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Introduction

Mariangela Bonasia and Rosaria Rita Canale

This monograph collects the theoretical and empirical contributions of some members of CRISEI on a wide range of topics for the year 2013. This year the focus of the researchers concern particularly on topics related to fiscal transparency over public budget, fiscal sustainability and public spending, financial literacy, money demand and pension policy.

The first paper analyse the importance of fiscal transparency in determining fiscal performance of a country by ensuring sound budgetary positions. De Simone, Di Maio and Gaeta, *More on Fiscal Transparency: Measuring Citizens' Capability of Effective Control over Public Budget*, propose a measurement of citizens' capability of effective control over the public budget developing a composite index by means of Non Linear Principal Component Analysis. They defined it as resulting from the availability of clear information about the public budget content and from the existence of institutional arrangements that allow citizens' involvement in budget oversight . In their opinion, both of these aspects measure meaningful citizen participation in resource allocation and concern the exercise of people's fiscal sovereignty at both national and supranational level. The results of their analysis show that there is a considerable cross-country variability in levels of citizens' capability of effective control over public budget. Furthermore, they found that the level of democracy, geographical position, socio-economic characteristics and the legal origins of the country show significant correlations with their index. These results suggest improving international fiscal transparency standards and codes by explicitly taking into account the effective involvement of citizens in the budget process, together with the provision of publicly accessible information.

The second contribution intend to validate standard financial literacy indexes using expectations data. Paiella, *A Note on the Validation of Financial Literacy* argues that the willingness to answer subjective expectations questions on future asset returns can provide an excellent basis for a validation exercise. Her plan is to predict this willingness using standard financial literacy measures plus a broad set of controls capturing numeracy and cognitive abilities, and addressing the probability reasoning critique. From the estimation of simple

probit models, she finds strong evidence of positive correlation between responding expectations questions and answering correctly the questions designed to appraise individual financial literacy, even after controlling for formal education which captures numeracy and generic cognitive skills. This evidence suggests that these questions do capture individual financial literacy.

With their study, Daniele, Foresti and Napolitano, *The Stability of Money Demand in the Long-run: Italy 1861-2010*, intend to investigate the consistency of the stability of money demand in Italy over a very long time period (1861-2010) that allow them to cover all the relevant changes occurring in the Italian monetary policy regime and financial system. Despite these institutional changes, their results show that the Italian money demand can be considered to be relatively stable. Furthermore, thanks to the methodologies employed, the results show that the estimated relation adopting M1 as a proxy for money demand is more stable with respect to the estimation using M2. In more general terms, this analysis suggests that a narrow monetary aggregate can provide a more stable money demand and that the main sources of instability of money demand are the less liquid assets considered in broader aggregates.

The fourth contribution analyses the different degrees of rigidity of fiscal policy in EMU countries derived by the constraints defined by the Stability and Growth Pact. Despite the current prescription of the European institutions, since the birth of the EMU, fiscal policy has not been defined by the same degree of rigidity. In this framework, Canale, *Fiscal sustainability and foreign debt in EMU countries: financial markets as the dissuasive arm of the Stability and Growth Pact* shows that the increase in government bond yields is not directly linked to default probability; rather it is due to liquidity needs that cannot be satisfied on domestic markets. In times of crisis the deficit/GDP ratio tends to rise and sends the signal that governments are relaxing their fiscal stance. Under conditions of liquidity constraints, markets increase the interest rates applied. Due to the sharp increase in refinancing costs governments, which cannot rely on a national central bank, are forced into fiscal retrenchments. Such retrenchments have little chance of success due to their real effects upon the GDP. The high cost of exiting the EMU means that, in the absence of a shared bailout

mechanism, financial markets give policy prescriptions and exert political pressure without having fiscal sovereignty.

The fifth paper studies the fiscal decentralization process by analysing the Italian regional (NUTS2 level) public spending in various sectors during the period 1996-2010. De Siano and D'Uva, *Does decentralization affect regional public spending in Italy?* uses spatial panel model to detect the presence of spatial interdependencies of Italian regional public spending and its determinants. In particular, their analysis controls for the impact of the reform of the constitutional article no. 117, in the perspective of wider administrative decentralization. The results of their investigation show that administrative decentralization has strongly increased spatial interdependencies of public spending choices. The matrices that best reveal the presence of regional public spending spillovers are those based on geographical distance. As regards the determinants of regional public spending, the main findings are the presence of congestion and mobility effects. Particularly strong after the constitutional reform is the shift in the demand to the private sector in particular for education, the mobility of individuals towards richer regions for health services and, finally, a positive correlation between left-wing governments and total and general administration expenditures.

The Italian pension system is the topic of the sixth contribution by Bonasia, *The Italian Pension System before and after Monti-Fornero reform: a note*. The last three decades were characterized by an economic and demographic emergency even further exacerbated by the recent economic and financial crisis. This situation led to a deterioration in the sustainability of pension systems. The author examines the most important reforms of the Italian pension system that have been adopted since the nineties until the year of the Monti-Fornero reform, with the aim to curb the dynamics of spending on pensions. She then describes the structure of supplementary pensions and the measures adopted in Italy to encourage the take-off. Finally, it discusses the current situation of pension accounts to take stock of what has been really done and what still needs to be done.

The final paper is by Pietroluongo, *Some numerical methods for the time of ruin*. The aim of her study is to obtain some approximate formulae for the distribution of the time to ruin by using classical methods of probability theory, Gram-Charlier and Edgeworth series. Subsequently, she deduces some asymptotic results for moments of the time to ruin.

