment on the shadow economy can be found in Bajada & Schneider (2009).

a crucial role in the decision to work underground, while bureaucracy associated with highly corrupt government officials is usually associated with a larger shadow economy (Schneider & Buehn, 2017). To demonstrate this, Johnson et al (1999) found that a one-point increase in the corruption index[13] was associated with a 5.1 percent point decrease in the unofficial economy, *ceteris paribus*. Empirical studies from Dreher et al (2005) showed that institutional quality can reduce the shadow economy and corruption, at the same time. This positive correlation may reflect peoples' overall perceptions of a country's institutional environment – if public institutions and government officials reveal low levels of corruption, shadow economy tends to be lower, and vice-versa, suggesting that the quality of the institutions and the size of the shadow economy go hand in hand (Friedman et al, 2000). This becomes especially true when one considers the endogenous linkage between institutional quality and taxation, tested by Loayza (1997) and Friedman et al (2000). Thus, the bigger the distance perception of tax payers between what they pay to the State and what they get from it, the bigger their predisposition is to engage in the shadow economy (Gonçalves, 2016). Tanzi (1998) refers that countries like Portugal have managed to reduce the incidence of corruption significantly[14], considering the existence of an inversely proportional relationship between the development level of a country and corruption-bribery which, therefore, may affect the size of the shadow economy.

In sum, bureaucracy with highly corrupt government officials tends to be associated with larger unofficial activity, while a good application of laws through securing property rights and contract enforceability increases the benefits of

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[13] This index ranks between 0 and 10 (10 means an absence of corruption).
[14] In 2016, Portugal ranked 29th, out of 176 countries, in the Corruption Perception Index, released by Transparency International.

being engaged in the formal economy, given the fact that a certain level of taxation, mostly spent in productive public services, characterizes efficient policies. Hence, production in the formal sector benefits from higher provision of productive public services and is negatively affected by taxation, while the shadow economy reacts in the opposite way (Schneider & Buehn, 2017). As Gonçalves (2016) notes by saying that fraud (including corruption) usually precede, follow or succeed shadow economy, even though shadow economy can exist without fraud and fraud without shadow economy.

Tax Morale & Deterrence

Tax morale is defined by OECD (2013) as the motivation of an individual to pay its taxes. Deterrence is the probability of being audited and the height of the penalty which, according to Schneider (2011) can also impact on the intrinsic motivation to pay taxes. In this way, the former is influenced by the latter, so there is always a reciprocal link between the two, but it is also influenced by the quality of state institutions and constitutional differences among states (Schneider, 2011).

Tax morale is particularly affected by the efficiency of the public sector, since it has an indirect effect on the size of the shadow economy (Schneider & Buehn, 2017). However, citizens are willing to honestly declare income, even if they do not receive a full public good equivalent to their tax payments, if the political process is perceived to be fair and legitimate, representing an interaction between taxpayers and the government with an establishment of a fair, reciprocal exchange that involves giving and taking of both parties, with the government providing public services to citizens in exchange for their tax payments (Feld & Frey, 2007).

3.3. Consequences of the Shadow Economy

The debate about the influence that shadow economy represents in the economy of a nation is not recent, with some authors mentioning its benefits and some others its disadvantages.

The shadow economy mitigates government-induced distortions and, as a result, leads to enhanced economic activities in the official sector. In this sense, it is possible to say that the presence of the unofficial sector plays as a complement to the official economy rather than a substitute (Choi & Thum, 2005). One could say that the elimination of the shadow economy would benefit the economy and society as whole, but studies demonstrate that this sentence cannot be considered as an obvious consequence. It is not very straightforward that the shadow economy can also have a positive side, but it might take place in certain conditions. Schneider (2013) assumes that two thirds of all activities in the shadow economy complement those in the official sector, since that amount returns to the official economy via consumption (Schneider, 2002), concluding that the development of the shadow economy can lead to higher value-added figures, given the fact that total GDP is formed by the official GDP and part of the shadow economy GDP. This is particularly true in developed countries, like Portugal, but the same does not apply to developing countries where shadow economy already represents a large portion of the official economy, so there would not exist any major positive effect to the official GDP (Gonçalves, 2016). Considering these facts, if shadow economy disappeared or suffered a huge decline, it would only improve a country's total welfare if almost all of it was transferred to the official economy (Schneider, 2013).

On the negative side, an increase of the shadow economy results in lower tax revenues and, consequently, in a lower amount of public services and goods available. The erosion of tax and social security bases not only cause significantly large budget deficits, but they also cause an inefficiency of the Government policies, which are a consequence of unreliable indicators (Dreher et al, 2005). This erosion is partly explained by the existence of undeclared work which, according to European Commission (2007), tends to obstruct growth-oriented economic, budgetary and social policies. This is particularly harmful to the social security system when one decides to enter in the informal economy while receiving social security benefits, since it creates a system responsibility without creating a system financing source (Gonçalves, 2016). Considering that public infrastructure has a key role on economic growth (Loayza, 1997), the idea that a country may face a decrease of economic growth related with a growth of the shadow economy might become true. Loayza (1997) finds some evidence about this by studying the correlation between the shadow economy and economic growth, in which he finds that the relative size of the informal sector is negatively correlated with the rate of economic growth while empirically states that an increase in the size of the informal sector negatively affects growth by reducing the availability of public services and by increasing the number of activities that use some of the existing public services less efficiently or not at all. In fact, the growth of the shadow economy represents a huge risk to public sectors which, obviously, depends on the tax and social security contributions to keep the protective welfare state running smoothly. This growth represents less revenue and, consequently, an additional pressure on public finance, reducing the quality and quantity of publicly provided goods and services. This can lead to increased

tax rates in the official sector, often combined with deterioration in the quality of public goods and of the administration, with the consequence of even stronger incentives to participate in the shadow economy (Schneider & Enste, 2000), resulting in a snowball effect.

