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Stock-flow adjustments and fiscal performance: an empirical application to the European Union member states

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Abstract

Stock-flow adjustments (SFA) are an important factor that contribute to changes in government debt other than government budget deficit/surplus and for that reason they may have a persistent influence in explaining the sustainability of fiscal accounts. The existing literature argues that this aggregate can be used to hide a budgetary deficit (through different uses of creative accounting), and to improve, artificially, the fiscal performance of a country. The purpose of this work is to analyse the contents of these adjustments (which are somewhat heterogeneous), to understand its importance in explaining the trajectory of European public debts and to assess whether SFA are related to fiscal transparency and to fiscal rules, in the context of the European fiscal framework. For this, an empirical analysis was applied to the 28 European Union member states between 1996 and 2017, trying to demonstrate the importance of these aggregate in fiscal performance and to find determinants of the SFA and evidence of the relationship between SFA and fiscal transparency and fiscal rules. The main conclusions suggest that SFA tend to increase in periods of crisis and fiscal consolidations and that, all the rest equal, SFA are higher for countries bellowing to the EMU, which may be explained by the higher restrictions and commitment assumed by these countries. We also found evidence that level of expenditure, inflation, government party orientation and fiscal transparency level affect the aggregate. We found no evidence supporting the influence of economic and electoral cycle and the internal fiscal rules on SFA.

Resumo

Para além do saldo orçamental, os ajustamentos défice-divida (SFA) são um fator importante que contribui para as variações da divida pública e, por esta razão, estes ajustamentos podem ter uma influência persistente na explicação da sustentabilidade das contas públicas. A literatura existente defende que este agregado pode ser utilizado para ocultar a ocorrência de um défice orçamental (através de diferentes formas de contabilidade criativa) e para melhorar, artificialmente, o desempenho orçamental de um país. O objetivo deste trabalho é analisar o conteúdo destes ajustamentos, compreender a sua importância na explicação da trajetória das dívidas públicas europeias e avaliar se os SFA estão relacionados com a transparência orçamental e com as regras orçamentais, no contexto do quadro orçamental europeu. Para isso, uma análise empírica foi aplicada aos 28 Estados membros da União Europeia entre 1996 e 2017, de forma a demonstrar a importância deste agregado no desempenho orçamental e a encontrar os determinantes dos SFA e evidência de uma relação empírica entre os ajustamentos défice-divida e a transparência e regras orçamentais. As conclusões sugerem que os SFA tendem a aumentar em períodos de crise ou de consolidação orçamental e que, tudo o resto contante, os SFA são superiores em países que pertencem à UEM, o que pode ser explicado pelo maior número de restrições e compromissos orçamentais assumidos por estes países. Para além disso, resultados demonstram que o nível de despesa pública, inflação, orientação política do governo e nível de transparência orçamental influenciam este agregado. Por fim, não foi encontrada evidência empírica que suporte a teoria que ciclos económicos e eleitorais e as regras orçamentais internas afetem os SFA.

Palavras-chave:

Ajustamentos défice-divida; transparência orçamental; contabilidade criativa; regras orçamentais; União Europeia; Dados em painel

Códigos JEL:

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Introduction

The establishment of fiscal rules in the European context aiming at strengthening fiscal discipline and, specifically, the monitoring of the public debt dynamics has been a real concern since the signing of the Maastricht Treaty in 1992. However, over the last few years and especially during the recent economic and financial crisis in Europe, most of the European Union (EU) member states have shown a significant increase in the public debt level.

Although the budget deficit/surplus is the most monitored fiscal aggregate when it comes to assessing the fiscal performance of a country, there is another factor contributing to changes in government debt, which, according to the existing literature, has become increasingly relevant for the analysis of the fiscal performance of a country – the stock-flow adjustments (SFA). This aggregate, also known as deficit-debt adjustments, is defined, for a given period, as the difference between the change in government debt (a stock) and the general government deficit (a flow) (Eurostat, 2018). As a contributing factor to the increase/reduction of public debt, SFA may persistently influence the sustainability of fiscal accounts and, therefore, should not be explicitly omitted or neglected. Moreover, besides its relevance to assess fiscal discipline, this aggregate can also be indicative of the degree of fiscal transparency, which reinforces the importance of its monitoring for controlling economic performance.

In this line of thinking, the purpose of this work is to analyse and understand the contents of these adjustments (which are somewhat heterogeneous), to comprehend its importance in explaining the trajectory of European public debts and to assess whether SFA are related to fiscal transparency and with European fiscal rules, in the sense that the European fiscal framework may lead governments to resort to some form of creative accounting.

In this context, the key research questions to be answered in this dissertation are: i) What is the composition and the magnitude of SFA in the European context and the importance of closely monitoring this aggregate as part of the evaluation of the fiscal performance?; ii) What is the relation between SFA and fiscal transparency?; iii) Is there a relationship between the requirements of fiscal rules and the SFA aggregate?

The main motivation for the development of this work is to go deep into a fiscal aggregate not very highlighted in the empirical work already done, but also the challenge of adding some important contributions to this scientific area, seeking to find empirical evidence to prove the importance of the deficit-debt adjustments in the analysis of fiscal performances

of the member states. The contributions to the scientific knowledge are the focus on the European fiscal framework and on the performance of the European Union countries, the inclusion of data from recent years, and the performance of an econometric analysis that includes as explanatory variables of SFA a diverse and complete set of economic, financial, electoral and socio-political determinants. Moreover, we aim at contributing for research also by compiling a complete, relevant and easy to understand literature review about the topic.

This dissertation is divided into the following chapters. Chapter 1 reviews the dynamics of public debt, focussing on the main factors contributing to the trajectory of the public debt and stressing the importance of the deficit-debt adjustments to fiscal sustainability. The composition of SFA is presented and a quantitative analysis of the main components for the European countries is developed as well as an analysis of the economic effects and outcomes of SFA. Chapter 2 aims at showing the potential relationship between this aggregate and fiscal transparency, trying to investigate the influence of the fiscal transparency level on the aggregate. Chapter 3 presents the relationship between SFA and the existing fiscal rules within the European fiscal framework and explores the relevance of including this aggregate as a target to improve the monitoring of fiscal performance. In Chapter 4, a descriptive and an econometric analyses are applied in order to address the above-mentioned research questions. Finally, the main conclusions are drawn.

1. The economics of stock-flow adjustments

European Union member states have shown an increase in the level of public debt, especially during the recent economic and financial crisis. The objective is, firstly, to analyse the dynamics of public debt in order to clarify the role of the SFA in this path and then to go deep into this aggregate, presenting the constituent components and the rationale of its classification. This section ends up with the literature review on the connection between SFA and economic outcomes.

1.1 The dynamics of public debt

The dynamics of public debt can be described by three determinants of changes in public debt, namely the primary deficit, the interest-growth differential and the stock-flow adjustments. These three determinants are derived from the following equation:

$$B_t = B_{t-1} + (G - T)_t + i_t B_{t-1} + SFA_t \qquad (1.1)$$

where B_t is the public debt at time t, T_t is the government revenue in period t, G_t is the government primary expenditure in period t, i_t is the implicit interest rate in period t, and SFA_t are the stock-flow adjustments in period t.

According to equation (1.1), if $(G-T) + i_t B_{t-1} > 0$, there is a balance deficit (in this case the budget balance has a negative sign), and the previous equation can be given by:

$$\Delta B_t = \text{BALANCE DEFICIT}_t + SFA_t \qquad (1.2)$$

So, if the SFA are positive, this means that the public debt increases more than the annual deficit, which implies that SFA have a positive contribution to the growth of government debt. On the other hand, if the SFA are negative, the contribution to the public debt increase is negative (Rybáček, 2015).

In the case of a balance surplus, $(G-T) + i_t B_{t-1} < 0$, equation (1.1) can be given by:

$$\Delta B_t = - \text{BALANCE SURPLUS}_t + SFA_t \qquad (1.3)$$

With an annual surplus and a positive SFA, there is a negative contribution of the latter to the public debt decrease, and if SFA are negative, this means that the public debt decreases by more than the annual surplus (Rybáček, 2015).

When dividing the public debt equation by the nominal Gross Domestic Product (GDP), we obtain the equation of the public debt dynamics (Amador, Braz, Campos, Sazedj, & Wemans, 2016), given by:

$$\left(\frac{B}{Y}\right)_t = \left(\frac{G-T}{Y}\right)_t + \frac{(1+i_t)\,B_{t-1}}{(1+y_t)\,Y_{t-1}} + \left(\frac{SFA}{Y}\right)_t \qquad (1.4)$$

where Y_t is the nominal GDP at time t and y_t is the nominal GDP change rate in period t.

$$\frac{B_t}{Y_t} - \frac{B_{t-1}}{Y_{t-1}} = \left(\frac{G-T}{Y}\right)_t + \frac{(i_t-y_t)}{(1+y_t)}\frac{B_{t-1}}{Y_{t-1}} + \left(\frac{SFA}{Y}\right)_t \qquad (1.5)$$

Equation 1.5 shows the factors that influence the public debt path, that is, the determinants of the equation of the public debt dynamics, these being:

- the primary deficit effect, represented by $\left(\frac{G-T}{Y}\right)_t$,

- the interest-growth differential or snowball effect, represented by $\frac{(i_t-y_t)}{(1+y_t)}\frac{B_{t-1}}{Y_{t-1}}$, and

- the stock-flow adjustments effect represented by $\left(\frac{SFA}{Y}\right)_t$.

Thereby, we conclude that the public debt-to-GDP ratio increases with negative primary budget balances, positive interest-growth differentials and with positive stock-flows adjustments, so that SFA can be an important factor in explaining the dynamics of the debt.

Accountably, the stock-flow adjustments (SFA) are defined, for a given period, as the difference between the change in government debt (a stock) and the general government deficit/surplus (a flow) (Eurostat, 2018). This aggregate explains the reason why, sometimes, the existence of a deficit in the public accounts is not reflected in an increase in the public debt (or why a surplus may not produce a debt reduction).

Some authors conclude that SFA may have an important role in explaining the changes in the public debt ratio. Weber (2012) shows that deficit-debt adjustments are significant in explaining the changes in debt and in particular the debt increases. The sample includes data from 1980 to 2010 for 163 countries worldwide, capable of representing low-income, advanced and emerging economies. Also, Eyraud and Wu (2015) provide statistical data of the decomposition of debt changes between 2007 and 2013 for the Euro Area and show that SFA accounted for about 33 percent of the total changes in debt, allowing to conclude that this aggregate is not so residual as expected. In the same context, Campos, Jaimovich, and Panizza (2006) find the same result and conclude, with a panel data of 117 countries and 1900

observations, that deficit-debt adjustments play an important role in explaining the debt dynamics.

1.2 The composition of stock-flow adjustments

Stock-flow adjustments aggregate can be measured by the difference between the changes in public debt and the balance deficit, but the measurement is also possible through an explicitly method. In the past, a complete understanding and analysis of this aggregate was not always possible, due to the lack of the appropriate data, which led to difficulties in the study of SFA and limited its deepening (Seiferling, 2013).

Nowadays, according to Eurostat (2018), SFA are composed by 17 components plus a residual element. These components are divided into three main categories (Table 1), which allow for an explicitly measurement of the aggregate.

The first category, *net acquisition of financial assets*, reflects the changes in financial assets (acquisitions less disposals) held by general governments (consolidated within general government) and is one of the most important components of SFA in the 28 European Union (EU) countries (Jaramillo, Mulas-Granados, & Kimani, 2017). Among the different transactions inside this category, are the ones that arise from the movement of government deposits at banks, net purchases of bills, notes or bonds issued by foreign governments, banks and non-financial corporations, whose assets are considered as liquid. The illiquid assets inside this category are loans to non-government units, shares, among others, and represent the majority of the assets in this category (Jaramillo et al., 2017).

These financial transactions in assets do not have an impact on the deficit and are commonly denominated by "below the line" operations (Reischmann, 2016, p. 2); however, they directly influence the level of debt and therefore are considered to be stock-flow adjustments. A simple example is when the government issues debt, but instead of spending the amount on public spending, retains it as a deposit. Public debt increases, but the government deficit does not have any variation (Reischmann, 2016).

The impact of these transactions on public debt is explained by the need to, sometimes, resort to debt issuance as a form of financing the acquisition of assets (e.g. equity injections into companies) or, oppositely, use the financial assets holding by the government to finance state spending or debt repayment (e.g. through a privatization process) (Rybáček, 2015).

There is an important, often discussed, issue about these transactions of assets, which relates to its accounting. The question is whether they should be considered a financial or a non-financial transaction; in other words, whether they should or not affect the budget balance (Rybáček, 2015). According to von Hagen and Wolff (2006), this question arises when there is, for example, a capital injection in a public company, which is considered a relevant tool to avoid high levels of deficits, since governments try to declare the existence of an economic interest related to the investment in that company, in order to record the injection as a financial transaction, i.e. a stock-flow adjustment instead of a capital transfer (which is a non-financial transaction, influencing the deficit).