More on Fiscal Transparency: Measuring Citizens' Capability of Effective Control over Public Budget

Elina De Simone, Amedeo Di Maio and Gaeta Giuseppe Lucio

Abstract

This paper proposes an index aimed at measuring citizens' possibility of effective control over the public budget. An effective public finance monitoring power results, first of all, from the availability of clear information about the public budget content and from institutional arrangements that allow citizens' involvement in budget oversight. Our index is built using selected data from the Open Budget Initiative dataset and Non Linear Principal Component Analysis. Our analysis shows that countries differ widely in their levels of citizens' capability of effective control over public budget and that socio-economic and institutional characteristics can explain at least part of this variability. We conclude by suggesting how to redesign the international framework of norms and codes of fiscal transparency in order to include the pivotal issue of effective citizens' control on fiscal data.

Keywords: fiscal transparency; public budget control

JEL classification: H61, E62

1. Introduction

The upward trend of public deficit and debt-to-GDP ratios across many EU Member States and OECD countries since the mid Seventies is the historical background which gave rise to the literature on the institutional aspects of fiscal policy (Hemming and Kell, 2001)¹. A part of budgetary institutions, fiscal transparency, mostly meant as “openness toward the public at large about government structure and functions, fiscal policy intentions, public sector accounts, and projections” (Kopits and Craig, 1998, p.1), increases the policymakers’ accountability and is considered a valuable solution to address the issue of deficit bias (Hemming and Kell, 2001; Alt and Lassen, 2006; Debrun and Kumar, 2007).

As a matter of fact, in response to the Council Directive 2011/85/EU, a very recent report of the European Commission suggests: “for the sake of accountability and transparency, government entities should report in a complete and comparable manner on their use of public resources and their performance” (EU Commission 2013, p. 6).

Moreover, since Alesina and Perotti’s 1996 paper, economic literature assumes that fiscal transparency directly affects the fiscal performance of a country by ensuring sound budgetary positions² (Kopits and Craig, 1998; Alt and Lassen, 2006; Leachman et al., 2007; Debrun and Kumar, 2007; Augustine et al. 2011).

Quantitative measures of fiscal transparency mostly assess compliance with international standards (Hameed, 2005; Bastida and Benito, 2007; Augustine et al, 2011; Weber, 2012) and have been used as a rating tool in order to assess the fiscally responsible behavior of different countries.

The majority of these studies consider the importance of fiscal transparency as a monolithic tool to address macroeconomic policy, but only very few contributes discuss possible conceptual shades of fiscal transparency. For example, Heald (2006) discusses the difference between nominal and effective transparency, which informs the problem of citizens’ ability of “processing, digesting, and using the information” (Heald, 2006, p.35).

¹ Similar justification for fiscal governance is provided on the official site of DGEcoFin (http://ec.europa.eu/economy_finance/db_indicators/fiscal_governance/index_en.htm)

² Recent contributions on the role of institutions for sound fiscal policy can be found in Bank of Italy (2012)

Recalling Puviani's idea of "material progress" to the budget (Puviani, 1903), i.e. the knowability, predictability, controllability of the budget by citizens, we propose to assess fiscal transparency by focusing specifically on the availability of clear information about the public budget content to citizens and on the existence of institutional arrangements that allow citizens' involvement in budget oversight. Both of these characteristics contribute, in our opinion, to the determination of citizens' capability of effective control over public budget, which in turn may ease the correspondence between citizens' preferences and allocative choices expressed by budget items. In this perspective, fiscal transparency consists in the availability and intelligibility of budget and financial information to the public audience and the opportunity to use these data and thus exercise the democratic right to shape governments' budget allocations (Justice and Dülger, 2009).

To the best of our knowledge, there has been no effort toward developing a measurement of citizens' capability of effective control over the public budget. Measures of fiscal transparency based on the International Budget Partnership (IBP) questionnaire, such as the budget disclosure indicators by Rios et al. (2013) and the Open Budget Index (Seifert et al. 2013), take only partially into account the availability of instruments that ease the presentation of budgetary information to the public and the extent of citizens' involvement in budget oversight.

Our analysis relies on data provided by the 2012 Open Budget Survey, which was developed by the International Budget Partnership (2012) and contains information about multiple features of budget transparency in 101 countries.

After a selection of variables useful to measure the availability of clear information about the public budget to citizens and the existence of institutional arrangements that allow citizens' involvement in budget oversight, we combined these variables in a composite index by means of Non Linear Principal Component Analysis (NLPCA; Gifi, 1990; Michailidis and de Leeuw, 1998).

The remainder of this paper is organized as follows: section two provides a review of the literature about fiscal transparency, a comprehensive analysis of indexes developed by scholars and international organizations to measure it and a discussion of the concept of citizens' capability of effective control over the public budget. The third section describes

data and methodology used to devise our index of citizens' capability of effective control over the public budget. Section four contains a discussion of our results and provides an empirical analysis focused on socio-economic and institutional factors that can explain cross-country variability in our index scores. Finally, section five provides some conclusive remarks.

2. Literature review

The most common definition of fiscal transparency concerns the generic quality, diffusion and ease of access of fiscal data and denotes the total disclosure of financial and non financial information regarding governmental decision-making procedures and transactions, the roles of various State bodies, and the terms used in the budget law in a timely and systematic way (Kopits and Craig, 1998).

However, far from being a single principle, fiscal transparency entails multiple dimensions, which do not simply refer to different areas of the budgetary information (e.g. fiscal reports; fiscal forecasts, contingent liabilities) but also concern: upwards and downwards transparency (according to which part of the vertical relationship between principal and agent is affected by the provision of information); outwards and inwards transparency (relating to the horizontal relationships inside and outside the organization); event (measurable) and process transparency (not measurable); transparency in retrospect (ex post) versus transparency in real time (continuous surveillance); nominal versus effective transparency (which gives raise to transparency illusion, as we will explain later); the timing of introduction of transparency and the habitat of transparency³.