3.4.   Mitigation solutions

Shadow economy is often considered as a debilitating force that weakens the official economy by attracting factors of production away from the official economy and creating unfair competition for official firms. As such, most countries attempt to control underground economic activities through various punitive measures, rather than through reforms of the tax and social security systems (Schneider & Enste, 2000). In order to study different ways to mitigate shadow economy, CEGEA (2008) referred two essential principles. The first one was easing the tax compliance burden, considering that people tend to associate excessive costs and difficulty to tax compliance. The second one was the combat of the sense of impunity by those who are engaged in the shadow economy, since there is a general feeling that the non-compliance would not be punished at all or the probability of getting caught was too low. Cebula (1996) empirically concluded that the size of the shadow economy might be diminished by increased IRS audits and penalties, but the evidence also suggests that an exclusive reliance on deterrence is not a reasonable strategy to increase tax compliance (Feld & Frey, 2007). Research has shown that people's decisions to participate in the shadow economy are barely influenced by detection rates[15], but depend much more on other factors like acceptance of the tax system, perceived values, and the overall

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[15] According to Table IX, in Portugal, almost half of the surveyed participants perceive a high risk of detection, even though the Portuguese shadow economy has a considerable size.

situation in the labor market (Feld & Schneider, 2010). However, if the population perceives the existence of tax evasion without penalties, it will increase the sense of injustice among those who pay their taxes, which eventually leads to an increase of the shadow economy (Bairrada & Martins, 2008). Gonçalves (2016) suggests a more pragmatic way of reducing shadow economy, by knowing who is engaged in the shadow economy and how is it being done. In this way, the author mentions that companies and wealthier individuals are those who more often participate in shadow economy, so any attention from authorities should be more targeted to bigger fiscal frauds and capital flights, rather than smaller businesses, even though these should not be left out, too.

To mitigate the movement of workers to the shadow economy and increase social protection coverage, some nations with prominent level of shadow economy and environments in which most employment relations are informal, created a system of matching contributions, providing some incentives for greater participation in the formal labor market and therefore the pension system (BBVA, 2012), focused on individuals who would otherwise have no coverage at all. However, in countries like Colombia and Peru, the results were disappointing. Not only coverage remained low, but became still lower. It is still too early to develop some deeper conclusions about these programs, but Hinz et al (2013) consider that matching is moderately effective in increasing program participation but not generally measurably effective in raising contributions and thus benefit levels.

In sum, shadow economy cannot be tackled simply by increasing the probability of detection and increasing the level of penalties, since these only deals with the effects rather than causes of the problem (Williams & Schneider,

2016). The strengthening of institutions and tax morale plays a crucial role in the mitigation of the shadow economy, as well.

4. Shadow Economy and Social Security

Shadow economy is a phenomenon present in all economies, regardless of their development, being considered as a main concern to the national authorities and institutions. In terms of influence from a macroeconomic perspective, it decreases tax revenues and undermines the financing of social security systems (European Commission, 2007). According to Schneider (2014), by definition, every activity in the shadow economy involves a "shadow labor market" to some extent. Hence, this labor market includes all cases, where the employees or the employers, or both, are engaged in the shadow economy. Besides the effect that shadow economy has on the social security system sustainability, it is also important to notice how the social security system can affect shadow economy. According to Bajada & Schneider (2009), a large and prolonged participation in the shadow economy by the unemployed not only distorts the intended equitable distribution of social security system, but it can also engender what they call as "dependency trap", if shadow economy income (when supplemented by social security payments), discourages active participation in the formal economy. However, even though the social security burden is considered to be one of the main driving forces of the shadow economy, social contributions have never shown a positive correlation with the shadow economy (Bovi, 2003), so the effect of this variable is not straightforward. In fact, associated costs noticed by economic agents by the time they plan to engage in shadow economy activity, seem to prevent them of doing so. This applies both to the employees' and employers' side. Regarding the former one, if social contributions are considered to be fair and faced as a

future wage, while having the perception that if by engaging the shadow economy, will possibly lose social benefits, it will exist the incentive to pay them (Bovi, 2003). While the latter one, considering that social contributions contribute to higher productivity and are an appreciated source of credit (Bovi, 2003), will possibly not feel tempted to go underground. The costs of participating in the informal sector, also known as costs of concealment are usually modelled in terms of exclusion from certain public goods and services (e.g., social infrastructure, property rights and the justice system) (Blackburn et al, 2012). In fact, according to Table X, the inexistence of social security entitlements was considered, by Southern Europe citizens, where Portugal is also included, the major consequence of working in shadow economy.

Brown (2008) defines three main priorities of a well-designed social security pension system: the mitigation and alleviation of poverty amongst the elderly; to help citizens maintain an acceptable standard of living post-retirement; and solidarity. Brown (2008) referred solidarity as the desire of workers and employers to contribute and support the social security system. To achieve it, he assumes that there should not be a substantial proportion of workers who do not participate and benefit from the system, at the same time. Shadow economy assumes a key role on this. If people perceive that the total of taxes and social security contributions are too high[16] and do not benefit enough from the system, they will end up entering the shadow economy. As such, social security system should not create what Brown (2008) defines as "perverse economic incentives", which may lead people to do it. However, the implementation of an effective social

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[16] According to Brown (2008), "too high" depends from time to time and culture to culture, even though there is always a limit on the total of taxes and contributions applied.

security system should always be subject to a deep analysis by the policy makers. If the level of generosity is too low, the social security system fails to maintain adequate support for those experiencing financial hardship while on the other hand, a very generous system may encourage welfare dependency (Bajada & Schneider, 2009).