Table 1. The composition of the stock-flow adjustments

Stock-flow adjustments
Net acquisition of financial assets
Currency and deposits
Debt securities
Loans
Equity and investment fund shares/units
Financial derivatives
Other accounts receivable
Other financial assets
Adjustments
Net incurrence of liabilities in financial derivatives
Net incurrence of other accounts payable
Net incurrence of other liabilities
Issuances above/below nominal value
Difference between the interest accrued and paid
Redemption/repurchases of debt above/below nominal value
Appreciation/depreciation of foreign currency debt
Changes in sector classification
Other volume changes in financial liabilities
Statistical discrepancies
Difference between capital and financial accounts
Other statistical discrepancies

Source: Eurostat (2018).

The second main category, *adjustments*, is divided into three sub-categories, namely transactions in liabilities not included in the government debt concept, valuation effects and appreciation/depreciation of foreign currency debt and other changes in volume.

The most common concept of public debt in Europe is the Maastricht debt, whose concept excludes some financial liabilities as the financial derivatives (Eurostat, 2018). Furthermore, the European System of National and Regional Accounts (ESA 2010) establishes that the accounting record of a liability in the balance must be made when the obligation arises and not at the time of payment (accrual principle), which may lead to differences between the deficit and the debt (von Hagen & Wolff, 2006). Thus, the so-called *transactions in liabilities not included in government debt* concept emerge.

The *valuation effects*, according to Eurostat (2018), arise due to the following effects: 1) debt issued above or below its face value, which leads to a difference between the debt record value (i.e. face value) and the issue value (relevant for the deficit record); 2) differences between the interest accrued and paid, which reflects another adjustment related with the accrual principle (because interest accrued but not yet paid is not considered in the public debt, but is included in the deficit) and 3) an early redemption or repurchase of debt, above or below face value.

The third component of the *adjustments* category includes the *appreciation or depreciation of foreign currency* and the impact on the debt is due to the exchange rate variations. When a country has public debt issued in foreign currency without hedging, the value of the debt changes according to the exchange rate between the two currencies in question, which results in a change in the stock of public debt without any impact on the deficit/surplus. The importance of these adjustments depends on the "structure of currencies in which debt is denominated" (Rybáček, 2015, p. 8). An example could be the case of a country like Portugal, whose public debt portfolio has loans obtained by the Portuguese State outside the Euro Zone and which are subject to exchange rate appreciation/depreciation. For example, in the specific case of the public debt issued in US Dollars, if euro appreciates or depreciates against dollar, this leads to fluctuations in the face value of the Portuguese debt issued in dollars. This has to do with the public debt itself, so it is recorded directly in the debt rather than in the deficit. This component also includes *other changes in volume*, which result from reclassifications of the institutional sector, for example, when a unit, which was classified as a government institution, is no longer considered one. The adjustment emerges once the debt of the reclassified unit is no longer considered as public debt and the stock of debt must be updated (Eurostat, 2018).

The last of the three main aggregates is called *statistical discrepancies*. This adjustment results from a wide range of statistical data and classification criteria. There is an enormous diversity of data related to the government sector, and it can be difficult to harmonize all statistical calculations without any discrepancy between the deficit and the debt change. Among the causes of discrepancies are data compilation differences, differences between the time of recording and the cash flow. It should also be noted that this component of SFA tends to be related to the quality of the national statistical systems, and so an indicator of the correct appropriation of the deficit measurement (Eurostat, 2018).

Another additional adjustment emerges when there is the need to calculate the aggregate value of debt for all EU countries. This implies aggregate debt denominated in different currencies, like the British pound and the Euro, which creates another adjustment when the exchange rate between the currencies fluctuates.

Despite the high heterogeneity of the components that constitute the SFA, according to Banco de Portugal (2016), Eurostat closely supervises the SFA aggregate in the context of the monitoring of the Excessive Deficit Procedure governed by the Treaty on the Functioning of the European Union. The main objective is to ensure that governments do not use this aggregate to hide public deficit and to artificially improve their fiscal performance.

Thus, it is possible to analyse the decomposition of SFA into the categories and subcategories previously defined for the 28 EU members with detail, using a complete dataset since 2015. Figure 1[1] shows that in 2017 *net acquisition of financial assets* represents a large proportion of stock-flow adjustment in most of the countries and has a positive impact on total SFA in 18 of the 28 countries. The second category with the most expression in the total SFA is *adjustments*, which in 2017 generally had a negative impact on the SFA. As expected, *statistical discrepancies* tend to be close to zero.

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[1] The data displayed are retrieved from Eurostat database, on 14 March, 2019.

Figure 1. Main categories of stock-flow adjustments for the EU-28 as a percentage of GDP, 2017
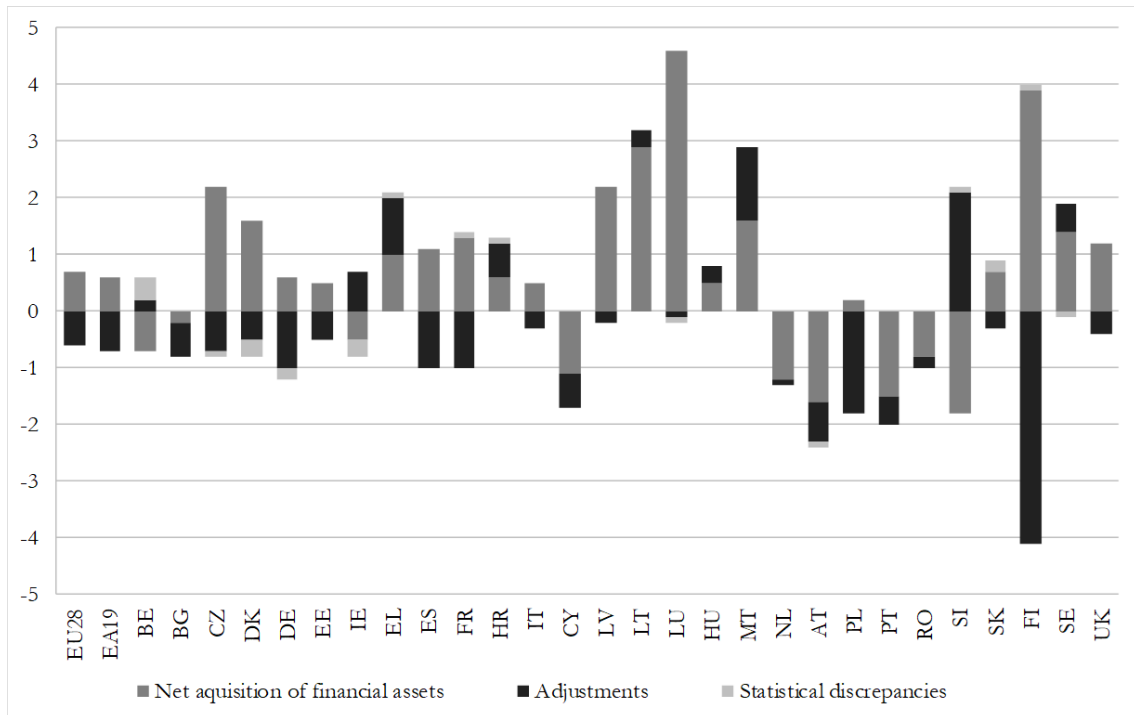
Source: Eurostat (2018).

The analysis of the statistical data available in the same database for the last three years shows that deficit-debt adjustments are close to zero in aggregate terms for the EU and the Euro Area, but most of the countries have an annual SFA higher than 1% of GDP. However, inside these two territories, there is heterogeneity of values, with some countries having a large positive SFA and others having a negative one. Figure 2 shows the SFA for the EU countries in the last three years. In 2015 and 2016, most countries had a negative stock-flow adjustment, being possible to point out the case of Greece in 2015 with a very negative value in this aggregate, but the reverse happened in 2017.

Figure 2. Stock-flow adjustments for the EU-28 as a percentage of GDP, 2015-2017
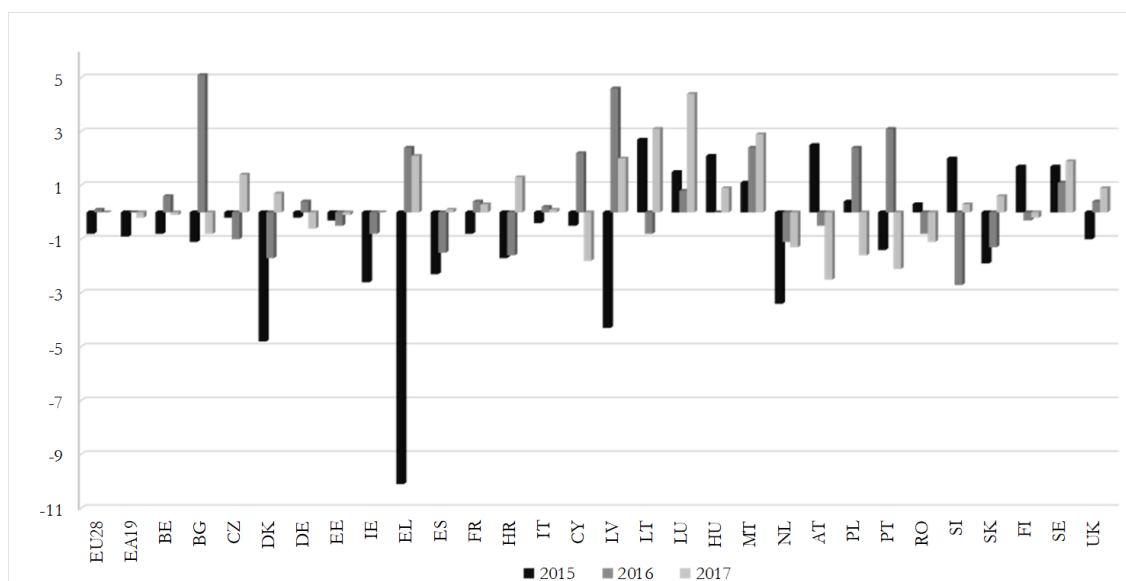
Source: Eurostat (2018).

Although Eurostat is currently monitoring this aggregate, once SFA are considered a residual aggregate of the government public debt, it is sometimes ignored in the debt dynamics analyses, because assuming that this complex aggregate is zero simplifies studies, analyses and forecasts. However, accounting for the impact and significance of SFA to fiscal and economic outcomes may be a step further in improving the monitoring of the sustainability of fiscal accounts.

1.3 Stock-flow adjustments and economic outcomes

The economic and financial analysis of the consequences of the debt accumulation, particularly due to the persistence of primary deficits in public accounts, has already been widely explored. In fact, although Eurostat is currently monitoring SFA, once this aggregate is considered to be a residual component of the government public debt change, it is not widely considered in the analysis of the fiscal performance of a country, with the government deficit/surplus being the most monitored fiscal aggregate when it comes to assessing fiscal performance. However, large and persistent SFA should not be omitted or neglected, once they may have a significant influence on the fiscal and economic performance of a country (von Hagen & Wolff, 2006).

Regarding the impact of the deficit-debt adjustments on the level of public debt, Campos et al. (2006) and Jaramillo et al. (2017) study the debt accumulation for about 117 and 90 countries, respectively, focussing on the debt spikes episodes. The authors include on the

sample high-, emerging- and low-income countries in order to guarantee a significant diversity of data. Both studies are consensual, showing that budget deficits explain a small fraction of debt spikes, in contrast to deficit-debt adjustments, which are considered "one of the key determinants of debt dynamics" (Campos et al., 2006, p. 1). Being a relevant determinant of debt accumulation, which are the consequences of having a high size of stock-flow adjustments? The existing literature focuses on the consequences of the size and the composition of SFA on economic outcomes.

The composition of SFA is very important in determining the consequences of having a high accumulation of this aggregate, and consequently an increase in the public debt. If the accumulation of SFA is made up of a huge amount of illiquid assets, which tends to occur during debt spikes, the probability of having "a non-declining debt path syndrome" is higher when compared to the accumulation of liquid assets (Jaramillo et al., 2017, p. 11). It means that, as the assets are not liquid, it is not so easy to reduce debt by selling these assets, which leads to a greater difficulty in having a non-declining debt performance. The authors use a probit model to estimate the likelihood of debt-to-GDP reduction after these episodes and find out that there is a positive relationship between the average size of SFA and the probability of a "non-declining debt path". However, it should be noted that the results obtained are the product of an analysis focused only on episodes of debt peaks, which are specific events. Thus, SFA may influence the ease of a country recovering from debt episodes or crisis, raising the question of the duration and intensity of debt peaks.