Far from discussing in detail the conceptualization of fiscal transparency, economic literature, with only few exceptions (Heald, 2003; Heald, 2006; Kauffmann and Bellver, 2005), focused on fiscal transparency as an institutional device “necessary for macroeconomic stability and for surveillance and policy advice” (EU Commission, 2013, p. 5). As Blöndal (2003, p. 10) clarifies, fiscal transparency belongs to the seven institutional features that are necessary to control public expenditure: “medium-term budget frameworks; prudent economic

³ See Heald (2006) for a complete description.

assumptions; top-down budgeting techniques; relaxing central input controls; focus on results; budget transparency; modern financial management practices. Although they are identified as seven separate features, they do in fact build on each other and must be seen as a package” (Blöndal, 2003, p. 10). In brief, fiscal transparency together with stricter fiscal rules or binding fiscal targets, the implementation of traditional institutional reforms, and the creation of independent fiscal authorities are invoked to overcome the problem of deficit bias (Von Hagen and Harden, 1995; Poterba and Von Hagen, 1999; Hemming and Kell, 2001; Debrun and Kumar, 2007; Deroose and Kastrop, 2008).

The importance of transparency of public finance was also underlined by the European Institution. In the Council Directive 2011/85/EU *on requirements for budgetary frameworks for the Member States*, the Council recalls that fiscal transparency increases the quality of budgetary forecasts, recommends “arrangements for independent monitoring and analysis, to enhance the transparency of elements of the budget process” (Article 1, c.f) and includes a whole chapter focused on transparency (Chapter VI).

International organizations like the International Monetary Fund (IMF) and the Organization for Economic Co-operation and Development’s (OECD) were also engaged in issuing standards on fiscal transparency (IMF, 1998, 2001 and 2007, actually under revision⁴; OECD, 2002) covering many aspects of budget systems and budget actors.

There are several fiscal transparency measures, provided both by international institutions and developed in academic papers. The empirical research on fiscal transparency is limited, but expanding at the same time: the majority of indexes of fiscal transparency assess levels of openness, ease of access and monitoring of governments’ fiscal decision-making (Alt and Lassen, 2006) and “typically aim at capturing all or some of the dimensions of fiscal transparency identified in Kopits and Craig (1998)” (Arbatli and Escolano, 2012, p. 6).

We can categorize these measures as such⁵:

- 1) Indexes based on IMF’s Fiscal Transparency Reports on the Observance of Standards and Codes (ROSC). In particular, Hameed (2005), relying on ROSC data, calculated a

⁴ <http://www.imf.org/external/np/exr/consult/2012/FAD/index.htm>

⁵ We are aware that our categorization of fiscal transparency measures may appear too simplistic because there is a certain amount of overlap between the different standards in terms of the types of documents and specific disclosures that they cover but we think it’s helpful in distinguish among the main sources of data used.

summary index of fiscal transparency as a mean of all the practices (data assurance, medium term budgeting framework; budget execution reporting, and fiscal risk disclosure)⁶. Similarly, Dabla-Norris et al. (2010) developed a sub-index assessing transparency in low-income countries at all the three stages of the budget process (planning, approval and implementation) by using multiple sources (International Budget Partnership (IBP), Public Expenditure and Financial Accountability (PEFA) reports and ROSC)⁷: Augustine et al. (2012), using IMF framework and data, construct a Fiscal Transparency component which is obtained as an average score resulting from three subcomponents, namely Open Government, Autonomous Budget/Audit Process and Independent Forecasting, which mainly concern the availability of information about the government accounts;

- 2) Indexes based on compliance with OECD requirements⁸. Bastida and Benito (2007) put together an additive index of fiscal transparency based on OECD/World Bank Budgeting Database in order to assess to what extent OECD Best Practices (OBP) have been actually fulfilled by each country. OBP sections were split into 40 dummy variables. Each one of these variables took the value ‘ 0 ’ when the country did not comply with each corresponding best practice and ‘ 1 ’ when the country did. The final aggregate index is the sum of scores registered for the selected variables and ranges from 0 (country does not meet any OBP recommendation) to 40 (country meets all OBP recommendations). Bernoth and Wolff (2006)’s Audit is also based on a OECD/World Bank survey of budget practices. To each question, they assigned a value between zero and four, where four indicates the response most conducive to fiscal transparency. Again, their final index is built with a simple aggregation of scores attributed to the selected responses. Alt and Lassen’s index (2006) is also partially constructed on variables belonging to the Organization for Economic Co-operation and Development (OECD) but, in order to derive an aggregate indicator (out

⁶ Each practice was assigned a category 0, 0.33, 0.66, or 1, where 0 indicates weak practices, and 1 indicates strong practices (Hameed, 2005, p. 12)

⁷ An updated version of Hameed’s index was used in Arbatli and Escolano (2012).

⁸ Unlike OECD, which does not produce systematic assessments of member countries, IMF assesses compliance with its Code albeit without issuing an official indicator.

of a maximum index value of 11), they rely on survey responses of a research specific questionnaire.

- 3) Indexes of transparency based on different frameworks and methodologies. Debrun and Kumar (2007) proposed an alternative measure of fiscal transparency defined as absence of creative accounting calculated as 1 minus the median coefficient of correlation (in absolute value, 15-year rolling correlation) between stock-flow adjustments and the overall budget balance in percentage of GDP over 2004-1990. Kaufmann and Bellver (2005) using multiple sources, construct an overall transparency index based on the weighted average of two sub- indices of transparency (namely economic/institutional transparency and political transparency), calculated by using Unobserved Component Model (UCM).

Evidence of transparency is also a reference tool for advisors and think tanks. For example, Oxford Analytica (www.oxan.com), estandardsforum.com Freedom House (www.freedomhouse.org), International Country Risk Guide (www.prsgroup.com), Transparency International (TI), (www.transparency.org), Global Integrity (www.globalintegrity.org), and the Open Budget Initiative (www.openbudgetindex.org) by IBP (International Budget Partnership), are some of the most cited sources of indicators of transparency in the budget process, based on the compilation of survey/questionnaires by business people and on expert assessments. Since 2005 IBP organization issues general OBI (Open Budget Index) scores,⁹ which are widely used in academic research (De Renzio and Masud, 2011; Arbatli and Escolano, 2012; Wehner and De Renzio, 2013; Rios et al., 2013).