Williams & Schneider (2016) computations suggest a strong statistically significant correlation between a greater level of social protection expenditure and a low level of employment in the shadow economy, in the EU-27. To analyze this relationship, it was decided to test how the Portuguese social security system expenditures could affect the size of shadow economy.

5. Data & Methods

This empirical investigation was developed on a sample composed by a single country (Portugal) and a period of 33 years, to test theoretical assumptions. It is important to mention that the main obstacle for empirical analysis regarding shadow economy is the availability and reliability of the data. Considering shadow economy is a complex phenomenon, its measurability proves to be extremely challenging. In this aspect, the study relied almost entirely on data provided by PORDATA. This section will be dedicated to discussing the data used for the estimation and the econometric approach.

Data

In order to proceed with this test, all the variables were chosen based on the most relevant causal variables presented by Schneider & Buehn (2013) (Table VII), while Table VIII shows all the data collected regarding Portugal. Even though there were older records (some since 1977), the sample period starts from 1983

until 2015, in order to harmonize[17] all the data available provided by PORDATA, considering that the records regarding some of the variables were only available since that year. A big amount of observations is crucial for this type of research, which is the main reason why it was decided to collect the older data one could get. However, the lack of available data resulted in a small sample size. Therefore, it was also decided to dedicate a part of this empirical chapter to do a brief inferential statistical analysis, testing how welfare policies can affect shadow economy size. Nevertheless, meaningful findings are produced. In this study, all model estimations were implemented in the statistical software package STATA.

Econometric Specification

Two main models are estimated. The first one is a bivariate regression where the specification is given below:

Model 1

$$ShadowEconomySize_t = \beta_0 + \beta_1 Social\ Security\ Expenditure_t + \epsilon_t$$

β_1 represents the coefficient of interest, which gives the marginal impact of social security spending on the shadow economy. However, considering that β_1 might be biased, since there are other factors that can also explain the shadow economy size these were also added as control variables by running a multivariate regression. The exact equational specification is given below:

Model 2

$$ShadowEconomySize_t = \beta_0 + \beta_1 Social\ SecurityExpenditure_t +$$
$$\beta_2 UnemploymentRate_t + \beta_3\ IndirectTaxes_t +$$
$$\beta_4 RealGDPGrowth_t + \beta_5 SelfEmployment_t + \beta_6 Dummy + \beta_7 Year + \epsilon_t$$

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[17] This only applies to the variables used in the econometric study.

Where Dummy = 1, from 2003 onwards, which allows the correction of any systematic difference that the change of the author regarding shadow economy size data from 2002 to 2003 could cause. While the variable *Year* controls year effects.

6. Results

In order to test the proposed relation, Figure 3 compares the evolution between two variables – social security expenditure (% GDP) and shadow economy size (% of official GDP), in Portugal, during the analyzed period. It is possible to observe opposite trends regarding the two variables. While social security expenditure seems to increase throughout the years, shadow economy seems to decrease, which would corroborate William & Schneider's theory. Figure 4 seems to transmit another perspective. By inserting a polynomial trend line, it is possible to observe that the marginal effect of social security expenditure increase on the reduction of shadow economy seems to work until the 17.5% threshold, approximately. After this, the result becomes negative and shadow economy increases, again. This seems to go in line with what Schneider & Enste (2000) refer – considering that social welfare size would be directly linked to the social security spending amount, more social transfers would lead to stronger negative incentives for beneficiaries to work in the official economy. The authors mention the disincentives that these systems provide for individuals receiving welfare payments to search for work in the official economy, by the fact that their overall income is higher if they receive these transfers while working in the underground economy. So, the positive effect of an increase of social transfers to mitigate shadow economy seems to disappear after a certain point. What if one adds different welfare components like education and health spending to this

comparison? Is there any kind of relation between these variables and a decrease of the shadow economy? By comparing Figure 5 with Figure 6, one could say that education expenditure seems to be a more effective way of reducing shadow economy, *ceteris paribus*, than increasing health expenditure. Berrittella (2015), whose results emphasize the role of education on decreasing shadow economy size, suggests that policies devoted to a higher education level imply a decreasing effect on the shadow economy. Berrittella (2015) considers that as education increases wage rates, it increases the opportunity costs of participating in shadow economy and the effect that it has on social and moral dynamics, which can cause a positive impact on individuals' tax morale. To test the relation between social welfare policies and shadow economy it was also decided to compare them through a scatter plot with shadow economy size and at-risk-of-poverty rate after social transfers (less data was available, causing a smaller sample). Figure 7 seems to indicate another time that the role of social transfers in reducing poverty can have a negative impact on shadow economy until a certain point, which goes in line with the conclusions about Figure 4. Therefore, it seems that policy makers should not only be focused on economic measures to reduce shadow economy but also (and probably more important) on how public institutions quality and the application of these measures is perceived by citizens, considering that the rationales that explain the engagement in the shadow economy are only partly explained by fiscal and economic factors. This situation is particularly perceived by the size of the shadow economy in different countries. Those with small public sectors and comparatively high tax morale (like the US and Switzerland) are also the ones with the smallest shadow economies (Schneider & Enste, 2000; Schneider, 2002), which might indicate a possible

relation between the two variables. Nevertheless, social transfers allied with a proper level of investment in public services seem to be truly effective on the reduction of shadow economy.

Table V shows that the size of shadow economy is, on average, 21% with a healthy degree of variation, later explained through a regression analysis. The main explanatory variable of interest is the social security spending as a proportion of the official GDP. Column 1 and column 2 from Table VI estimates Model 1 and Model 2. While, column 3 provides an estimation of Model 2 with Newey-West (1987) correction.