Concerning the impact of the SFA composition on interest rates, and once this fiscal aggregate is usually composed by a huge amount of illiquid assets, it is expected that SFA may influencing the interest rates. Thus, the expectation is that the lower the liquidity of the assets on deficit-debt adjustments, the greater the associated risk, since the lower is the ease of converting these assets into currency. This results in a higher pressure on interest rates, because public lenders will demand a higher rate to offset the risk associated with the public debt (Afonso & Alves, 2017). In order to confirm this theory, Afonso and Alves (2017) assess the financial impact of SFA on interest rates, through a panel data, which included data from 14 EU countries between 1970 and 2015. The estimation results demonstrate that the composition of SFA is, effectively, important to explain interest rates, but the impact is not as linear as expected. Generally, in the panel used, there are more cases when the effect of relief on interest rates dominates, especially during the recent economic and financial crisis (although, some countries show a positive effect of the stock-flow adjustments on the interest rates). This effect is explained by the fact that the magnitude of SFA tends to be justified by

non-recurrent measures, which normally represent sustainability measures, contributing for the sustainability of fiscal accounts (which prevailed over the first mentioned effect), resulting in a decrease of interest rates. Thus, it is possible to conclude that stock-flow adjustments contribute to the fiscal sustainability of countries.

Another important topic of discussion about the consequences of deficit-debt adjustments is related with the impact of these adjustments on debt forecasting, particularly the underestimation of these adjustments. It is expected that an underestimation of SFA influences the debt forecasts, which normally has already a downward bias. The consequences of an over optimistic forecast are diverse and have been widely explored; nonetheless, stock-flow adjustments are normally ignored. According to Jaramillo et al. (2017), huge differences between debt forecasts and actual data are, in part, justified by deficit-debt adjustments, because this aggregate tends to be disregarded. However, in order to improve debt sustainability analyses and also be able to predict and correctly estimate the public debt trajectory, it is necessary to forecast this aggregate with high detail and rigor. This will increase the utility of these predictions and allow governments to better define their fiscal policies and actions, in order to pursue their goals (Jaramillo et al., 2017).

2. Stock-flow adjustments and fiscal transparency

One of the main topics of discussion in the existing literature about stock-flow adjustments is the relationship between this aggregate and fiscal performance. The issue emerges once it is possible to resort to stock-flow adjustments as an instrument to hide public deficit and, therefore, to artificially improve the fiscal performance of a country. This can be very significant, for example, when a country is in a consolidation process after an economic and financial crisis. The level of transparency in public accounts is important in the sense that a country with a higher level of fiscal transparency may, theoretically, have more difficulties in distorting its fiscal performance, since it is easier to monitor public accounts when there is more information. In addition, it is also important to highlight that we are dealing with an endogenous relationship, as the level of transparency may influence the size of the SFA, SFA may also influence the level of transparency of the public accounts.

The purpose is now to discuss and debate this topic, presenting an overview of the existing literature, and showing that there is some empirical evidence supporting the relationship between deficit-debt adjustments and fiscal transparency.

2.1 What is and how to measure fiscal transparency?

The importance and the focus on the concept and measurement of fiscal transparency have increased over time associated with the increase in the number of cases of corruption in the public/governmental sector. Nowadays, the credibility of an institution (such as the government) is closely related to the quality and transparency of the information it produces, in other words, its level of transparency (Hameed, 2005).

Fiscal transparency is, according to (Kopits & Craig, 1998, p. 1), defined as:

openness toward the public at large about government structure and functions, fiscal policy intentions, public sector accounts, and projections. It involves ready access to reliable, comprehensive, timely, understandable, and internationally comparable information on government activities — whether undertaken inside or outside the government sector -so that the electorate and financial markets can accurately assess the government's financial position and the true costs and benefits of government activities, including their present and future economic and social implications.

The measurement of the level of transparency is made through the assessment of the available information related to the fiscal performance of a country, which is typically aggregated in a specific measure: an index of transparency. There is a huge diversity of indices

developed over time, provided by researchers, who resort to the available data to construct them, as von Hagen (1992), Alt and Lassen (2003), Alt and Lassen (2006). Also, there is some empirical work done with pre-existing indices (Gerunov, 2016), that are updated by new works, to facilitate the compilation and analysis of data.

For example, von Hagen (1992) was one of the first authors studying fiscal performance and budgetary discipline, by developing a complex index for the evaluation of the budget transparency for 8 European countries. The index is made up of a set of variables, such as: the existing of special funds; if the budget is presented in one document or in multiple versions; an evaluation of transparency by respondents; whether there is correspondence to the national account or whether the budget includes all loans to non-governmental entities, among others. Alt and Lassen (2003) also create a fiscal transparency index for 19 EU countries, using information from the 1999 OECD questionnaire about budgetary transparency. The authors choose eleven measures, from a set of 76, that they considered to be the crucial dimensions of fiscal transparency and that include some of the same variables used by von Hagen (1992) and also others like whether financial reports are audited, if the budget documentation has a forecast of expenditure for more than a year or if the economic assumptions used in the budget are subject to an independent review. They also complemented the index with an extra measure that assesses the use of the accrual accounting method by governments.

More recently, one of the most complete and popular index was created, according to Gerunov (2016) and Alt, Lassen, and Wehner (2014), the Open Budget Index (OBI). This independent index compares the level of transparency in the public accounts of different countries, specifically in the government budget. The index is made through the analysis of the quantity and the quality of the information that governments publish and a questionnaire completed by researchers typically based in each country. The index is divided into 5 scales, being the highest level the "Extensive Information Available" and the lowest the "Scant or No Information Available"[2]. However, the index is still very limited in terms of data (time and cross-sectional), and there is only data for 2006-2017 for 15 EU countries.

Hameed (2005) also develops a well-known index built on the Code of Good Practices on Fiscal Transparency, approved by the International Monetary Fund in 1998. The code was revised in 2007, but the 4 main pillars, which contributed to the development of the index,

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[2] The data can be retrieved from https://www.internationalbudget.org/open-budget-survey/open-budget-index-rankings/, on 13 March, 2019.

remained the same, namely: clarity of roles and responsibility, open budget process, public availability of information and assurances of integrity. This index, the IMF Fiscal Transparency Index, was after used by some authors who performed empirical studies about SFA, fiscal transparency and creative accounting, as Weber (2012) and Alt et al. (2014).

A last alternative that also represents a good option for the analyses of the level of transparency is the data available from the World Economic Forum (WEF). This forum developed a Global Competitiveness Index, based on 12 pillars, which include, among others, a pillar related to institutions. This pillar evaluates the "legal and administrative framework within which individuals, firms, and governments interact"[3]. In each of the pillars, the WEF evaluates and classifies their current quality and quantity level. For example, in the Institutional pillar they measure the property rights protection, the security level, and, among others, the undue influence and corruption level[4]. This last measure represents a good index for the level of fiscal transparency because it includes a very detailed analysis of whether governments are often allocating illegal public funds to companies or groups, whether the judiciary is independent and whether there are lobbies or interest groups in public contracts.

Finally, there are more options that can be considered as good proxies of the fiscal transparency level, as the Voice and Accountability Index from The Worldwide Governance Indicators, which covers the dimension of fiscal transparency related to measures that assess whether officials are held accountable for their actions, or the Corruption Perception Index related with the perceived levels of public sector corruption.

It is important to note that most of these measures of fiscal transparency have some restrictions. First, some indices are based on countries self-evaluation (e.g. questionnaires), which may create an up down bias, once self-assessment done by governments themselves (or by the population) may be overly optimistic, questioning the terms of comparison of these measures (Alt & Lassen, 2003). Second, there are no consistent and comparative indices for many countries and for several years, once most of the indices previously presented have not been updated, nor expanded to new years and new countries. This way, there is the need to develop a uniform fiscal transparency measure that should be as easy to calculate as possible and available for a significant number of years and countries.

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[3]The data can be retrieved from http://www3.weforum.org/docs/GCR20172018/04Backmatter/TheGlobalCompetitivenessReport2017%E2%80%932018AppendixA.pdf, on 25 April, 2019.

[4]The data can be retrieved from http://reports.weforum.org/global-competitiveness-report-2015-2016/appendix-a-measurement-of-key-concepts-and-preliminary-index-structure/, on 21 April, 2019.

2.2 How can stock-flow adjustments be used to artificially improve the fiscal performance?

The most recent economic and financial crisis in Europe and the necessity of straightening the sustainability of public accounts in the European Union and, particularly, in the Euro Area, led to the imposition of strong fiscal rules. This, combined with the special emphasis given to the public debt and the deficit, being the two most visible indicators when it comes to assessing fiscal performance, strongly contributes to governments resorting to creative accounting (Hameed, 2005; Seiferling, 2013). The incentives to perform these stratagems are diverse, depending, among others, on the fiscal situation, institutional pressure and electoral incentives, as for example, the adoption of a popular policy in order to win elections (Maltritz & Wuste, 2015; Reischmann, 2016).

As it was previously mentioned, stock-flow adjustments were, for a long time, seen as a residual component, whose measurement was implicitly made, but, even now that some institutions like Eurostat closely monitor this aggregate, there are some stratagems that can be used to improve the revealed performance of a country, and stock-flow adjustments can be an easy instrument for that. Nonetheless, the ease of using this aggregate to improve fiscal performance, or even other instruments of fiscal illusion, depends essentially on the level of transparency of public accounts, once the higher the level and the quality of information, the more difficult tends to be the hiding and distorting of fiscal performance. This is because if there is more openness in the public accounts, it is expected that the scrutiny of these accounts will also be greater (Gerunov, 2016).

According to Seiferling (2013), some transactions, like the sale of financial assets, without any rational economic purpose, just to improve the inflow of cash, may improve the fiscal performance of a country, because they represent a decrease in the government debt. On the other hand, in general, a permanently positive value in the deficit-debt adjustments aggregate allows governments to accumulate debt over the years, without exceeding the yearly limit set as the target for the budget deficit (von Hagen & Wolff, 2006). But, SFA may be legitimate and represent an effective adjustment as a result of, for example, a systematic acquisition of assets or of debt appreciation or depreciation (Alt et al., 2014).

Reischmann (2016) and von Hagen and Wolff (2006) enumerate some moments when governments may have a greater incentive to engage in this type of schemes, finding that the amount of SFA is affected by the cyclical component of debt, recession periods and election periods. The scrutiny of the government accounts in some EU countries suggests the use of a

strategy to improve fiscal performance in electoral periods. Among the examples, is the support made to some companies through capital injections, in order to prevent their financial collapse or avoid the privatization of the company. Also, an equity injection can be used as a form of creative accounting, in case the government injects money in a company, and receives goods or services as a counterpart. In this case, the government is just avoiding public spending, turning it into an acquisition of assets (a financial transaction) to, eventually, not increase public spending and the budgetary deficit.

In general, two components of SFA are the most important sources of creative accounting: *shares and other equity* and *net incurrence of other accounts payables* (Alt et al., 2014). The first one occurs when continuing subsidies are accounted as equity purchases, that one may treat them as "below the line" operations, without any impact on the deficit calculations. Examples of Eurostat reclassifications of equity injections are very common, as the case of the Portuguese government injection of capital into seven public companies (as Metro de Lisboa) in 2002 or in 2005 when the Portuguese government injected capital into public hospitals (Alt et al., 2014; Reischmann, 2016). At that time, Eurostat represented by the director Yves Franchet stated that these capital injections guaranteed the subsistence of these companies, representing a support given to their losses (Alt et al., 2014).

Despite the Portuguese government attempt to define these actions as financial investments, Eurostat did not accept the classifications and considered that they should not be reflected in the public accounts as SFA but as a deficit item (Reischmann, 2016). The same happened in 2011 with the government of Ireland, with two capital transfers into state banks, which were reclassified as capital transfers and contributed to the deficit.

The second main source of creative accounting happens when there is accumulation of *other accounts payables*, arising from goods/services delivered, but not yet paid, that contribute to a smaller deficit than the real one, since cash accounting has not yet occurred. The stratagem of delaying payments is not to report the delivery, arguing that there is no institutional information about the goods having already been delivered, in order to guarantee that the accrual principle does not lead to a higher level of deficit. This tends to happen with year-end transactions (Alt et al., 2014).

In this sense, creative accounting or "gimmicks" emerges as a method or a variety of efforts that governments can resort to apparently improve fiscal performance, seen as an important finance statistics as the budget balance and the debt (Koen & van den Noord, 2005; Milesi-Ferretti, 2004). The goal is to hide borrowing from budget transactions, avoiding the

deterioration of the budget balance, because they are directly accounted for in the public debt (through the residual aggregate) (Reischmann, 2016; Weber, 2012). These schemes have no influence on the real performance of a country, being just a form of illusion (Alt et al., 2014).