While there is a great variety of measurements of fiscal transparency, to the best of our knowledge, there are no measures specifically and exclusively focusing on two interrelated aspects such as availability of clear information about the public budget content and from the existence of institutional arrangements that allow citizens' involvement in budget oversight.

Indeed, the definition of fiscal transparency must concern, on the one hand, the accessibility and availability of mechanisms that allow the civil society to scrutinize the budget process; “effective fiscal transparency entails the intelligibility and usability as well as availability of

⁹ A detailed description of the OBI index is provided in section 3.

budget and financial information, to nonspecialists (most citizens and many public officials) as well as to budget analysts and other specialists and budget-process insiders. It also entails the existence of an attentive and comprehending audience, which for purposes of democratizing budgeting would have to include non-specialists” (Justice and Dulger, 2011, p.263). Similarly, Heald underlines that: “for transparency to be effective, there must be receptors capable of processing, digesting, and using the information” (Heald, 2006, p.35).

In order to solve the problem of fiscal illusion, which mostly refers to the problem of knowability of budget items by citizens, effective fiscal transparency must concern the right to the budget, i.e. the possibility that citizens/voters have a say over the choices expressed through the budget (which Puviani calls “material progress to the budget”). At the beginning of 20th century, the economist Amilcare Puviani blamed that motivations behind the modern budget are concealed to the great mass of the people, the press and the majority of Parliament (Puviani, 1903).

Transparency eliminates information asymmetry by easing information availability and enforcing democratization of the budget: fully accessible information counteracts citizens’ disillusionment following politicians’ broken promises which are the consequence of a “disconnect between what citizens expect from government and what they are willing to pay” (Ebdon and Franklin, 2006, p. 444). Hence citizens’ complete accessibility to budgeting “can be very useful in educating the public about key trade-offs and gaining valuable input from citizens about their priorities and preferences.” (Ebdon and Franklin, 2006, pp. 444-445)¹⁰. “Transparency can promote public-spirited behavior by constraining bargaining based on self-interest and promoting principled deliberation instead. Even when self-interest is universal, providing information to principals about the actions of their agents – here, elected officials – reduces the costs of monitoring, thereby promising to improve governance in a representative democracy” (Garrett and Vermeule, 2008, p.68).

As emphasized by Philipps and Stewart (2009), the availability of budget information is linked to citizens’ engagement in the budget process. Following these authors, fiscal

¹⁰ According to Salmon and Wolfersperger, we assume that 1) information is always a good and that the collective consumption dimension of information does not matter. If these assumptions hold, people should always be pleased to get more free information, but both assumptions can be questioned (Salmon and Wolfersperger, 2007, p. 13)

transparency, allows “empowering engagement of citizens to participate in establishing a fair and legitimate fiscal policy in a country, both through their representatives in a democratic legislature and more broadly” (Philipps and Stewart, 2009, p.4). They argue that the distributive and social justice impacts of budgetary decisions and the democratic oversight of government budgets by legislative and civil society actors have been widely neglected in the definition of budgetary legislation and best practices (Philipps and Stewart, 2009, p.3). However, in order to generate the political consensus which follows from the exercise of democratic control over the budget, Philipps and Stewart (2009) emphasize the need to redesign the institutional framework characterizing the fiscal process in each country¹¹. However, given that “simply placing more budget information in the public domain will not have an impact unless citizens can understand it, and have the legal and institutional channels to use it” (Carlitz, 2010, p.3), in order to hold decision makers to account, citizens must also be able to consume the otherwise useless information. If citizens “have no means to judge, they will tend to be inattentive to the means employed by the government and also to the question of whether these means are the most appropriate to produce the outcomes they are concerned with” (Salmon and Wolfersperger, 2007, p. 15).

In sum, citizens’ capability of effective control over public budget results from two complementary aspects: i) availability of clear information about the public budget content and ii) institutional arrangements that allow citizens’ involvement in budget oversight. Both these aspects are relevant: being informed without being involved in the oversight of the budget restricts citizens’ capability to affect budget choices, while being engaged in the budget process without being adequately informed does not allow an effective exercise of the oversight function.

The focus on these aspects is grounded in the idea of effective fiscal transparency described by Justice and Dulger (2011) and concerns all the actions/measures to foster democratic

¹¹ The conflict-resolution role of the fiscal process was clearly described by the famous public finance scholar R.A. Musgrave (1981): “the fiscal process as much as any other democratic institution, occupies the middle ground between anarchy and absolute rule. It provides the forum on which interest groups and ideologies may clash without resort to the barricades and on which compromise and cooperation may be sought. Located at the centre of the dispute, the budget process can hardly be expected to function neatly and without error if only because it is created by the same conflicting interests which it must reconcile. Yet an orderly working of that process is essential to the conduct of public affairs and for this its multiple objectives must be understood” (Musgrave, 1981, p. 76).

oversight, thanks to an effective accessibility and intelligibility of fiscal information concerning government's budget provided to the citizens. However, the link between effective transparency and citizens' participation is not straightforward as one does not automatically assure or generate the other.

There is an ongoing discussion about how fiscal transparency and public participation are related because "the conditions, factors, and mechanisms that contribute to increased transparency are likely to be somewhat different from those that contribute to greater participation or accountability" (Khagram et al., 2013, p.7). In a number of countries, extensive disclosure of fiscal information has not led to broader participation, despite opportunities for the latter. Processes of political regime change and increasing political competition, (b) fiscal and economic crises, (c) corruption scandals and the media, and (d) external (international, global, regional, and transnational) influences are all factors that may contribute, in different combinations, to explain why greater popular engagement did not automatically follow from higher fiscal transparency (Khagram et al., 2013, pp. 34-35).