By calibrating model (2) with values given in column (3), the following equation is provided:

$$ShadowEconomySize_t = 7.498 - 0.224\,SocialSecurityExpenditure_t +$$
$$0.438\,UnemploymentRate_t + 0.0112\,IndirectTaxes_t -$$
$$0.221\,RealGDPGrowth_t - 0.0432\,SelfEmployment_t + 0.0311\,Dummy_t -$$
$$0.00366\,Year_t + \epsilon_t$$

Interpreting the above equation gives the answer to the proposed research question. The relevant coefficient is β_1, which gives the marginal impact of social security spending on the shadow economy. The preferred results are presented in Table VI – Column 3. It is possible to conclude that a 1 percentage point increase in social security expenditure results in a 0.224 percentage point decrease in the size of the shadow economy, *ceteris paribus*. These results corroborate the computations carried out by Williams & Schneider (2016) that were previously mentioned. However, unemployment seems to exert a much bigger effect, since a 1 percentage point increase in unemployment rate results in a 0.438 percentage point increase in the size of the shadow economy, *ceteris paribus*.

Moreover, it is possible to observe that a great degree of variation is explained by the explanatory variable. In other words, the adjusted R-squared is about 91.2% which means that the explanatory variable explains about 91.2% of the variation in the dependent variable. However, it is also deeply important to mention that this relation can only be done when all the other factors are held fixed, especially when one discusses an issue like shadow economy which is caused by a multitude of non-economic factors, so the fact that one finds an association between two or more variables might be suggestive, unless causality can be established, it is rarely compelling (Wooldridge, 2015).

It was also decided to run a few regression diagnostics and tests to evaluate the quality of the proposed model. First, a Fisher test is done to see if the model is jointly significant - testing if it is statistically relevant to choose these particular control and explanatory variables in this regression. The Fisher test (Figure 8) reveals a F-statistic of 36.80 and an associated p-value of less than 0.01, implying that the joint significance of the main regressors is extremely statistically precise. Therefore, the model seems to be jointly significant and indicates the statistical power of the model selected. Hence, the chosen explanatory variables seem to be statistically related to the size of shadow economy. The particularly high F-statistic and a very low p-value provide confidence that the chosen model explains an important variation in the data and that coefficients are statistically different from zero. Afterwards, a Breusch-Pagan test (Figure 9) is conducted to check whether the residuals are heteroskedastic. Gauss-Markov assumptions stipule that if residuals are heteroskedastic then OLS standard errors will be biased, which would mean that t-statistic would be inflated, being that a cause of concern. Considering the results, it is not possible to conclude that there is

heteroskedasticity in model 2 when standard errors are computed without correction. Therefore, the Gauss-Markov homoscedastic error terms assumption is not violated since the test seems to demonstrate that error terms do have constant variance, i.e. the null of constant error term variance is not rejected with a p-value being 0.1913. The results of column (3) in Table VI are as valid as the naïve estimation of model 2 in column (2). Similar results are found when a more generalized test of heteroskedasticity is used, like the information matrix test (Cameron & Trivedi, 1990) (Figure 10).

In conclusion, the joint statistical significance and diagnostic testing reveal that social security spending indeed exerts a statistically strong and negative impact on the size of shadow economy.

7. Conclusions and Future Research

The role of social security in reducing poverty and inequalities cannot be denied. Ending with the shadow economy seems to be a utopia, even though it seems possible to decrease its dimension and adverse effects.

Almost half of the Portuguese population inquired stated that the risk of being detected in shadow economy is high, so more than increasing deterrence it seems that there is a bigger gap to fill in terms of *tax morale*. A balance between an acceptable level of taxes applied to the citizens and a provision of public services from equivalent quality which makes people perceive their contributions are being applied correctly can be seen as one of the most important things to decrease shadow economy. However, the possible mitigation of the shadow economy may not have the positive outcome expected, since Schneider (2013) assumes that two thirds of all activities in the shadow economy complement those

in the official sector, assuming a complementary role rather than a substitute one (Choi & Thum, 2005). Although, from a theoretical perspective, it seems that both employers and employees recognize the positive effect that their social security payments can have in their future, since both benefit from them.

The lack of reliable data regarding such a controversial and obscure issue plus the difficult measurement of something that is deeply influenced by people's perceptions conducted to an empirical model that might not exactly correspond to reality, contributing to its limitation, even though it was possible to take several conclusions from it. It was possible to observe a considerable relation between an increase of the social security expenditure and a consequent decrease in shadow economy, either doing inferential statistics or econometric analysis.

In the end, shadow economy not only represents a threat to the social security sustainability, but it also causes macroeconomic data distortions which, consequently, will affect policymaker's decisions. Civil society, who suffers most with the associated costs, plays a major role in this. On the one hand, there is an urgent need to demand responsibility for wrong policies that lead people and companies to engage shadow economy, while on the other hand, citizens should not be accomplices to this behavior, either by option or need. Possible solutions to the financial problems of the social security system by trying to mitigate shadow economy will never be successful until more attention is paid to the field of social policy and the impact of economic decisions that affect it. Based on this, understanding the dichotomy shadow/official economy and what leads society to choose one of the sides seems to be the most challenging future task, either economically, sociologically or otherwise.