The analysis of the fiscal performance and the fiscal sustainability of public accounts requires the research of the relationship between budget deficit and public debt, being the investigation of creative accounting evidence largely explored recently. Reischmann (2016) and von Hagen and Wolff (2006) investigate creative accounting in Europe and try to find some empirical evidence. In general, results show the existence of creative accounting, even using different empirical methods.

Reischmann (2016) investigates creative accounting and tries to find some empirical evidence between electoral interests and creative accounting in the EU countries. With a panel data of 27 countries and data from 1970 to 2011, the author uses as a proxy of creative accounting the stock-flow adjustments aggregate, since, as mentioned, this aggregate can be used to hide public deficit. Results show that the amount of stock-flow adjustments tends to be higher in election periods, as proved also by Alt et al. (2014). This reinforces that this aggregate can be an instrument used by governments to support some companies with electoral motives. In addition, the study shows that SFA are used by governments to intentionally improve fiscal performance, specifically to "sugarcoat the budget balance" (Reischmann, 2016, p. 11), which may happen during election periods but also due to specific economic or financial motivations that happen outside election years.

Similarly, von Hagen and Wolff (2006) test the existence of creative accounting through the stock-flow adjustments in Europe, but by resorting to a different process. As it was already concluded, a positive and persistent SFA may be indicative of creative accounting, but this may not always be true. A positive and persistent SFA can instead be indicative of a significant acquisition of financial assets, simultaneously with a budget surplus. Thus, the author studies the existence of a high correlation between stock-flow adjustments and the amount of assets acquired, for 9 EU countries and the 1996-2002 period. The results show that the correlation between SFA and the amount of financial assets acquired, for that period, was not very significant, although some data on assets limitations may compromise the results. However, this may reinforce that there are some "specific effects" that probably explain the deficit-debt adjustments. But it is also necessary to understand that a high level on the *net acquisition of financial assets* component may also be indicative of creative accounting, once for example governments can hide a capital injection by accounting this as an acquisition of financial assets.

2.3 Evidence on the relationship between stock-flow adjustments and fiscal transparency

The relationship between stock-flow adjustments and fiscal transparency has been explored by recent studies, with the goal of finding some empirical evidence about this relationship and the existence of creative accounting. In fact, there is evidence that less transparent fiscal systems tend to have more hidden liabilities and higher deficit-debt adjustments, which may have enormous consequences on economic performance. In these sense, among others, it is possible to point out the work developed by Weber (2012), Chang and Esfahani (2013), Alt et al. (2014) and Seiferling (2013).

Weber (2012) analyses the stock-flow adjustments aggregate and tries to explain the nature of this aggregate, so that one may understand the reason for the existence of such discrepancies between the debt and the accumulation of deficits. Besides the fact that he finds that a significant part of SFA is explained by country-specific factors, the author also tries to find empirical evidence of the relationship between stock-flow adjustments and fiscal transparency. As previously mentioned, Weber (2012) uses an index as the measure of the level of fiscal transparency, which includes information from the index of transparency made by Hameed (2005) about the quality of the budget information pre-existing. The results show that there is a relationship between stock-flow adjustments and fiscal transparency, because countries with a higher level of fiscal transparency tend to have smaller SFA and this aggregate tends to contribute less to the increase of the level of public debt. This is revealed by empirical evidence proving the existence of country-specific factors that explained differences in the average SFA. Among these specific factors, there are the level of fiscal transparency and the ease to resort to fiscal stratagems.

In addition to these studies, Chang and Esfahani (2013) also find evidence that important government characteristics may influence the opportunity cost of incurring in stratagems to hide expenditures, and therefore, to hide deficit. The authors show, using a sample of 82 countries with data from 1970 to 2010, that SFA are not an insignificant and random aggregate, concluding that they are systematically related with some circumstances like the government or economic conditions. In more detail, there is evidence that the size of SFA is linked with country-specific characteristics as the credibility, openness, legislative structure and, among others, the level of transparency, conclusions also proved by Weber (2012). According to the study presented, countries with a smaller level of transparency and with a weaker institutional framework allow governments to hide deficit, because it is easier to do that without anyone noticing.

By contrast, Seiferling (2013) studies the correlation between SFA and fiscal transparency trying to re-examine the empirical work already done but with a more complete SFA dataset that, when compared to previous studies, includes economic flows as the changes in valuation and volume and the financial assets. The author does not find a correlation between the aggregate and fiscal transparency, showing that for that sample of 22 countries there is no correlation.

Finally, the work made by Alt et al. (2014) demonstrates that countries with higher fiscal transparency commonly fulfil the fiscal rules requirements in all the fiscal reports, but sporadically they also violate the deficit limits. However, in recession times, some countries with a lower level of transparency systematically circumvented these rules with creative accounting and fiscal gimmicks in order to keep the apparently good fiscal performance.

Concluding, most of the literature and empirical work made, being Seiferling (2013) an exception, suggest the existence of empirical evidence of a relationship between the degree of fiscal transparency and the aggregate under analysis, providing that SFA may not be a random aggregate.

In this sense, governments have some incentives to limit the level of transparency, as this make it possible for fiscal policy to be more freely used, allowing greater internal flexibility and the use of it for electoral interests and also to fulfil the requirements of fiscal rules, especially within the Economic and Monetary Union. After the most recent economic and financial crisis, that has exposed gaps in the effectiveness of the fiscal governance framework, the monitoring of the fiscal deficits has become a real preoccupation, once excessive deficits are one of the fundamental reasons of crises (Eyraud & Wu, 2015). This led to the necessity of strengthening the framework, which has been happening with successive reforms since 1997. The question that arises is whether the fiscal rules imposed are effective enough to prevent these actions and whether the European fiscal framework can avoid the creative accounting.

3. Stock-flow adjustments and fiscal rules

The European fiscal framework has been designed since the beginning of the European Union, being the goal of this fiscal framework to prevent irresponsible fiscal policies from having destructive effects on the growth and macroeconomic stability. Initially, the European integration was seen as a successful construction, but the most recent difficulties put this success in perspective and absorbed the greatest attention (Alt et al., 2014).

Therefore, the imposition of fiscal rules was mandatory to prevent some risks related with the moral hazard existent in the political and economic union. In fact, the European Union member states have been establishing a complex set of fiscal rules; however, the discussion about its effectiveness and its ability to prevent the moral hazard problem remains quite present. This moral hazard problem arises from the imperfect information existent among different countries and the lack of fiscal discipline and transparency that prevents a perfect coordination between members (Alt et al., 2014; Reischmann, 2016).

Furthermore, fiscal rules emerge as a way to sustain the politicians' behaviour and their operations to win votes, but they also may have a negative impact on fiscal transparency and may represent an incentive for governments to manipulate data. In fact, although European fiscal rules are created to support cooperation, they usually provide incentives for national governments to manipulate the data reported, instead of implementing fiscal procedures. The transparency of the budget process can decrease incentives to manipulation (Alt et al., 2014).

The European fiscal rules were, mainly, defined in the Maastricht Treaty (1992) and in the Stability and Growth Pact (SGP) (1997), being this last the "core of the European fiscal governance framework" (Eyraud & Wu, 2015, p. 5). Among the rules defined, two of them are considered the fundamental rules in government finance: keep the debt limited to 60% of GDP and the annual deficit to 3% of GDP. In this regard, considering the coherence between public debt and public deficit, it is necessary to evaluate the fiscal performance of a country, with SFA having an important role on this relationship. Once governments may resort to stock-flow adjustments to hide part of the annual deficit and to fulfil with the rules defined, they are putting the sustainability of public finances and of the European Union as a whole at risk, which strengthens the need to close monitor this aggregate and the quality of fiscal data (Reischmann, 2016).

As proved by Milesi-Ferretti (2004), the imposition of fiscal rules related to EMU membership may create incentives for governments to use creative accounting to manipulate national accounts in order to guarantee the compliance with them. Also, von Hagen and Wolff

(2006), applying an empirical model to 15 EU countries, with data from 1980 to 2003 in order to study the relationship between deficit and stock-flow adjustments, find that in many years SFA were significant representing an important indicator of the possible use of this aggregate as a regular strategy. The results show that after the inclusion of the rules related to the Stability and Growth Pact and the Excessive Deficit Procedure, there is evidence of a systematic correlation between SFA and deficits, which indicates that the strengthening of fiscal rules has contributed to the increase in the number of fiscal stratagems. According to theses authors, there is also evidence that the tendency to resort to creative accounting is related to the cost of government status and the economic cost of avoiding the rule and tend to be more common in times of recession, since it is used to hide part of the deficit.

In addition, Maltritz and Wuste (2015) study the effectiveness of fiscal rules, the impact of EMU membership and creative accounting. The authors show that there is a connection between fiscal rules and stock-flow adjustments, using data from 27 EU countries. The question that arises is whether fiscal rules are effective in preventing excessive deficits and, at same time, in preventing creative accounting and if fiscal rules are effective in the presence of sizable SFA. Results support the conclusions of the previous literature, showing the existence of an empirical evidence for a positive effect of fiscal rules on the fiscal budget. Also, SFA show a positive impact on primary balance. However, the study does not provide evidence concerning the EMU membership.

Bearing that in mind, and to combat the moral hazard problems identified, it was necessary to fortify the fiscal framework with successive re-definitions of the fiscal rules. The major revisions began in 2005 with the implementation of a more flexible framework in the procedures, as well as with the improvement of the economic sustainability of fiscal rules. The SGP was later revised in 2011 with the Six Pack, representing a significant change in the structure of the framework. In 2013, the fiscal framework was again strengthened with the Two Pack which aimed to fortify budgetary oversight and coordination for the Euro Area countries. In 2012, most of EU countries adopted the Fiscal Compact, whose rules represent a complex "second-round" of fiscal rules, based on structural indicators, which are especially subject to contradictory understandings and measurement problems (Alt et al., 2014). Among other issues, this pact defined the "Golden rule" according to which the budget must be balanced, with a limit of 0.5% of GDP for the structural deficit (if the public debt is less than 60% of GDP, this limit is increased to 1% of GDP). These rules have contributed to an even more complex fiscal framework and should be a cause of concern, given the high difficulty in

monitoring, and controlling the performance of a country (Alt et al., 2014; Collignon, 2012; Eyraud & Wu, 2015).

In addition, the fiscal compact accentuates the importance of the deficit/debt relation, defining that countries must include the rule of structural equilibrium of their internal fiscal rules but not define any boundary to debt. In fact, improving the fiscal transparency emerges as a fundamental goal given the current situation.

According to Maltritz and Wuste (2015), most of the literature argues that the majority of the studies confirm a substantial positive effect of fiscal rules on budget deficits control. The authors show that the existence of fiscal rules tends to decrease deficits expressively, but having stock-flow adjustments a substantial influence on the budget, that could be understood as indicator that the existence of fiscal rules creates some kind of incentives to resort to creative accounting (assuming SFA as a measure of creative accounting).

The Stability and Growth Pact states that countries that are under an Excessive Deficit Procedure must prepare a report with detailed information on their budgetary accounts, reporting the value of the deficit and debt, among other things that include, for example, SFA, since these aggregate can have a considerable impact on the debt level (Piątkowski, 2018). The imposition of these rules has made it possible for Eurostat to monitor SFA and to significantly control the adjustments classified as such in the public accounts, which may imply a reduction in the freedom to use this aggregate as a form of creative accounting.

In fact, the current control over fiscal reporting and the imposition of a higher level of restrictions on SFA aggregate classifications can be a good indicator of a significant improvement in the quality of budgetary accounting at the European level, which reinforces the work made to increase the transparency of public accounts.

4. An empirical assessment of stock-flow adjustments

As suggested by the literature review presented in the previous chapters, in the current context of the economic and monetary integration, the EU member states are under increasing pressure on their public finances: firstly, because EMU members no longer have monetary and exchange-rate instruments but only fiscal policy, and, secondly, because all EU members are subject to the fiscal rules imposed by the European integration.

The consolidation and sustainability of public finances is often assessed by changes in the budget balance (overall or structural); however, monitoring this aggregate may not be enough to ensure that countries improve their fiscal performance or that they are, at least, recovering from a bad performance in past years. There is a set of public revenues and expenditures that, according to European statistical rules, do not pass through the budget balance and are directly recorded in the public debt – the stock-flow adjustments. Therefore, this aggregate is crucial in explaining the component of the public debt path that is not explained by the occurrence of fiscal deficits and to understand its significance may be a further step in improving the monitoring and control of the sustainability of fiscal accounts.

Having in mind that the main purpose of this dissertation is to analyse and understand what this aggregate is, to evaluate its importance in explaining the trajectory of the European public debt, to assess how it is related to fiscal transparency and, finally, to understand whether the requirements imposed by fiscal rules influence or not SFA, we can consider that so far the literature review allows us to know and understand the work developed in this area, and to some extent, meet the proposed objectives. However, in order to provide a more detailed, complete and extensive analysis, an empirical assessment will now be developed for the 28 EU member states between 1996 and 2017, trying to go further in explaining the stock-flow adjustments.