Our analysis is one of the few papers which tries to measure citizens' degree of information concerning public budget, developing a new index which can be further used to investigate the factors that shape the relationship between transparency and participation.

3. Data and methodology

3.1 Data

We rely on data provided by the Open Budget Survey (OBS) carried out by the International Budget Partnership in 2012. OBS is a fruitful source of budgetary-related information as it avoids the problem of self-selection bias, provides comparative information at country level at the same point in time and is less susceptible than ROSC data to government manipulation (Wehner and De Renzio, 2013). This survey is aimed at measuring budget transparency, participation and oversight in 101 countries around the world and consists of 125 questions, which were answered by independent researchers who work in the assessed countries (International Budget Partnership, 2012a). The full list of countries covered is reported in tab. 1. Data gathered through the survey are used to construct the OBI index reported in section 2.

In order to put up our index of citizens' capability of effective control over the public budget, among the 125 questions available in the survey, we selected 16 questions that are specifically related to three topics:

- i) citizens' access to budget details and dissemination (questions 109-112 in the original questionnaire)¹²;
- ii) availability of non technical documentation that helps citizens to analyze public budget (question 113 in the original questionnaire).
- iii) public engagement in the oversight function (questions 114-125 in the original questionnaire);

Questions about i) and ii) are useful in order to measure the availability of clear information about the public budget content, while questions about iii) identify the existence of institutional arrangements that allow citizens' involvement in budget oversight. As we discussed in section 2, both of these elements are crucial in order to measure citizens' capability of effective control over the public budget.

The selection of questions was made according to the question–topic correspondence explicitly set by the International Budget Partnership and reported on the official website of the survey (<http://survey.internationalbudget.org>). The number of the selected questions in the original OBS database and their exact wording are reported in tab. 2.

In the original database, answers to these questions range from 1 to 4, where 1 indicates that the international standard is fully met with regards to the type of budget information (or budget practice) assessed by the question; 2 indicates a good practice; 3 corresponds to minimal efforts to attain the relevant standard; 4 indicates that the standard is not met at all. Question 126 represents a unique exception because only two answers were possible, a first one indicating that the relevant standard is fully met and the second one representing a standard not met at all (answers were coded 1 and 2 respectively).

In order to ease the interpretation of our results, these original scales were reversed; therefore, in our analyses higher values indicate that there is a higher availability of information about

¹² A citizens' budget is a document that summarizes and explains basic public budget information by presenting it in an accessible format (International Budget Partnership, 2012b).

the public budget or that there are better institutional arrangements to allow citizens' involvement in budget oversight.

Frequencies registered for answers to each question are reported in tab. 2. No missing data were observed, except for Sudan which was excluded from our analysis; therefore, our final dataset includes 100 countries.

[TAB.2 ABOUT HERE]

3.2 Methodology

Two relevant aspects have to be considered, when using the selected questions to construct a composite index measuring institutional arrangements that favor citizens' budget supervision:

i) all the selected questions measure qualitative dimensions by assigning numerical evaluations to their variants. While these evaluations may be considered highly rigorous, they represent an arbitrary *cardinal* coding of *ordinal* variables;

ii) in order to ease cross-country comparison, the final composite index must preserve the maximum possible portion of total variation of the original data and, at the same time, identify those individual indicators that have the largest variation across countries.

In order to take into account both of these aspects, we decided to base our index on Non Linear Principal Component Analysis (NLPCA: Gifi, 1990; Michailidis and de Leeuw, 1998). NLPCA performs data analysis in two steps; first, it assigns numerical values to the categories of the ordinal variables through a process of optimal scaling (or optimal scoring). In more detail, NLPCA calculates nonlinear (i.e. not necessarily equally spaced) quantifications for the ordered categories in a way that the overall variance accounted for by the transformed variables is maximized.

Secondly, these transformed variables are analyzed in a Principal Component Analysis (PCA, see Abdi and Williams, 2010 for a complete review and discussion of this method) with the aim of identifying a limited number of uncorrelated principal components that reproduce as much variance from the observed data as possible.

The application of this methodology allows to: i) keep the ordinal properties of the original data, because it produces scores that are not sensitive to the interval differences between the

original numerical evaluations. The scores given to each answer are not a priori elicited and do not result in arbitrary and unsatisfactory transformations of the data made by the analyst; ii) analyze the relationships between the original variables and use their combination to build latent factors; iii) use these latent factors in order to summarize the original multivariate attributes.

Moreover, the use of NLPCA allows overcoming the problems arising when building indexes through linear additive functions, where all the considered institutional arrangements have equal weight and therefore are considered as perfect substitutes for each other (Lagona and Padovano, 2007).

4. Results

The analysis was run by means of the CATPCA module of SPSS, which was set up in order to preserve the order of categories of the observed variable in the optimally scaled variables.

Fig. 1 presents a graphical representation of the eigenvalues related to the first 5 components extracted from the data. The first principal component has an eigenvalue equal to 5.9 (explaining about 35% of the total variance); moving to the subsequent components, a big drop in eigenvalues registered. Therefore, following Cattell's rule (Cattell, 1966), we decided to retain only the first component in our analysis and consider it as an even-handed synthesis of information originally contained in our dataset.

[FIG.1 ABOUT HERE]

Tab. 4 presents the variables' loadings on this component, which are the correlation coefficients between the component and the original variables, measuring the importance of each variable in accounting for the variability in the component. With few exceptions, all the variables show high or moderate positive loadings (>0.50), therefore supporting our idea of using this component as a synthetic index.

[TAB.3 ABOUT HERE]

Countries' scores on the first principal component, that is to say the observations' projections onto the principal component, represent our final non standardized index, which was rescaled

in order to make the final index range from 0 to 100. Countries' ranking, based on final index scores, are reported in tab. 3.