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Legislative

Law no. 28/1984, D. R. I Série. 188 (1984-08-14) 2501-2510

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Law no. 32/2002, D. R. I Série. 294 (2002-12-20) 7954-7968
Law no. 1/2005, D. R. I Série-A. 155 (2005-08-12) 4642-4686
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Decree-Law no. 167-E/2013, D. R. I Série. 253 (2013-12-31) 364-369

Annexes
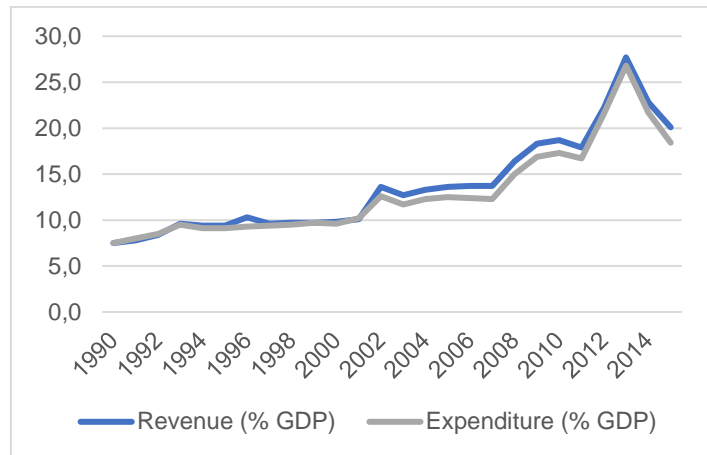
FIGURE 1 – SOCIAL SECURITY REVENUE/EXPENDITURE (% GDP) (SOURCE: PORDATA)
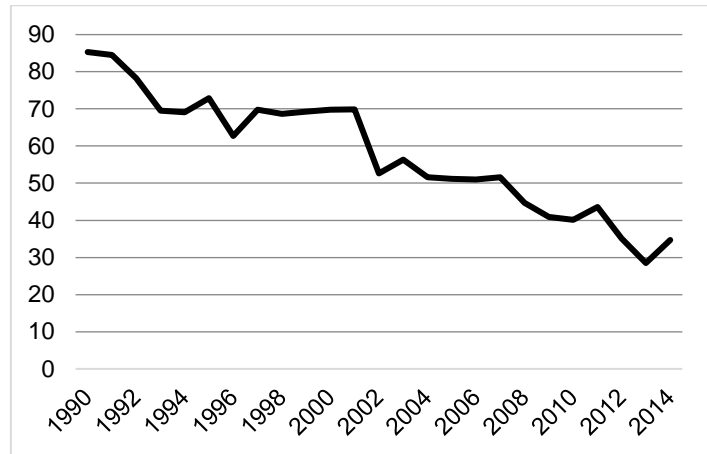
FIGURE 2 – CONTRIBUTIONS IN TOTAL OF SOCIAL SECURITY REVENUE (%) (SOURCE: PORDATA)
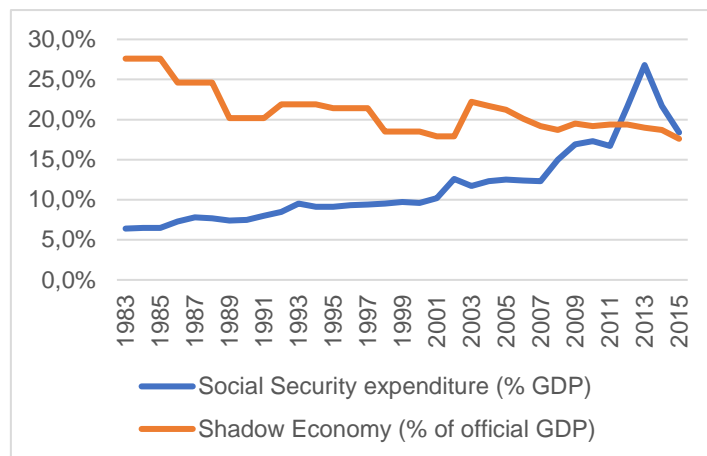
FIGURE 3 – SOCIAL SECURITY EXPENDITURE AND SHADOW ECONOMY SIZE EVOLUTION (1983-2015) (SOURCE: AUTHOR'S CALCULATIONS)
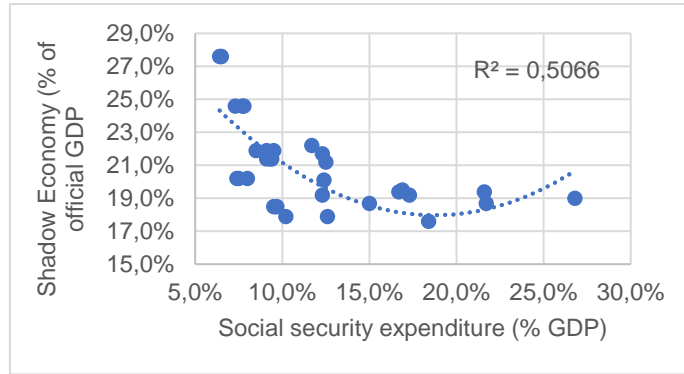