This chapter is divided into the following sections. Section 4.1 presents the strategy that is adopted in this empirical assessment, particularly, the type of analysis (divided into a descriptive analysis and an econometric analysis) and the space and time dimensions of the data. Section 4.2 focuses on the descriptive exploratory analysis of the stock-flow adjustments. Section 4.3 presents an econometric explanatory analysis, in which an econometric model with panel data is developed and estimated, aiming at explaining SFA.

4.1 The empirical strategy

The aim of this empirical work is to contribute to the strengthening of the economic literature by developing a comprehensive empirical application that allows, firstly, to assess the magnitude of SFA in the European context and, secondly, to seek empirical evidence of a relationship between SFA and the economic/fiscal performance and conditions of a country, with particular emphasis on fiscal transparency and fiscal rules. The purpose is to present a comprehensive application that is:

- divided into a two-stage analysis: being the first stage a descriptive exploratory analysis and the second an econometric explanatory one;
- developed for all the 28 EU member states at the time of this investigation[5]. The choice of these countries is motivated by the fact that there is a common fiscal framework for all EU members, as well as an harmonized and robust statistical information due to the internationally compatible EU accounting framework defined in the European System of National and Regional Accounts (ESA). In addition, as 1995 marks the first year of the current ESA series, the data available is complete for all countries and years since that date;
- developed for the 1996-2017 period, given that 1995 marks the first year of the current ESA comparable series, and the variable of interest, stock-flow adjustments, is fully available since 1996.

The longitudinal dataset offers some advantages driven by the use of time and cross series that allow more information and, therefore, more variability, a higher number of degrees of freedom, higher efficiency and lower collinearity among the variables, when compared to other options, which results in a higher accuracy of the results (Baltagi, 2013).

In the descriptive approach, the purpose is to perform a statistical analysis of the fiscal aggregate, in order to understand the magnitude of the SFA in the European context. More precisely, the goal is to present some elements that add and show an overall perspective on the performance of this aggregate (and its subcategories), as well as its relevance to the explanation of the public debt path.

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[5] The countries in the EU at this time of investigation are Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom.

In the econometric explanatory analysis, the objective is to respond to the research questions through panel regressions where the stock-flow adjustments (in percentage of GDP), as the dependent variable, are related to relevant explanatory variables. As explanatory variables, we intend to include different groups of variables, some related to the economic-financial conditions, others to the electoral and socio-political conditions or even the external framework, among others, considering that the level of fiscal transparency and the requirements of the fiscal rules are two variables to be highlighted.

Although some authors have made empirical approaches similar to this one, this work stands out by focusing on the 28 EU members (and not on any other more diverse group) and by including more recent data, up to 2017, that may modify the results. The EU specific framework, rules, and conditions may lead to different results when compared to other groups of countries, for example OECD countries, as the differences between members may be wider in the latter context. Also, in recent years, the economic and financial environment of the EU members has changed considerably, and Eurostat has significantly increased the monitoring and control of this fiscal aggregate. In addition, we intend to make a more complete approach that attempts to explain SFA not only from a specific point of view — e.g. electoral motives (Reischmann, 2016), debt spikes (Jaramillo et al., 2017), or level of fiscal transparency (Weber, 2012) — but in a more complete and rigorous basis, including a model with different sets of explanatory variables.

4.2 A descriptive exploratory analysis

As presented above, the SFA aggregate was seen, for a long time, as a residual aggregate with small impact on the general government debt and not sufficiently relevant to be considered in public account analyses. Also, in some analyses of the public debt dynamics, the aggregate is assumed to be zero, in order to facilitated calculations, forecasts and relationship analyses. This is because, in fact, for large country samples and long periods of time, the SFA average tends to be close of zero. However, its diversity and impact on debt has led researchers and scholars to take this aggregate in economic studies into consideration. Nowadays, some work has been carried out with the objective of investigating the SFA and demonstrating its significance.

Regarding the diversity of this aggregate, and according to section 1.2, SFA are divided into 3 subcategories. Table 2 presents a statistical decomposition of SFA into subcategories over the 1996-2017 period, showing the mean, standard deviation, maximum and minimum

observed for each subcategory in this period. The calculations are based on a sample of 351 observations, given that detailed data about subcategories of SFA is not available for all years and EU member states in Eurostat database.

Table 2. Decomposition of SFA into subcategories[6]

Variable	Mean	Std. deviation	Maximum	Minimum
Stock-flow adjustments	0.117	2.992	13.76 (Netherlands, 2008)	-35.62 (Greece, 2012)
Net acquisition of financial assets	0.471	2.456	23.90 (Greece, 2012)	-8.90 (Greece, 2015)
Currency and deposits	0.348	1.440	5.90 (Bulgaria, 2016)	-4.90 (Latvia, 2015)
Debt securities	0.005	0.762	7.50 (Greece, 2012)	-6.90 (Greece, 2015)
Loans	0.119	0.742	6.90 (Netherlands, 2008)	-4.40 (Netherlands, 2009)
Equity and investment fund share	-0.259	1.400	16.80 (Greece, 2012)	-6.40 (Greece, 2013)
Adjustments	-0.352	3.667	9.80 (Romania, 1997)	-59.60 (Greece, 2012)
Transactions in liabilities not included in government debt	-0.343	1.1971	2.90 (Greece, 2013)	-11.00 (Hungary, 2011)
Valuation effects	-0.136	2.3625	1.2 (Slovenia, 2017)	-58.50 (Greece, 2012)
Appreciation/depreciation of foreign currency debt	0.159	0.7835	7.80 (Romania, 1997)	-2.40 (Hungary, 2012)
Statistical discrepancies	-0.010	0.380	3.30 (Greece, 2000)	-1.50 (Romania, 1997)

N=351. The sample includes Belgium, Czech Republic, Greece, Spain, Latvia, Lithuania, Hungary, Netherlands, Portugal, Romania and United Kingdom over the period 1996-2017; Poland over 2000-2017; Croatia over 2002-2017; Malta over 2004-2017; Estonia over 2011-2017; Bulgaria, Denmark, Germany, Ireland, France, Italy, Croatia, Cyprus, Luxembourg, Austria, Slovakia, Finland and Sweden over 2015-2017.

Source: Eurostat

By analysing Table 2, one can notice that, during the period in analysis, SFA average was 0.117, with the maximum observed in 2008 for the Netherlands and the minimum in 2012 for Greece. In 2008, the Dutch government acquired equities to private banks and granted loans to financial institutions (Reischmann, 2016). On the other hand, in 2012, the negative value observed for Greece is due to operations of debt restructuring (Eurostat, 2014).

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[6] Based on the statistical analysis made by Reischmann (2016) for the 1995-2011 period.

In addition, these statistics prove that *net acquisition of financial assets* is the subcategory with the highest positive impact on debt, on average for this period the impact was 0.471% of GDP. Inside this subcategory, *currency and deposits* and *equity and investment fund share* represent the main transactions. It is important to note that, in terms of maximum, in 2012, Greece recorded the maximum value with *equity and investment fund share* having an impact of 16.80% of GDP.

In what concerns the adjustments subcategory, the average value is negative (-0.352), showing that these adjustments tend to have a negative impact on gross general debt. Specifically, the first two subcategories of adjustments tend to have a negative impact on general gross debt, while appreciations or depreciations of foreign currency debt a positive one.

Finally, statistical discrepancies are close to zero, as expected, with the maximum observed for Greece in 2000 and the minimum for Romania in 1997. However, despite a residual category, relatively small for EU countries, it can be used as an indicator of the of the accuracy of the data available, and, therefore, of the quality of the statistical system (Eurostat, 2018)

To analyse the impact of SFA on debt, Figure 3 presents the differences between the accumulated general government debt changes and the accumulated deficits (which is equal to the accumulated general government debt changes assuming that SFA are zero) over the 1996-2017 period. Differences between these two values represent the sum of the SFA in the period. In general, one can conclude that SFA are significant and persistent over time, representing a substantial source of differences between debt and deficits/surpluses, for some countries.

For example, with a significant positive impact of SFA on public debt it is possible to highlight countries as Luxembourg, with an accumulation of SFA in the period of 67.87% of GDP, Finland of 60.69%, Cyprus of 34.34% and Romania of 29.72%. For all these countries, ignoring the effects of SFA, public debt would be significantly lower than the real one, as shown in Figure 3. On the other hand, in countries such as Greece, Slovakia, Czech Republic and Poland, by ignoring SFA and its effects, the public debt would be significatively higher, with the accumulative SFA over time of -28.85, -21.49, -15.49 and -11.04 % of GDP, respectively.

Thus, from this analysis, it is possible to concluded that even if the SFA are on average close to zero for large samples of countries, within this average value there are quite different observations from each one of them, that a simple average study cannot identify. In fact, SFA are, for some groups of countries, very important to explain the trajectory of the public debt,

given the magnitude of them over the time, which reinforces the need of closely monitor this aggregate as part of the evaluation of the fiscal performance. Therefore, to understand the determinants of the SFA aggregate and the relationship with fiscal transparency, fiscal rules and the political-economic framework is an important step forward in the study of fiscal performance.

Figure 3. Accumulated general government debt changes and accumulated deficits/surpluses, as a percentage of GDP, 1996-2017[7]
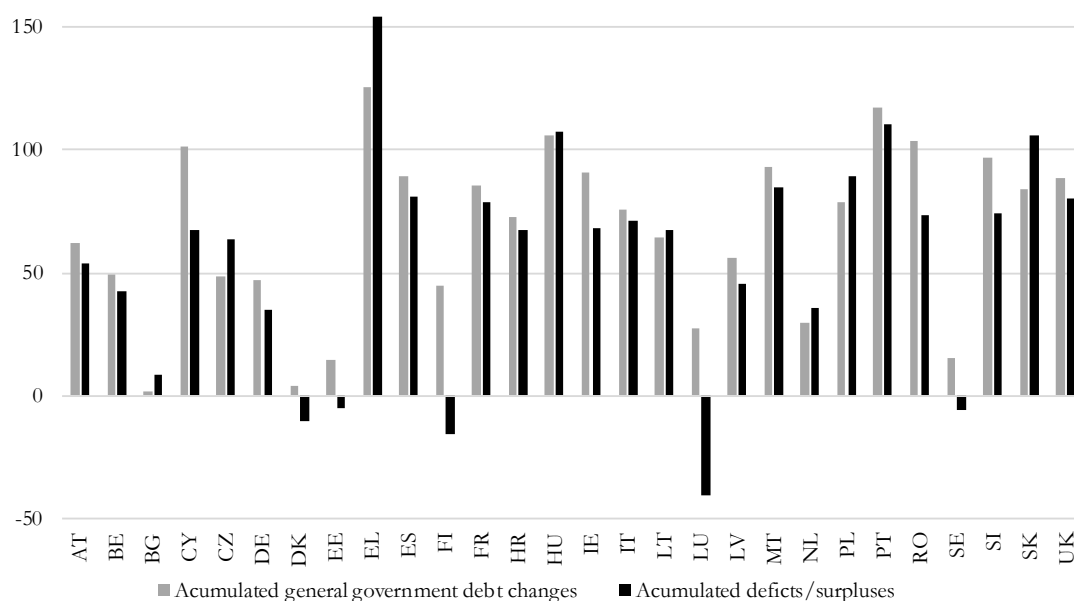
Source: Ameco and own calculations.

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[7] Due to data limitations, the analysis for Bulgaria is for 1998-2017 and for Denmark and Croatia is for 2001-2017

4.3 An econometric explanatory analysis

Stock-flow adjustments have been treated as a random and insignificant residual aggregate in the past years. However, since 2006 some authors have tried to demonstrate that this may not be completely true and that governments may resort to this aggregate as way to change the fiscal performance perception. An econometric explanatory analysis will be developed with the goal of explaining SFA (the dependent variable) through a set of explanatory variables, being the main objective to identify the main factors that might influence and explain SFA. The econometric model, as previously mentioned, is estimated using an unbalanced data panel for the 28 EU member states between 1996 and 2017. This section is divided into the following sub-sections: sub-section 4.3.1 presents the variables to be used as well as the specification of the econometric model to be estimated; sub-section 4.3.2 includes some considerations about the econometric approach, specifically the strategy adopted and results; finally, sub-section 4.3.3 presents a discussion of the results and the conclusions.

4.3.1 Explanatory variables of stock-flow adjustments

The main goal of this econometric analysis is to explain SFA of the EU member states, being the SFA as a percentage of GDP the dependent variable. For this, we resort to an unbalanced data panel, which allows for the analysis of the information through both a spatial and a temporal dimension. The spatial dimension includes data of the 28 EU member states and the temporal dimension ranges from 1996 to 2017, but the data panel is unbalanced because of the lack of observations for some of the explanatory variables, particularly in the early years of the sample period and for some of the countries. Among the explanatory variables, we intend to include a relevant set of indicators that, according to most of the literature, might affect SFA.