[TAB.4 ABOUT HERE]

[FIG.2 ABOUT HERE]

When comparing our index of citizens' capability of effective control over the public budget with the OBI index (fig. 2), although a high level of correlation is registered (Pearson correlation= 0.68; Spearman rank correlation =0.70), some differences stand out quite clearly. Beside South Korea, which displays the highest score (100), the top ten of our index include Brazil (50.19) and the Philippines (45.21), which register lower scores according to the OBI index. South Korea is very sensitive to budget openness, given its meaningful examples of participative budgeting (You and Lee, 2013): the same sensitivity characterizes Brazil which was the first country experiencing participatory budgeting and by the Philippines, where multiple initiatives to foster citizens' empowerment in public governance are in place (Labonne and Chase, 2009).

Czech Republic and Russia, which were at the top of the OBI rating scale, display lower scores for our index (11.69 and 12.26 respectively). This result suggests that these countries' efforts toward openness of the budget process do not concern the effective public accessibility to budget information and analysis. Relative high scoring of effective citizens' control for some developing countries (like Kenya 41.19; Botswana 37.36; Kazakhstan 35.82; Honduras 35.63; Afghanistan 28.74) require careful interpretation as these countries have just publishing a citizens' budget, which, in most cases, is aimed more at please donors than at effectively obtaining that citizens know more. Moreover, albeit we have included just the presence of public hearings on the budget by the legislature as a selected question, we, unfortunately, do not take into account how if it influences budgetary decisions (in some cases, it could be irrelevant in practice).

Considering the lowest scoring countries, besides countries which appear also at the bottom of the OBI ranking (like Niger, Qatar, Equatorial Guinea, Chad, Benin, Iraq), Lebanon displays very low scores in our index (0), while the same country obtains higher results in the OBI index (32.63).

Overall, our analysis shows that countries differ widely in their levels of citizens' capability of effective control over public budget. In order to explain this variability, we attempt to identify socio-economic and institutional variables that are correlated with citizens' capability of effective control over public budget.

The existing literature has emphasized some socio-economic, political and institutional determinants which affect the level of government budget disclosure. Alt et al. (2006) analyzed budget procedures in the U.S. and suggested that political competition and fiscal imbalance (in the form of higher surpluses or deficit) affect the level of fiscal transparency. Rios et al. (2013) searched for the determinants of central government budget disclosure and found it to be significantly correlated with internet penetration, population size, government balance, administrative culture (whether Anglo-Saxon, Nordic or Continental) and party ideology. Wehner and De Renzio (2013) found that some characteristics of the electoral system such as free and fair elections positively affect fiscal transparency (measured by the Open Budget Index), while oil and gas dependence has negative effect on fiscal disclosure¹³. Follows a literature on aid dependency, some authors have also investigated possible linkages between aid dependency and transparency but de Renzio and Angemi (2012) do not find that fiscal transparency is negatively affected by aid dependency.

Following these examples, we selected a number of covariates which are theoretically correlated with citizens' capability of effective control over public budget and ran an empirical analysis based on OLS regression, using our index of citizens' capability of control over budget as the dependent variable.

Following Wehner and De Renzio (2013), our set of covariates includes an index of democracy (POLITYSCORE) (Marshall, Gurr and Jaggers, 2010), which takes into account the strength of the executive power and the competitiveness of political participation. Geographical positions (seven categories according to the World Bank regional classification) and socio-economic characteristics, like wealth (logGDP) and size of population (logPOP), were also included following Rios et al. (2013). Finally, following the argument expressed by Schleifer et al. (2008), we distinguish five categories of legal origins (British, French,

¹³ On the other hand, Ross (2011) finds that oil wealth has a negative effect on budget transparency in autocracies.

Socialist, German and Scandinavian) as variables characterizing the institutional and administrative framework of each country.

The complete list of covariates and their detailed descriptions are reported in tab. 5.

[TAB.5 ABOUT HERE]

Results of our regression analysis are displayed in table 6 and are mostly in line with expectations. Before looking at the results, it is worth noting that, given the nature of the data we used, our empirical analysis must be intended as the search for robust *ceteris paribus* correlations.

[TAB.6 ABOUT HERE]

The level of democracy, wealth and size of each country shows positive and significant coefficients revealing that the richer and more democratic and populated the country, the higher its citizens' capability of effective control over public budget. Middle Eastern & North African countries, as well as South Asian countries, are in general less likely to promote citizens' effective control over the budget than countries in East Asia & the Pacific region. Finally, British, German and Scandinavian origins are positively associated with higher levels of citizens' capability of effective control over public budget, confirming that there is a strong linkage between the institutional framework of the governance system and the availability of budget information, as well as between the institutional framework of the governance system and citizens' active engagement.

Our results contribute to the ongoing debate on transparency standards and codes update, which should also recommend to “ensure that external oversight institutions and citizens have the information they need to hold governments to account” (IMF, 2012, p.38). We think that, in order to encompass all the aspects related to budget decisionmaking, codes and standards must go beyond simple public openness of fiscal information and also entail the effective bottom-up control of the governmental allocative choices by means of better publicly accessible information and by means of institutional settings that allow budget oversight by citizens.

5. Conclusions

The process of fiscal illusion troubles the citizens' exercise of their sovereignty and conditions their scrutiny of budget policy. Hence, in order to tear off the "veil of ignorance" between government and citizens, alongside fiscal discipline enhancing institutions, it is necessary to provide adequate correspondence between governmental fiscal policies and citizens' right to evaluate allocative budget choices, a correspondence that, far from being automatic, must be inevitably found in the functioning of possible forms and institutes of budgetary accountability.

In this paper, we focused on citizens' capability of effective control over the public budget. We defined it as resulting from the availability of clear information about the public budget content and from the existence of institutional arrangements that allow citizens' involvement in budget oversight. In our opinion, both of these aspects measure "meaningful citizen participation in resource allocation" (Justice and Dulger, 2009, p.268) and concern the exercise of people's fiscal sovereignty at both national and supranational level (Phillips and Stewart, 2009). The focus on these aspects is therefore linked to the concept of effective fiscal transparency described by Justice and Dulger (2011).