FIGURE 4 – RELATIONSHIP BETWEEN SHADOW ECONOMY SIZE AND SOCIAL SECURITY EXPENDITURE (1983-2015) (SOURCE: AUTHOR'S CALCULATIONS)
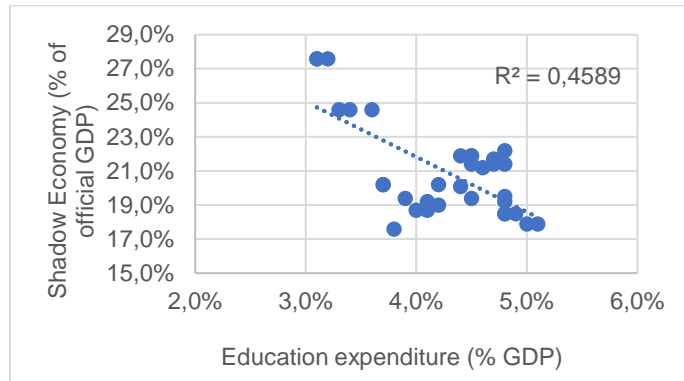
FIGURE 5 – RELATIONSHIP BETWEEN SHADOW ECONOMY SIZE AND EDUCATION EXPENDITURE (1983-2015) (SOURCE: AUTHOR'S CALCULATIONS)
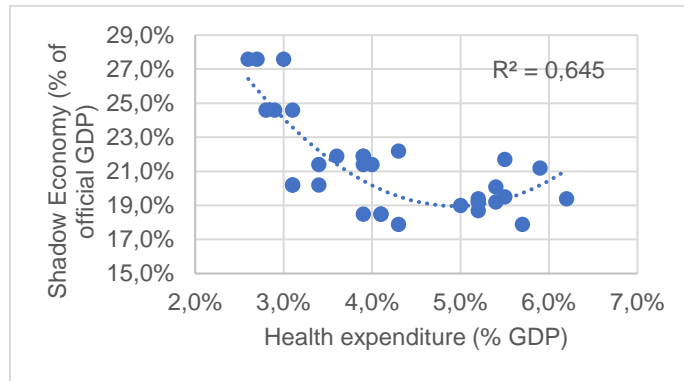
FIGURE 6 – RELATIONSHIP BETWEEN SHADOW ECONOMY SIZE AND HEALTH EXPENDITURE (1983-2015) (SOURCE: AUTHOR'S CALCULATIONS)
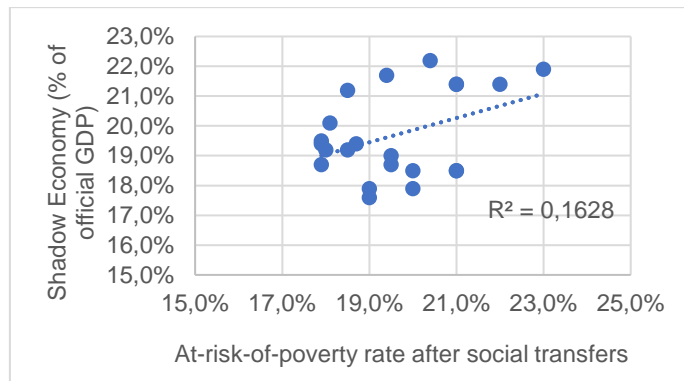
FIGURE 7 – RELATIONSHIP BETWEEN SHADOW ECONOMY SIZE AND AT-RISK-OF-POVERTY RATE AFTER SOCIAL TRANSFERS (1994-2015) (AUTHOR'S CALCULATIONS)

```
. test  unemprate ssexpenditure indirecttax realgdpgrowth selfemployment dummy year

( 1)  unemprate = 0
( 2)  ssexpenditure = 0
( 3)  indirecttax = 0
( 4)  realgdpgrowth = 0
( 5)  selfemployment = 0
( 6)  dummy = 0
( 7)  year = 0

      F( 7,   25) =   36.80
          Prob > F =    0.0000
```