Firstly, it is important to note that we attempt to include a meaningful set of variables to provide an econometric approach that is the most complete as possible, so that it is able to explain the dependent variable through different perspectives. Once this aggregate is part of the public debt dynamics and includes transactions that do not have an influence on the budget balance, it may be influenced not only by economic-financial factors, but also, as seen in the previous literature review, by factors related to the political conditions, the external framework and, as highlighted previously, by the fiscal transparency level and the strength of fiscal rules. Given that we include as explanatory variables of SFA the ones presented in the Table 3, we try to anticipate its possible influence on SFA by analysing prior studies and research work.

Table 3. Explanatory variables of stock-flow adjustments

Group of determinants	Explanatory variable	Description	Unit	Source
Economic and financial	GDPGAP	Gap between actual and trend gross domestic product at 2010 reference levels	% GDP	Ameco database
	PEXPEDIT	Total expenditure of general government	% GDP	Ameco database
	INFLATION	Annual average inflation rate, all-items Harmonised Indices of Consumer Prices (HICP 2015 = 100)	%	Ameco database
	CRISIS	Dummy variable: 1 if there was a systematic financial crisis (banking/currency/sovereign debt crisis) in a given country in a given year; 0 otherwise	-	Lo Duca et al. (2017)
	FCONSOL	Dummy variable: 1 if there was a consolidation in a given country in a given year; 0 otherwise	-	Ameco database and own calculations
Fiscal rules	FRI	Fiscal Rules Index (scale from -1 to 1)	-	European Commission
External framework	EMU	Dummy variable: 1 for countries in the Economic Monetary Union; 0 otherwise	-	EU website[8]
Political	ELECTION	Dummy variable: 1 if there was a legislative election in a given country in a given year; 0 otherwise	-	Comparative Political Dataset[9]
	GOVPARTY	Party orientation with respect to economic policy, coded No information (0); Right (1); Centre (2); Left (3)	-	The Database of Political Institutions[10]
Transparency level	CPI	Corruption Perception Index (scale of 0 to 100, where 0 is highly corrupt and 100 is very clean)	-	Transparency International[11]
	VAI	Voice and Accountability Index (scale from -2.5 to 2.5)	-	World Bank Data

Concerning the economic and financial group of determinants, we include some control variables as the GDP gap, representing the business cycle fluctuations, and the public expenditure, representing the size of government. We also include the inflation rate, once, according to Campos et al. (2006) and Weber (2012), inflation increases the SFA. Although there is not a strong theory capable of explaining the relationship between SFA and inflation; in fact, some components of SFA are nominal variables measured in different periods of time, which may explain the use of this variable as explanatory (Campos et al., 2006).

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[8] The data were retrieved from https://europa.eu/european-union/about-eu/euro/which-countries-use-euro_en, accessed on 27 July 2019.

[9] The data were retrieved from the http://www.cpds-data.org/, accessed on 20 July 2019.

[10] The data were retrieved from https://publications.iadb.org/en/database-political-institutions-2017-dpi2017, accessed on 25 July 2019.

[11] The data were retrieved from https://www.transparency.org/research/cpi/overview, accessed on 16 July 2019.

A dummy related with the crisis periods was also included, because it is expected for stock-flow adjustments to be higher during economic recessions and spikes of debt (Alt et al., 2014; Jaramillo et al., 2017). Weber (2012) finds that, between 1980 and 2010, SFA were extremely important to explain debt spikes, but not so for the debt reductions. Indeed, Reischmann (2016) argues that SFA were large during the 2007 financial crisis, reflecting that, in several countries, stock-flow adjustments were higher in this period due to the increase of the acquisition of financial asset. Thereby, we include a dummy that indicates if a specific country in a specific year was in crisis, specifically if there was a banking, currency and/or sovereign debt crisis. Table 4 includes data resulting from SFA conditional statistical analysis and, according to the data about crisis periods, it is possible to identify the existence of a considerable difference between the average SFA in these periods when compare to normal periods. The average SFA in crisis periods is 0.95% of GDP, quite different from the average SFA in normal periods that is 0.32% of GDP.

Table 4. Stock-flow adjustments (as % GDP) conditional descriptive statistics for 28 EU member states, 1996-20017

Variable	SFA condition	Mean	Std. deviation
SFA	SFA (% GDP)	0.47	3.08
CRISIS	Crisis periods	0.95	4.84
	Normal periods	0.32	2.22
FCONSOL	Consolidation periods	0.97	2.87
	Non-consolidation periods	0.35	3.11
EMU	EMU members	0.81	3.66
	EMU non members	0.18	2.44
ELECTION	Election years	0.19	3.87
	Non-election years	0.57	2.73
GOVPARTY	Right-wing governments	0.14	3.51
	Centre-wing governments	1.78	3.23
	Left-wing governments	0.57	2.47

Regarding the fiscal consolidation dummy, the goal is to identify if fiscal consolidation periods affect SFA, in order to find evidence for differences between periods with distinct budgetary requirements. For these, it is important to define the meaning of fiscal consolidation period. The existing literature is not unanimous in defining the term fiscal consolidation; however, we adopted as a fiscal consolidation period a year in which the primary public deficit (as a percentage of GDP) decreases by at least 1.5 percentage points. This measure is proposed by Alesina, Perotti, and Tavares (1998) which argue that fiscal consolidation is seen as a policy

with an impact on the primary balance. It may be interesting to include this variable as an explanatory variable of SFA, because a fiscal consolidation may occur at the expense of high values in the SFA aggregate, once these are not usually considered in the definitions of fiscal consolidation.

During the time period under analysis, it is possible to identify 113 consolidation periods, according to the criterion defined. Table 4 shows the difference between SFA during consolidation periods and non-consolidation ones, proving that SFA average during consolidation years is higher (0.97%) than the average SFA in non-consolidation years (0.35%).

The Fiscal Rules Index (FRI) is an index developed by the European Commission that assesses the strength of the fiscal rules of each country. The index consists of an evaluation of the characteristics of these rules, such as the statutory basis of the rule, the possibility or the ease of a possible revision, the nature of the monitoring or the institutions that supervise the enforcement, the penalization system and the media visibility of the rule. FRI is widely used by researchers in empirical work related to the analysis of the fiscal requirements of a country, as seen in Seiferling (2013) and Maltritz and Wuste (2015).

In the same line of thinking, the inclusion of the EMU dummy variable aims to identify possible differences between EMU members and non-members. In fact, although all EU member countries are subject to fiscal rules, EMU members face an extra commitment level and more fiscal constraints, which may lead to significant differences among these two groups.

According to Milesi-Ferretti (2004), the imposition of fiscal rules and other requirements such as those included in the Stability and Growth Pact create an extra incentive for governments to resort to creative accounting, as a tool to ensure that the rules are met and there are no consequences of breaking them. Thus, variables such as the Fiscal Rules Index may be important in explaining the SFA. In addition, according to Maltritz and Wuste (2015), EMU members are also subject to different events, since they do not have monetary or exchange rate policies to deal with competitiveness problems, economic crises, among others. Focusing on the SFA conditional statistics analysis in Table 4, one can conclude that SFA tend to be, on average for the past 21 years, considerably higher in the EMU members than in the non-EMU members, being the average SFA in the first 0.81% and 0.18% in the second group of countries.

Concerning the political group of variables, there are two main variables of interest to study. The first one, election dummy, examines whether the stock-flow adjustments are influenced by the election periods; in different words, whether they are influenced by the electoral cycle. The goal is to understand if in election years governments tend to increase

SFA, in order to hide the budgetary deficit resulting from electoral policies to win votes. Governments may also engage in some strategies to win elections, as supporting or bailing out to companies or avoiding privatization in these periods to maintain the support of economic and social groups. As proved by Buti, Martins, and Turrini (2007) and Alt et al. (2014), SFA may be affected by political cycle and increase in election years. Both studies show that this aggregate increased in election years. Table 4 presents differences in average SFA in election years and non-election years, showing that, unexpectedly, average SFA is smaller during election years (0.19%) than in non-election years (0.57%), which does not mean that electoral cycle is not relevant.

The second political variable, the government party variable, examines whether political ideology influences SFA, once political orientations can be quite different between different governments in charge. Generally, left-wing governments tend to try to gain more influence by acquiring corporate shares, while right-wing governments are more likely to adopt measures such as privatization and deregulation, which may lead to differences in our aggregate of interest (Belloc, Nicita, & Sepe, 2014; Bortolotti, Fantini, & Siniscalco, 2004; Bortolotti & Pinotti, 2008). By examining Table 4, it is possible to conclude that the differences between average SFA in right, centre or left-wing governments are significant, with the largest average SFA occurring in centre-wing governments (1.78%).

Regarding fiscal transparency, the possible relation between the fiscal transparency level and the SFA was deeply explained in chapter 2 of this dissertation. As mentioned, there is still a gap in the data available, once there is not a strong and systematic index capable of measuring the level of fiscal transparency over time. This empirical analysis involves a cross and long-time series and the indices available are not sufficiently capable of satisfying our goal. Although there is a large number of fiscal transparency indexes, provided by international institutions or researchers, which may seem more appropriate than the indexes chosen as fiscal transparency proxies for this empirical work, the unevenness in country and time dimension limited the resort to these indices, and according to Cicatiello, De Simone, and Gaeta (2017) this is a problem that has affected and limited most studies on fiscal transparency.

For this reason, we selected two indices that we find to be good proxies of the fiscal transparency level: the Corruption Perception Index (CPI) and the Voice and Accountability Index (VAI). The first one, the CPI, is an index developed by the Transparency International movement that measures the perceived levels of public sector corruption, according to experts and business people, where 0 is highly corrupt and 100 is very clean. The second one, the VAI, is part of the Worldwide Governance Indicators (WGI) project whose goal is to report

indicators about governments, which are divided into six dimensions, being VAI one of them. This index captures perceptions of the extent to *which the citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media*[12]. It can represent the dimension of fiscal transparency that evaluates if officials are held accountable for their actions (transparency and accountability). Both indices seem to be the most complete and suitable indices for assessing the quality of institutions/democracy and therefore will be used in our work as a proxy for fiscal transparency.

As discussed earlier, greater fiscal transparency is expected to reduce the ease of resorting to creative accounting to artificially improve fiscal performance. In general, governments with high transparency tend to invest in assets with higher expected returns than governments with a lower level of transparency. Also, increasing fiscal transparency results in a better quality of data and, therefore, in a reduction of the measurement issue that affects the SFA aggregate (Alt et al., 2014; Seiferling & Tareq, 2015).

The descriptive statistics of each explanatory variable can be read in Table 5, being important to highlight the following variables. Concerning the public expenditure variable, the average for the period under analysis and for the 28 EU members is 44.69% and the maximum and the minimum are observed in the same country, Ireland, in 2017 and 2010, respectively, which is curious. Regarding the inflation rate variable, it has a large dispersion (standard deviation is 7.92) and a minimum of -1.70% observed in Ireland in 2017 and the maximum of 154.90% observed in Romania in 1997. The high dispersion of the Corruption Perception Index variable should also be noted. In 1998 and 1999, Denmark was considered the cleaner country of the index (which includes other countries of the world besides EU countries) and in 2000 was the turn of Finland. The minimum was observed in 2002 for Romania, with a CPI index of 26. In relation to the VAI variable, the minimum is observed for Croatia in 1998 and the maximum for Denmark in 2004.

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[12] Retrieved from https://info.worldbank.org/governance/wgi/pdf/va.pdf, accessed on 27 July, 2019.

Table 5. Descriptive statistics

Variable	Mean	Minimum	Maximum	Std. deviation
SFA (% GDP)	0.47	-35.62	13.77	3.08
GDPGAP	-0.32	-15.90 (Greece, 2013)	17.08 (Bulgaria, 1996)	3.37
PEXPEDIT	44.69	26.30 (Ireland, 2017)	65.08 (Ireland, 2010)	6.55
INFLATION	3.43	-1.70 (Ireland, 2009)	154.90 (Romania, 1997)	7.92
CRISIS	0.24	0	1	0.43
FCONSOL	0.19	0	1	0.39
FRI	0.20	-0.95 (Bulgaria, 1996)	3.40 (Netherlands, 2016)	1.02
EMU	0.45	0	1	0.50
ELECTION	0.26	0	1	0.44
GOVPARTY	1.64	0	3	1.10
CPI	63.62	26.00 (Romania, 2002)	100.00 (Finland, 2000), (Denmark, 1998,1999)	18.57
VAI	1.12	-0.29 (Croatia, 1998)	1.80 (Denmark, 2004)	0.35

4.3.2 Strategy and results of estimation

In order to estimate the econometric model identified above, it is important to clarify some points about the strategy to be adopted, which are related to the model specification, the estimation method and the possible endogeneity problem.