Using data provided by the Open Budget Survey and a methodology based on Non Linear Principal Component Analysis (NLPCA; Gifi, 1990; Michailidis & de Leeuw, 1998), we built an index of citizens' capability of effective control over the public budget that allows cross-country comparisons.

Our index fills a gap in the literature by providing a measure of citizens' capability of effective control over the public budget, which has not clearly been emphasized nor assessed by previous theoretical and empirical contributions.

Our results show that there is a considerable cross-country variability in levels of citizens' capability of effective control over public budget. In order to explain this variability, we ran an OLS regression analysis, testing the correlation between our index of citizens' capability of effective control over the public budget and a number of covariates which had been identified in previous contributions as factors associated with fiscal transparency (Alt et al, 2006; Carlitz, 2010; Wehner and De Rienzo, 2013; Rios et al., 2013). We found that the level of democracy, geographical position, socio-economic characteristics and the legal origins of the

country show significant correlations with our index. We finally suggest improving international fiscal transparency standards and codes by explicitly taking into account the effective involvement of citizens in the budget process, together with the provision of publicly accessible information.

Further research will attempt at further exploring the linkages between fiscal transparency and political participation by assessing the role of citizens' capability of effective control over the public budget in the framework of political competition during elections, in order to verify if countries where citizens' capability of control is higher are characterized by lower electoral turnout, higher political activism and more affordable fiscal promises by parties during elections.

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Tab. 1: Countries considered in the 2012 Open Budget Survey (OBS) . * excluded from our analysis due to relevant number of missing data.

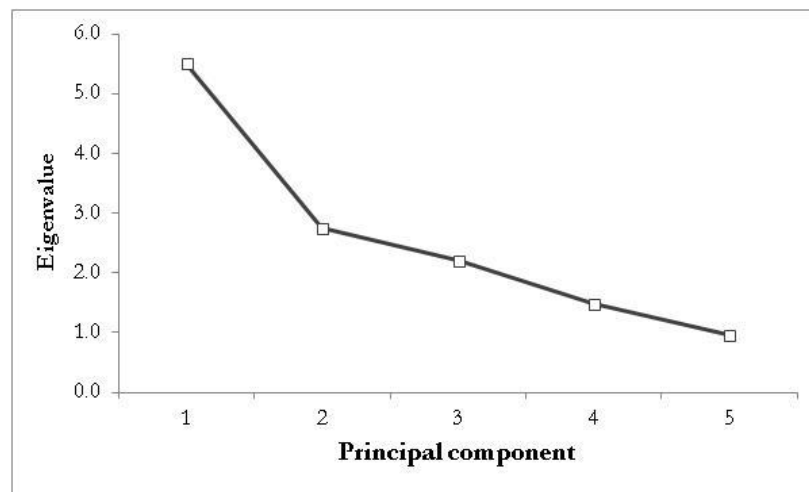
Afghanistan, Albania, Algeria, Angola, Argentina, Azerbaijan, Bangladesh, Benin, Bolivia, Bosnia And Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Cambodia, Cameroon, Chad, Chile, China, Colombia, Costa Rica, Croatia, Czech Republic, Dem. Rep. Of Congo, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Fiji, France, Georgia, Germany, Ghana, Guatemala, Honduras, India, Indonesia, Iraq, Italy, Jordan, Kazakhstan, Kenya, Kyrgyz Republic, Lebanon, Liberia, Macedonia, Malawi, Malaysia, Mali, Mexico, Mongolia, Morocco, Mozambique, Myanmar, Namibia, Nepal, New Zealand, Nicaragua, Niger, Nigeria, Norway, Pakistan, Papua New Guinea, Peru, Philippines, Poland, Portugal, Qatar, Romania, Russia, Rwanda, São Tomé E Príncipe, Saudi Arabia, Senegal, Serbia, Sierra Leone, Slovakia, Slovenia, South Africa, South Korea, Spain, Sri Lanka, Sudan (*), Sweden, Tajikistan, Tanzania, Thailand, Timor-Leste, Trinidad And Tobago, Tunisia, Turkey, Uganda, Ukraine, United Kingdom, United States, Venezuela, Vietnam, Yemen, Zambia, Zimbabwe

Tab. 2: Selected questions from the Open Budget Index (OBI) and frequencies registered for related answers.

Question number in the original dataset	Question	Answers			
		1	2	3	4
109	What is the most detail provided by the Citizens Budget?	74%	3%	18%	5%
110	How is the Citizens Budget disseminated to the public?	74%	8%	10%	8%
111	Are the public's priorities on budget information taken into consideration by the executive while drafting the Citizens Budget?	86%	7%	6%	1%
112	Are Citizens Budget throughout the budget process?	74%	22%	3%	1%
113	Does the executive make available to the public accessible, nontechnical definitions of terms used in the budget and other budget-related documents (for instance, in a glossary)?	48%	17%	13%	22%
114	Is the executive formally required to engage with the public during the budget process?	49%	34%	12%	5%
115	Does the executive clearly, and in a timely manner, articulate its purpose for engaging the public during the budget formulation and execution processes?	68%	24%	5%	3%
116	Has the executive established practical and accessible mechanisms to identify the public's perspective on budget priorities?	58%	29%	9%	4%
117	Has the executive established practical and accessible mechanisms to identify the public's perspective on budget execution?	78%	15%	4%	3%
118	Does the executive provide formal, detailed feedback to the public on how its inputs have been used to develop budget plans and improve budget execution?	92%	4%	4%	0%