FIGURE 8 – FISHER TEST OUTPUT (SOURCE: STATA 13)

```
. estat hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
        Ho: Constant variance
        Variables: fitted values of shadowecoofficialgdp

        chi2(1)      =      1.71
        Prob > chi2  =    0.1913
```

FIGURE 9 – BREUSCH-PAGAN TEST OUTPUT (SOURCE: STATA 13)

```
. estat imtest

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	33.00	32	0.4180
Skewness	10.51	7	0.1616
Kurtosis	0.02	1	0.8945
Total	43.52	40	0.3238

FIGURE 10 – INFORMATION MATRIX TEST OUTPUT (SOURCE: STATA 13)

TABLE I – GLOBAL FORMATION RATE

Share	Indexed reference remuneration to the *Indexante dos Apoios Sociais* – IAS	Rates
1	Up to 1.1 x IAS	2.3%
2	Above 1.1 x IAS until 2 x IAS	2.25%
3	Above 2 x IAS until 4 x IAS	2.2%
4	Above 4 x IAS until 8 x IAS	2.1%
5	Above 8 x IAS	2%

Source: Social Security website, available at: http://www.seg-social.pt/pensao-de-velhice

TABLE II – CONTRIBUTIVE SYSTEM – TOTAL REVENUE/EXPENDITURE

Total Revenue	19,753,910.3*
Total Expenditure	17,896,109.3*
Final Balance	**1,857,801.0***

Source: Instituto de Gestão Financeira da Segurança Social, I.P. (2017). Values in thousands of Euros*

TABLE III – SHADOW ECONOMY IN 2015 – PORTUGAL

Shadow Economy in 2015 (% GDP) [1]	17.6%
Portuguese GDP in 2015 [2]	179,504,330*
Shadow Economy in 2015 (absolute value)	31,592,762*

Source: (1) Schneider (2015); **(2)** PORDATA. Values in thousands of Euros*

TABLE IV - DIFFERENT COMPONENTS OF THE SHADOW ECONOMY

	Monetary Transactions		Non-monetary Transactions	
Illegal Activities	Trade in stolen goods, drugs; manufacture of drugs; prostitution, gambling, fraud		Barter, drugs, stolen goods, etc.	Produce or grow 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	Employee discounts, fringe benefits (cars, subsidized food, etc.)	Barter of legal services and goods.	Do-it-yourself work

Source: Lippert & Walker (1997)

TABLE V – SUMMARY STATISTICS

Variable	Observations	Mean	Std Dev	Min	Max
Year	33	-	-	1983	2015
Dependent Variable					
Shadow Economy (% of official GDP)	33	0,210	0,028	0,176	0,276
Independent Variable					
Social Security Expenditure (% GDP)	33	0,117	0,050	0,064	0,268
Control Variables					
Unemployment Rate	33	0,077	0,033	0,039	0,162
Indirect Taxes (% of total taxes)	33	0,590	0,039	0,520	0,712
Real GDP Growth Rate	33	0,020	0,028	-0,040	0,079
Self-employment (% total employment)	33	0,242	0,022	0,179	0,271

Source: STATA 13

TABLE VI – REGRESSION RESULTS

Variables	(1) Model 1	(2) Model 2	(3) Column 3
Social Security expenditure (% GDP)	-0.319***	-0.224*	-0.224*
	(0.0832)	(0.130)	(0.113)
Unemployment Rate		0.438***	0.438***
		(0.128)	(0.128)
Indirect Taxes (% of total taxes)		0.0112	0.0112
		(0.0648)	(0.0723)
Real GDP Growth Rate		-0.221**	-0.221**
		(0.0868)	(0.0953)
Self-employment (% total employment)		0.0432	0.0432
		(0.151)	(0.130)
Dummy		0.0311***	0.0311***
		(0.00814)	(0.00752)
Year		-0.00366***	-0.00366***
		(0.000637)	(0.000622)
Constant	0.248***	7.498***	7.498***
	(0.0106)	(1.285)	(1.257)
Observations	33	33	33
R-squared	0.322	0.912	0.912

Source: STATA 13

Note: Standard errors in parentheses. ***, **, * denote significance at the 1, 5, and 10% significance level.

Column 3 has Newey West (1987) Robust Standard Errors

TABLE VII – AVERAGE RELATIVE IMPACT (IN %) OF THE CAUSAL VARIABLES ON THE SHADOW

ECONOMY OVER 1999 TO 2010

Country	Average size of the shadow economy	Personal income tax	Indirect taxes	Tax morale	Unemployment	Self-employment	GDP Growth	Business Freedom
Australia	13.8	21.3	25.4	7.4	15.8	19.3	0.9	9.9
Austria	9.8	18.5	27.4	11.6	12.1	20.5	0.8	9.1
Belgium	21.5	19.2	20.2	19.1	16.5	17.3	0.4	7.2
Bulgaria	34.6	5.1	37.7	5.7	25.9	17.5	1.9	6.2
Canada	15.6	22.1	17.5	7.7	19.2	22.4	0.7	10.4
Chile	19.4	1.8	35.3	5.5	17.3	32.7	0.8	6.7
Cyprus	27.2	4.3	35.9	9.1	11.2	29.9	0.8	8.7
Czech Rep.	17.6	7.8	30.7	9.4	19.0	23.5	1.2	8.3
Denmark	17.3	34.6	33.5	4.0	9.5	9.9	0.3	8.2
Estonia	21.7	10.0	36.0	11.7	21.8	10.4	1.8	8.3
Finland	17.4	19.7	29.1	8.7	18.6	15.2	0.8	7.9
France	14.8	12.8	24.3	15.5	23.2	15.1	0.4	8.6
Germany	15.7	16.6	24.2	8.3	24.3	16.9	0.6	9.1
Greece	27.0	5.8	21.8	10.4	18.0	37.6	0.7	5.7
Hungary	24.1	12.3	34.9	6.4	18.6	18.5	1.2	8.0
Iceland	15.2	19.9	39.7	6.5	7.1	17.9	0.6	8.2
Ireland	16.1	12.5	35.4	7.9	12.5	21.3	1.0	8.5
Italy	26.9	15.6	18.9	9.0	18.6	31.0	0.1	6.8

Korea	26.3	5.7	27.3	3.4	9.8	44.3	1.4	8.0