Firstly, as mentioned earlier, both fiscal transparency proxies previously described appear to be the most appropriate among the alternatives, given the time and special dimension of this study. Thus, to ensure the robustness of the analysis, both alternatives are used to measure fiscal transparency. These originated two specifications of the econometric model, one for each of the fiscal transparency proxy. Both specifications are presented below.

Econometric specification (1)

$$SFA_{i,t} = \beta_0 + \beta_1\, GDPGAP_{i,t} + \beta_2\, PEXPEDIT_{i,t} + \beta_3\, INFLATION_{i,t} + \beta_4\, CRISIS_{i,t} +$$
$$\beta_5\, FCONSOL_{i,t} + \beta_6\, FRI_{i,t} + \beta_7\, EMU_{i,t} + \beta_8\, ELECTION_{i,t} + \beta_9\, GOVPARTY_{i,t} +$$
$$\beta_{10}\, CPI_{i,t} + \varepsilon_{i,t}$$

Econometric specification (2):

$$SFA_{i,t} = \beta_0 + \beta_1\, GDPGAP_{i,t} + \beta_2\, PEXPEDIT_{i,t} + \beta_3\, INFLATION_{i,t} + \beta_4\, CRISIS_{i,t} +$$

$$\beta_5\, FCONSOL_{i,t} + \beta_6\, FRI_{i,t} + \beta_7\, EMU_{i,t} + \beta_8\, ELECTION_{i,t} + \beta_9\, GOVPARTY_{i,t} +$$

$$\beta_{10}\, VAI_{i,t} + \varepsilon_{i,t}$$

As a first approach, the equation was estimated using a fixed effects model. According to the existing literature, the alternative of the fixed effects model is the random effects model. This model assumes that the unobserved effects result from a large number of random factors and, theoretically, the fixed effects model is preferable to the random effects model in the following situations (Baltagi, 2013): the study is for a specific set of individuals (firms, countries, etc.) belonging to a group and the inference has the goal of studying the behaviour of this set of individuals (the population is the same as the sample). By contrast, the random effects model is more appropriate if we are working with a set of individuals randomly chosen from a large population.

The *Hausman Test* allows to verify the appropriateness of the application of Random Effects (RE) versus Fixed Effects (FE) for a given estimation model. Under the null hypothesis, both estimators (fixed effects and random effects) are consistent but the random effects estimation is more efficient. In case of rejecting the null hypothesis, the random effects estimator is no longer consistent while the fixed effects estimator remains consistent. The results of the *Hausman Test* are displayed in Table 6[13], showing that it is possible to reject the null hypothesis of this test, and, therefore, the fixed effects are more appropriated to this specification.

Table 6. Hausman Test with Least Squares Method

Hausman Test (FE vs. RE Effects)		
Model specification	Statistic	Probability
(1)	31.6913	0.0005
(2)	31.4869	0.0005

Another option could be resort to the pooled OLS estimator, but, it is not appropriate for this case, because one can anticipate the existence of heterogeneity among the countries and the classical assumptions of this linear regression model ignore the variations and

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[13] All the tests and estimations are performed in EViews 10 software.

structures existing in time and cross section data, by assuming the homogeneity among the data.

To test the hypothesis of the existence of unobserved heterogeneity, the *Redundant Test for Fixed Effects* was applied. The *Redundant Test for Fixed Effects* is a F-test that compares the pooled OLS (restricted specifications) to the Fixed Effect model (unrestricted specification). The results in Table 7 show that, with high significance, it is possible to reject the null hypothesis for cross-section effects and, therefore, fixed effect model is not redundant, but instead more appropriated than pooled OLS. But, for the period effects the null hypothesis is not reject, and there are no fixed effects. Thus, the fixed effects should be used only in the cross-section dimension.

Table 7. Results of the Redundant Test for Fixed Effects

Redundant Test for Fixed Effects (cross-section effects)		
Model specification	Statistic	Probability
(1)	1.7036	0.0159
(2)	2.2389	0.0004
Redundant Test for Fixed Effects (period effects)		
Model specification	Statistic	Probability
(1)	1.3016	0.1670
(2)	1.4731	0.0806

Given the performed tests, the model was estimated with the fixed cross-section effects and to correct any heteroscedasticity problem in the data, a robust estimator (*White estimator)* was used, giving consistency to the estimators of the coefficients of the model. The estimation results are presented in Table 8 and analysed in the next section.

Table 8. Estimation results using the Least Squares Fixed Effects method

Explanatory variables	Model specification	
	(1)	**(2)**
GDPGAP	0.0525 (0.5929)	0.0534 (0.6649)
PEXPEDIT	-0.1938 (-2.9197)***	-0.2035 (-3.3923)***
INFLATION	0.0394 (2.4233)**	0.0338 (2.5326)**
CRISIS	1.5185 (4.1908)***	1.4355 (4.0736)***
FCONSOL	0.6821 (1.9328)*	0.7377 (2.1234)**
FRI	-0.2016 (-1.2561)	-0.2079 (-1.2880)
EMU	1.0729 (2.8247)***	1.0721 (2.9612)***
ELECTION	-0.2481 (-0.7626)	-0.2782 (-0.8589)
GOVPARTY	0.3382 (2.3766)**	0.2989 (2.2167)**
CPI	0.0362 (1.4801)	
VAI		-0.7852 (-0.5461)
P-value (F-statistic)	0.0000	0.0000
F-statistic	3.4812	3.5449
Observations	568	592

Notes: *, ** and *** represent statistical significance at levels of 10%, 5% and 1% respectively. The t-student statistics are in brackets. Complete econometric outputs are included in Appendix.

Finally, it cannot be disregard that the relationship between SFA and fiscal transparency may be defined as an endogenous relationship, since one can understand that as the level of transparency may influence the size of the SFA, the SFA may, also, influence the level of transparency of the public accounts. In fact, if governments resort to SFA to hide deficit, they are at the same time influencing the level of transparency of their accounts, according to the fiscal transparency definition. As it is not clear whether it is the existence of SFA that conditions fiscal transparency or the reverse; the more reasonable assumption is that the two variables influence each other.

Thus, it is essential to consider the hypothesis for the explanatory variable of fiscal transparency to be endogenous, once in the presence of an endogenous explanatory variable,

OLS estimates are biased and inconsistent. For this, we applied the 2SLS method of estimation to correct this possible endogeneity problem. As instruments, we used the 2-lagged endogenous explanatory variable.

We address the issue of endogeneity by using as instruments the lagged fiscal transparency proxies, the 2 years-lagged CPI for specification (1) and VAI for speciation (2). Theoretically, lagged variables are only able to provide a partial solution to the issue, once they are predetermined but not strictly exogenous. Nevertheless, as the time dimension of the panel becomes large, the bias that this option introduces becomes negligible (Baltagi, 2013). In the present study, the longitudinal dimension is 21 years, which may be considered relatively large, allowing the bias to have a non-significant effect on the results.

Again, a *Hausman Test* was performed to choose between Random and Fixed Effects. The results of the *Hausman Test* are presented in Table 9, showing that it is possible to reject the null hypothesis of this test (with a significance level of 5%), and, therefore, fixed effects are more appropriated.

Table 9. Hausman Test with 2SLS Method

Hausman Test (FE vs. RE Effects)		
Model specification	Statistic	Probability
(1)	25.6946	0.0042
(2)	18.5529	0.0463

Given that, the specifications were estimated resorting to the 2SLS method with the fixed cross-section effects and a robust estimator (*White estimator)*. The estimation results are presented in Table 10 and analysed in the following section.

In order to test the instrumental variable, the two essential requirements were analysed: to be correlated with the explanatory variable whose endogeneity is suspected and not to be correlated with the random perturbations of the model (Greenland, 2000). By analysing the correlation matrix, it is possible to see that the correlation between CPI variable and the 2 years-lagged CPI is 0.98 and that the correlation between 2 year-lagged CPI and the random error of 2SLS estimation is zero, which demonstrates that both requirements are fulfilled. Concerning the VAI explanatory variable, the correlation between the VAI variable and the 2 years-lagged VAI is 0.96 and the correlation between 2 year-lagged VAI and the random error of 2SLS estimation is zero.

Table 10. Estimation results using the 2SLS Fixed Effects method

Explanatory variables	Model specification	
	(1)	**(2)**
GDPGAP	0.0187 (0.2127)	0.0663 (0.7129)
PEXPEDIT	-0.1938 (-2.5811)***	-0.1759 (-2.5928)***
INFLATION	0.1240 (4.0874)***	0.0702 (2.4625)**
CRISIS	1.6176 (4.3295)***	1.5109 (3.9381)***
FCONSOL	0.9186 (2.3523)**	0.9443 (2.6007)***
FRI	-0.1579 (-0.9357)	-0.1864 (-1.0016)
EMU	0.9185 (1.6540)*	1.1213 (2.3369)**
ELECTION	-0.3337 (-0.9507)	-0.3972 (-1.1629)
GOVPARTY	0.4005 (2.8716)***	0.3291 (2.3089)**
CPI	0.1226 (2.2204)**	
VAI		-0.8781 (-0.3142)
P-value (F-statistic)	0.0000	0.0000
F-statistic	3.8603	3.5159
Observations	520	552

Notes: *, ** and *** represent statistical significance at levels of 10%, 5% and 1% respectively. The t-student statistics are in brackets. Differences in the number of observations result from the use of lagged explanatory variables. Complete econometric outputs are included in Appendix.

4.3.3 Results analysis and limitations

When analysing Table 8 and Table 10 from the previous section, we can conclude that results of both specifications are very similar as the coefficients of estimation and significance levels remain very close. However, there are some points to be compared: the estimation results of Least Squares Fixed Effect method (Table 8) show that variables such as PEXPEDIT, INFLATION, CRISIS, FCONSOL, EMU and GOVPARTY are significant in explaining SFA, but with different impacts and significance levels; in its turn, the results of 2-Stage Least Squares estimation (Table 10) show that the same variables are significant, and the CPI becomes significant.

The PEXPEDIT variable has a high level of significance (*p-value*=0.00), meaning that the null hypothesis associated with its estimation coefficient should be rejected for both specifications. The results suggest that the higher the level of public spending, the lower the deficit-debt adjustments tend to be, *ceteris paribus*. For both equations, the estimate coefficient β_2 is approximately -0.20, meaning that per each increase in public expenditure by 1 percentage point, the SFA tend to decrease 0.20% of GDP, all the rest equal, suggesting that there may be a choice between expenditure and SFA recordings. Conclusions on this variable remain the same for estimates by the 2SLS method.

The INFLATION variable is also significant in explaining SFA, with a *p-value* <0.05 and the expected sign in all specifications and estimation methods. The results show that the higher the inflation, the higher the SFA is, everything else equal. Estimates resulting from Least Squares method express a positive but small impact (β_3=0.05) of inflation in SFA; however, results from 2SLS method demonstrate a higher impact of this aggregate in the dependent variable: β_3=0.12 in specification (1) and β_3=0.07 in specification (2).

In relation to the CRISIS and FCONSOL variables, the results are closely aligned with the existing literature, showing that in "bad times" for public finances and poor economic performance, SFA tend to increase significantly, with the two explanatory variables being important to explain differences in this aggregate. The crisis dummy has a *p-value*=0.00 in all estimations, and a coefficient β_4 between 1.43 and 1.61, which means that in years considered years of crisis, SFA tend to be approximately 1.43 to 1.61% of GDP higher than in the other years, representing a considerable impact, given the average SFA is 0.47%. Regarding the FCONSOL variable, the level of significance varies from estimation to estimation; however, in all of them, for a significance level of 90%, the variable has significance in determining the SFA. The coefficient associated with this variable (β_5) is approximately 0.70 for LS estimation and 0.90 for 2SLS estimation. These results reflect, as previously mentioned, that stock-flow adjustments are higher during fiscal consolidations or crisis periods, essentially because governments increase the number of financial transactions, for example the acquisition of financial assets in this period to support companies.

Results also allow to verify that belonging or not to the EMU is significant in determining SFA. At a significance level of 90%, EMU membership affects SFA. The coefficient β_7 is close to 1.07 (Table 8), indicating that an EMU member state, *ceteris paribus*, has SFA higher than a non-member in about 1.07% of GDP. Indeed, EMU member states countries are subject to stricter fiscal rules than other countries and face an extra commitment

level, which may lead governments to resort to more measures outside of budgetary balance, explaining this effect.

Concerning the political explanatory variables, only the GOVPARTY proves to be significant in explaining stock-flow adjustments, with a *p-value*<0.05 in all the estimations, and a positive coefficient. Thus, centre and left governments are expected to have a higher SFA value. The literature supports this, justified by the fact that, in general, left-wing governments tend to gain more influence by acquiring corporate shares, while right-wing governments are more likely to adopt measures such as privatization and deregulation (Belloc et al., 2014; Bortolotti et al., 2004; Bortolotti & Pinotti, 2008).

Finally, it is important to highlight the results obtained for the proxy for fiscal transparency. In the case of the VAI variable, there is no evidence of a causal connection with SFA. However, in the case of the CPI variable and for estimations by the 2SLS method, which was applied to correct the possible endogeneity associated with fiscal transparency, the significance level (*p-value*=0.03) demonstrates that the variable is significant in determining stock-flow adjustments. However, the sign of the coefficient associated to the variable is not as expected. A higher fiscal transparency level was expected to result in a lower level of SFA, but in fact, the coefficient associated is positive. So, there is no evidence that countries with a higher punctuation in the CPI, i.e. countries with a cleaner perception system, tend to have lower SFA, as expected.

Indeed, results associated with the level of fiscal transparency are, certainly, limited by the lack of a complete panel data index capable of accurately measuring fiscal transparency for the sample under analysis. The existing fiscal transparency indices are weak in terms of dispersion in time and space, and there is no complete database capable of meeting the needs that this study requires for a true empirical analysis of the relationship between the SFA and fiscal transparency. For future development, the creation of a more complete fiscal transparency index would be an important step in the study of SFA.

Finally, by looking at Table 8 and Table 10, there is no evidence of a relationship between SFA and GDPGAP, FRI and ELECTION, which suggests that SFA are not influenced by the economic cycle neither by the electoral cycle. In the case of the Fiscal Rules Index, there is no evidence about the importance of fiscal rules in explaining differences in SFA. This may be explained by the fact that the study in question was carried out for EU member states, that, although there is some heterogeneity between the existing fiscal rules in each country, represent a group that can be considered relatively homogeneous, with little

dispersion in terms of the FRI variable. The low variety of the FRI index in the sample may explain that we do not find evidence of a relationship with SFA.

To ensure that the econometric specification chosen did not affect the results obtained for the FRI variable, we estimated the same specifications including only the FRI variable or the EMU variable and not both at the same time. However, the results obtained were not significantly different.

Conclusion

Over the last two decades, discrepancies between accumulated changes in debt and accumulated deficits/surplus have been significant, which allow to conclude that SFA have been an important contributing factor, positively or negatively, to the changes in public debt. The main purpose of this research was to study this aggregate, the complexity of its accountability, its importance in explaining the European public debts and its relationship with the level of fiscal transparency and with the level of requirement in fiscal rules.

The literature review presented suggests that while most discrepancies have legitimate reasons for being considered SFA, others may represent intentions of governments to engage in stratagems to improve results of annual public accounts. The economic consequences of high SFA accumulation may be considerably, especially in the presence of financial and economic crises, resulting in a higher difficulty in recovering from debt spikes and in effects over interest rates. The relevance of the aggregate leads some scholars and researchers to study and go deep into this aggregate, trying to establish an empirical relationship between this aggregate, fiscal transparency and creative accounting.

The deficit/surplus is one of the most highlighted aggregate in public accounts. One of the intents of governments is to prove that public accounts are healthy and controlled by demonstrating that there is equilibrium between public spending and revenues, which is strengthened by the increase of fiscal requirements and rules imposed to countries, especially in the EMU context. However, this leads to the existence of some incentives to perform stratagems that allow governments to have more flexibility in fiscal accounts and at same time to fulfil exigencies. According to the empirical work already done, SFA may be influenced by economic and financial conditions, electoral motives or governmental issues. The literature suggests that countries with less fiscal transparency tend to have more ability of resorting to SFA as a stratagem and as a form of creative accounting.

Additionally, fiscal rules have been implemented in the European Union framework aiming to strength the membership and to decrease the moral hazard problem associated. Even though the framework remains with some gaps, an important work has been done in order to consolidate and improve the existing rules and the monitoring of each member state.

In fact, SFA tend to be on average close to zero for large samples of countries as the 28 European Union members; however, according to our analysis within this average there are countries that observed high levels of accumulated SFA over the past 21 years and others with high negative values of SFA. This result cannot be identified with a simple average analysis. We proved that SFA are important in explaining the trajectory of the public debt, for some

groups of countries, which reinforces the need for closely monitor this aggregate. Given that, we applied an empirical analysis to the 28 European Union member states between 1996 and 2017, trying to find determinants of the SFA. The group of variables included economic-financial, electoral and socio-political conditions, the external framework, the level of fiscal transparency and the requirement of fiscal rules, with these last two variables to be highlighted.

Results suggest that SFA tend to significantly higher in periods of crisis and fiscal consolidations, than in normal periods, *ceteris paribus*, and that SFA are higher for countries bellowing to EMU, which may be explained by the higher fiscal restrictions and commitment level assumed by these countries in this period and for the ones that belong to the Economic and Monetary membership. We also found evidence that the level of expenditure, inflation, government party orientation and fiscal transparency level affect the aggregate. However, there is no evidence that countries with lower fiscal transparency level tend to have higher SFA. In addition, we found no evidence to support that the economic and electoral cycle and the internal fiscal rules influence SFA.

In the future, this work could be expanded to a more rigorous analysis of SFA by subcategories, which currently is not possible due to limitations on the data presented in the Eurostat database. In fact, the study could have been done for each one of the SFA subcategories to find out if any of these subcomponents is likely to be influenced by the chosen determinants. Actually, not all subcategories can be easily used as strategy to artificially increase fiscal performance; however, the lack of complete data for pre-2015 for each EU country does not allow, nowadays, for this type of analysis.

Moreover, the existing fiscal transparency indices are sparsely dispersed in time and space and there is no complete database capable of meeting the needs that this study requires for a rigorous empirical analysis of the relationship between the SFA and fiscal transparency. This constitutes the major limitation of this empirical work. We resort to two fiscal transparency proxies that seem to be the most appropriate, within the completely available data that exists for the time and spatial dimension of our panel data; however, for future development, the creation of a more complete fiscal transparency index would be an important step in the study of SFA.

List of the country codes

EU28	European Union (28 countries)
EA19	Euro Area (19 countries)
AT	Austria
BE	Belgium
BG	Bulgaria
CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
EE	Estonia
EL	Greece
ES	Spain
FI	Finland
FR	France
HR	Croatia
HU	Hungary
IE	Ireland
IT	Italy
LT	Lithuania
LU	Luxembourg
LV	Latvia
MT	Malta
NL	Netherlands
PL	Poland
PT	Portugal
RO	Romania
SE	Sweden
SI	Slovenia
SK	Slovakia
UK	United Kingdom

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Appendix

EViews 10 Estimation outputs

Specification (1) estimated with Panel Least Squares - Cross-section Fixed Effects

Dependent Variable: SFA
Method: Panel Least Squares
Date: 08/16/19   Time: 22:17
Sample: 1996 2017
Periods included: 22
Cross-sections included: 28
Total panel (unbalanced) observations: 568
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.310933	3.512014	1.512219	0.1311
PEXPEDIT	-0.193778	0.066370	-2.919677	0.0037
GDPGAP	0.052487	0.088531	0.592858	0.5535
INLFATION	0.039365	0.016244	2.423318	0.0157
CRISIS	1.518527	0.362350	4.190775	0.0000
FRI	-0.201565	0.160472	-1.256079	0.2096
FCONSOL	0.682126	0.352913	1.932844	0.0538
EMU	1.072938	0.379835	2.824747	0.0049
ELECTION	-0.248090	0.325331	-0.762578	0.4461
GOVPARTY	0.338230	0.142317	2.376585	0.0178
CPI	0.036171	0.024438	1.480138	0.1394

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.195511	Mean dependent var	0.462380
Adjusted R-squared	0.139348	S.D. dependent var	3.110991
S.E. of regression	2.886108	Akaike info criterion	5.022253
Sum squared resid	4414.697	Schwarz criterion	5.312747
Log likelihood	-1388.320	Hannan-Quinn criter.	5.135612
F-statistic	3.481159	Durbin-Watson stat	1.943705
Prob(F-statistic)	0.000000		

Specification (2) estimated with Panel Least Squares - Cross-section Fixed Effects

Dependent Variable: SFA
Method: Panel Least Squares
Date: 08/16/19   Time: 22:16
Sample: 1996 2017
Periods included: 22
Cross-sections included: 28
Total panel (unbalanced) observations: 592
White diagonal standard errors & covariance (d.f. corrected)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.013929	3.158277	2.854066	0.0045
PEXPEDIT	-0.203481	0.059984	-3.392283	0.0007
GDPGAP	0.053421	0.080334	0.664983	0.5063
INLFATION	0.033831	0.013358	2.532672	0.0116
CRISIS	1.435492	0.352388	4.073616	0.0001
FRI	-0.207879	0.161395	-1.288014	0.1983
FCONSOL	0.737607	0.347378	2.123356	0.0342
EMU	1.072065	0.362039	2.961189	0.0032
ELECTION	-0.278166	0.323869	-0.858884	0.3908
GOVPARTY	0.298933	0.134858	2.216657	0.0271
VAI	-0.785198	1.437813	-0.546106	0.5852

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.191430	Mean dependent var	0.475737
Adjusted R-squared	0.137428	S.D. dependent var	3.099977
S.E. of regression	2.879095	Akaike info criterion	5.014865
Sum squared resid	4592.210	Schwarz criterion	5.296239
Log likelihood	-1446.400	Hannan-Quinn criter.	5.124464
F-statistic	3.544881	Durbin-Watson stat	1.943090
Prob(F-statistic)	0.000000		

Specification (1) estimated with 2 Stage Least Squares - Cross-section Fixed Effects

```
Dependent Variable: SFA
Method: Panel Two-Stage Least Squares
Date: 08/17/19   Time: 12:27
Sample (adjusted): 1998 2017
Periods included: 20
Cross-sections included: 28
Total panel (unbalanced) observations: 520
White diagonal standard errors & covariance (d.f. corrected)
Instrument specification: C PEXPEDIT GDPGAP INLFATION CRISIS FRI
      FCONSOL EMU ELECTION GOVPARTY CPI(-2)
```

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.486873	5.475432	-0.088920	0.929:
PEXPEDIT	-0.193841	0.075101	-2.581064	0.010
GDPGAP	0.018732	0.088062	0.212717	0.831(
INLFATION	0.124028	0.030344	4.087391	0.000
CRISIS	1.617576	0.373614	4.329541	0.000(
FRI	-0.157858	0.168713	-0.935663	0.349!
FCONSOL	0.918624	0.390515	2.352342	0.019
EMU	0.918505	0.555333	1.653971	0.098i
ELECTION	-0.333666	0.350982	-0.950663	0.342:
GOVPARTY	0.400536	0.139480	2.871631	0.004:
CPI	0.122595	0.055213	2.220397	0.026!

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.213010	Mean dependent var	0.49635
Adjusted R-squared	0.152598	S.D. dependent var	3.16000
S.E. of regression	2.908921	Sum squared resid	4078.59
F-statistic	3.860318	Durbin-Watson stat	1.96765
Prob(F-statistic)	0.000000	Second-Stage SSR	3997.84
Instrument rank	38		

Specification (2) estimated with 2 Stage Least Squares - Cross-section Fixed Effects

Dependent Variable: SFA
Method: Panel Two-Stage Least Squares
Date: 08/17/19   Time: 12:31
Sample (adjusted): 1998 2017
Periods included: 20
Cross-sections included: 28
Total panel (unbalanced) observations: 552
White diagonal standard errors & covariance (d.f. corrected)
Instrument specification: C PEXPEDIT GDPGAP INLFATION CRISIS FRI
        FCONSOL EMU ELECTION GOVPARTY VAI(-2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.708698	4.321710	1.783715	0.0751
PEXPEDIT	-0.175946	0.067858	-2.592844	0.0098
GDPGAP	0.066319	0.093021	0.712943	0.4762
INLFATION	0.070242	0.028524	2.462536	0.0141
CRISIS	1.510877	0.383653	3.938137	0.0001
FRI	-0.186383	0.186069	-1.001684	0.3170
FCONSOL	0.944317	0.363104	2.600678	0.0096
EMU	1.121289	0.479820	2.336896	0.0198
ELECTION	-0.397235	0.341593	-1.162889	0.2454
GOVPARTY	0.329060	0.142518	2.308901	0.0213
VAI	-0.878061	2.794846	-0.314172	0.7535

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.201892	Mean dependent var	0.513256
Adjusted R-squared	0.144441	S.D. dependent var	3.131950
S.E. of regression	2.896942	Sum squared resid	4313.629
F-statistic	3.515871	Durbin-Watson stat	2.001628
Prob(F-statistic)	0.000000	Second-Stage SSR	4313.199
Instrument rank	38		