Latvia	22.2	8.2	32.3	13.3	23.3	14.6	1.8	6.6
Lithuania	25.4	9.0	28.8	17.5	19.9	17.1	1.5	6.1
Luxembourg	9.6	13.2	33.4	20.0	10.4	11.9	1.2	9.8
Malta	27.3	5.9	39.7	3.2	20.0	21.2	0.8	9.3
Mexico	30.0	2.3	42.1	10.2	5.9	33.8	0.4	5.3
Netherlands	13.2	13.6	32.5	13.0	10.4	19.7	0.8	10.0
New Zealand	12.2	21.8	25.4	8.4	11.9	22.9	0.6	9.1
Norway	18.6	21.2	31.5	12.5	10.8	13.0	0.5	10.5
Poland	26.4	6.1	27.8	7.8	26.1	25.7	1.3	5.3
Portugal	**22.7**	**8.1**	**29.9**	**8.7**	**14.6**	**31.1**	**0.4**	**7.2**
Romania	32.2	4.2	24.5	14.2	13.1	37.7	1.1	5.2
Slovak Rep.	17.5	4.8	31.7	6.4	34.9	13.7	1.5	7.1
Slovenia	25.2	9.6	33.9	9.6	15.4	21.7	1.2	8.6
Spain	22.8	10.6	17.9	10.4	29.2	23.8	0.6	7.5
Sweden	18.6	23.5	30.6	8.7	15.2	13.2	0.8	8.0
Switzerland	8.3	17.7	30.7	9.0	9.6	23.8	0.5	8.7
Turkey	30.6	4.9	31.4	0.7	16.4	41.4	0.6	4.6
United Kingdom	12.5	18.2	30.8	8.1	14.3	18.0	0.6	9.9
United States	8.7	27.5	5.1	13.2	22.0	16.0	0.9	15.4
Average	20.3	13.1	29.4	9.5	16.9	22.2	0.9	8.1

Source: Schneider & Buehn (2013)

TABLE VIII – COLLECTED DATA FOR ANALYSIS

Year	(1) Shadow Economy (% of official GDP)	(2) Unemployment Rate	(2) Social Security expenditure (% GDP)	(2) Indirect Taxes (% of total taxes)	(2) Real GDP Growth Rate	(2) Self-employment (% total employment)	(2) Education expenditure (% GDP)	(2) Health expenditure (% GDP)	(2) At-risk-of-poverty rate after social transfers
1983	27.6%	7.6%	6.4%	57.8%	1.0%	24.1%	3.2%	2.6%	-
1984	27.6%	8.2%	6.5%	57.9%	-1.0%	26.5%	3.1%	2.7%	-
1985	27.6%	8.5%	6.5%	55.7%	1.6%	26.0%	3.1%	3.0%	-
1986	24.6%	8.3%	7.3%	61.8%	3.3%	26.0%	3.3%	2.9%	-
1987	24.6%	6.8%	7.8%	71.2%	7.6%	26.6%	3.4%	2.8%	-
1988	24.6%	5.6%	7.7%	68.1%	5.3%	26.2%	3.6%	3.1%	-
1989	20.2%	5.0%	7.4%	62.8%	6.7%	25.8%	3.7%	3.1%	-
1990	20.2%	4.6%	7.5%	61.7%	7.9%	25.7%	3.7%	3.1%	-
1991	20.2%	4.1%	8.0%	59.0%	3.4%	26.7%	4.2%	3.4%	-
1992	21.9%	4.1%	8.5%	58.7%	3.1%	23.7%	4.5%	3.6%	-
1993	21.9%	5.5%	9.5%	59.9%	-0.7%	24.2%	4.5%	3.9%	-
1994	21.9%	6.8%	9.1%	62.3%	1.5%	25.2%	4.4%	3.9%	23.0%
1995	21.4%	7.1%	9.1%	61.0%	2.3%	25.8%	4.5%	3.4%	21.0%
1996	21.4%	7.2%	9.3%	58.3%	3.5%	26.7%	4.7%	4.0%	22.0%
1997	21.4%	6.7%	9.4%	57.8%	4.4%	27.1%	4.8%	3.9%	21.0%
1998	18.5%	4.9%	9.5%	57.7%	4.8%	25.8%	4.8%	3.9%	21.0%
1999	18.5%	4.4%	9.7%	58.0%	3.9%	24.8%	4.9%	4.1%	21.0%
2000	18.5%	3.9%	9.6%	56.0%	3.8%	23.6%	4.8%	4.1%	20.0%
2001	17.9%	4.0%	10.2%	56.7%	1.9%	24.7%	5.0%	4.3%	20.0%
2002	17.9%	5.0%	12.6%	58.3%	0.8%	24.9%	5.1%	5.7%	19.0%
2003	22.2%	6.3%	11.7%	60.6%	-0.9%	25.1%	4.8%	4.3%	20.4%
2004	21.7%	6.6%	12.3%	60.2%	1.8%	24.5%	4.7%	5.5%	19.4%
2005	21.2%	7.6%	12.5%	62.2%	0.8%	23.8%	4.6%	5.9%	18.5%
2006	20.1%	7.6%	12.4%	61.3%	1.6%	22.9%	4.4%	5.4%	18.1%
2007	19.2%	8.0%	12.3%	58.6%	2.5%	23.2%	4.1%	5.2%	18.5%
2008	18.7%	7.6%	15.0%	57.0%	0.2%	23.4%	4.1%	5.2%	17.9%
2009	19.5%	9.4%	16.9%	56.0%	-3.0%	23.2%	4.8%	5.5%	17.9%
2010	19.2%	10.8%	17.3%	58.0%	1.9%	22.2%	4.8%	5.4%	18.0%

2011	19.4%	12.7%	16.7%	56.2%	-1.8%	20.9%	4.5%	5.2%	17.9%
2012	19.4%	15.5%	21.6%	57.4%	-4.0%	21.4%	3.9%	6.2%	18.7%
2013	19.0%	16.2%	26.8%	52.0%	-1.1%	21.3%	4.2%	5.0%	19.5%
2014	18.7%	13.9%	21.7%	52.7%	0.9%	19.2%	4.0%	-	19.5%
2015	17.6%	12.4%	18.4%	53.0%	1.6%	17.9%	3.8%	-	19.0%

Source: (1) Dell'Anno (2007) – 1983 to 2002; Schneider (2015) – 2003 to 2015; **(2)** PORDATA.

TABLE IX – ASSESSMENT OF PERCEIVED RISK OF DETECTION, BY COUNTRY

Country	% stating high	% stating small	Refusal	Don't know
EU-28	36	53	2	9
Lithuania	49	43	2	6
UK	48	44	0	8
Ireland	47	41	1	11
Portugal	**47**	**40**	**1**	**12**
Estonia	44	42	4	10
Austria	41	44	4	11
Italy	39	50	3	8
Slovakia	39	53	1	7
Hungary	39	46	4	11
Poland	38	45	2	15
Belgium	36	60	1	3
Greece	36	57	2	5
Denmark	34	64	0	2
France	34	58	1	7
Germany	34	56	2	8
Croatia	33	59	2	6
Luxembourg	32	54	3	11
Finland	29	66	2	3
Spain	29	58	1	12
Romania	29	48	4	19
Cyprus	28	67	1	4
Latvia	28	62	2	6
Netherlands	25	69	0	6
Bulgaria	25	53	2	20
Czech Republic	24	66	3	7
Sweden	22	76	0	2
Malta	20	57	1	22
Slovenia	14	74	1	11

Source: European Commission (2014)

TABLE X – CONSEQUENCES OF WORKING IN SHADOW ECONOMY, BY EUROPEAN REGION (%)

Country	No social security entitlements	Lack of insurance against accidents	Harder physical working conditions than regular job	Higher risk of losing job	Higher risk of accidents compared with regular job
EU-28	20	19	7	7	6
Western	13	15	4	2	3
East-Central	19	15	11	11	8
Southern	**37**	**34**	**8**	**15**	**11**
Nordic	16	19	8	5	7

Source: European Commission (2014)