119	Does a legislative committee (or committees) hold public hearings on the macroeconomic and fiscal framework presented in the budget in which testimony from the executive branch and the public is heard?	48%	24%	23%	5%
120	Do legislative committees hold public hearings on the individual budgets of central government administrative units (i.e., ministries, departments, and agencies) in which testimony from the executive branch is heard?	46%	25%	15%	14%
121	Does a legislative committee (or committees) hold public hearings on the individual budgets of central government administrative units (i.e., ministries, departments, and agencies) in which testimony from the public is heard?	68%	22%	7%	3%
122	Do the legislative committees that hold public hearings release reports to the public on these hearings?	66%	8%	12%	14%
123	Does the supreme audit institution (SAI) maintain formal mechanisms through which the public can participate in the audit process?	58%	22%	11%	9%
124	Does the SAI maintain any communication with the public regarding its audit reports beyond simply making these reports publicly available?	71%	29%		
125	Does the supreme audit institution (SAI) provide formal, detailed feedback to the public on how their inputs have been used to determine its audit program or in audit reports?	86%	6%	5%	3%

Fig. 1: Scree plot; eigenvalues from NLPCA.



Tab. 3: Component loadings for the variables used in the analysis.

Variable	Variables loadings on component 1
q109l	0.745
q110l	0.82
q111l	0.586
q112l	0.763
q113l	0.681
q114l	0.409
q115l	0.585
q116l	0.531
q117l	0.662
q118l	0.601
q119l	0.53
q120l	0.531
q121l	0.438
q122l	0.477
q123l	0.55
q124l	0.528
q125l	0.386

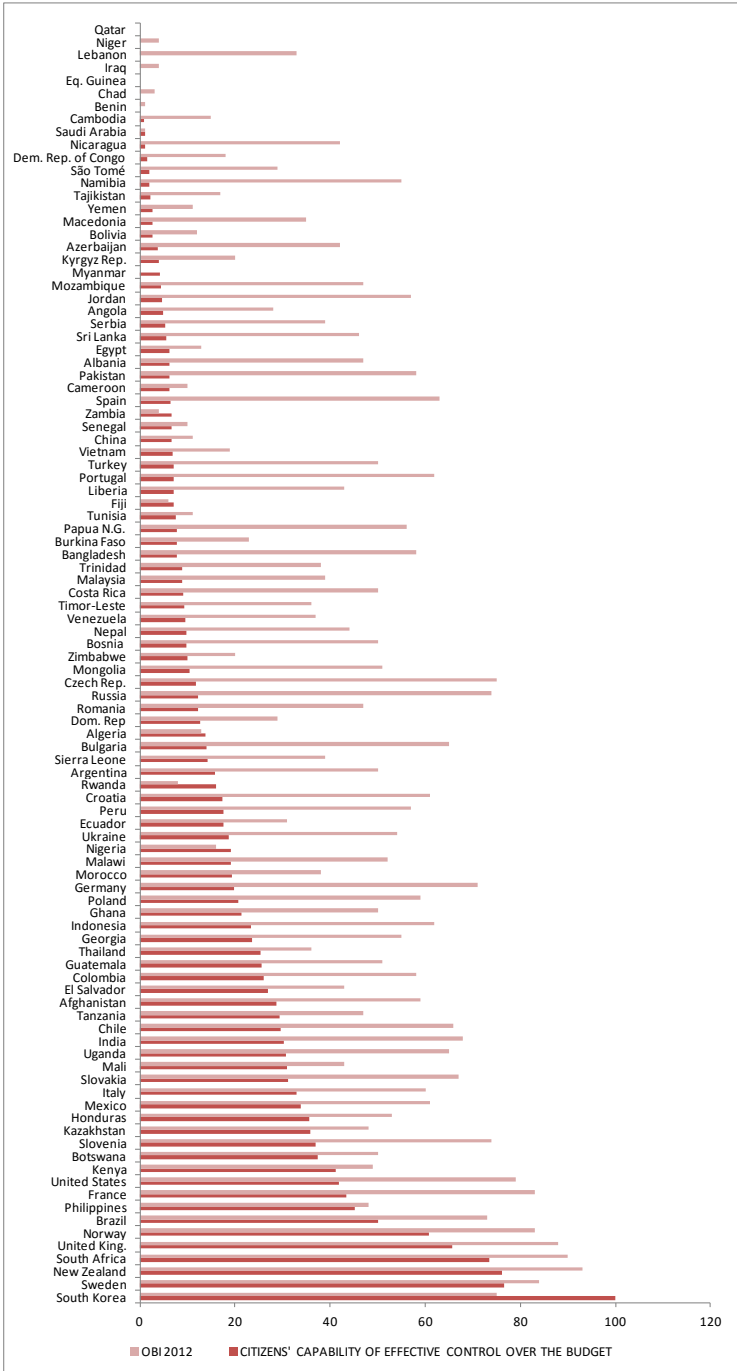
Tab. 4: index measuring citizens' capability of control over the budget. Scores by country.

COUNTRY	CITIZENS' CAPABILITY EFFECTIVE CONTROL OVER THE BUDGET	COUNTRY	CITIZENS' CAPABILITY EFFECTIVE CONTROL OVER THE BUDGET
South Korea	100	Zimbabwe	9.96
Sweden	76.63	Bosnia	9.77
New Zealand	76.05	Nepal	9.77
South Africa	73.56	Venezuela	9.58
United Kingdom	65.71	Timor-Le	9.39
Norway	60.73	Costa Rica	9
Brazil	50.19	Malaysia	8.81
Philippines	45.21	Trinidad	8.81
France	43.3	Bangladesh	7.85
United States	41.76	Burkina Faso	7.85
Kenya	41.19	Papua N.G.	7.85
Botswana	37.36	Tunisia	7.47
Slovenia	36.97	Fiji	7.09
Kazakhstan	35.82	Liberia	7.09
Honduras	35.63	Portugal	7.09
Mexico	33.91	Turkey	7.09
Italy	32.95	Vietnam	6.9
Slovakia	31.23	China	6.7
Mali	31.03	Senegal	6.7
Uganda	30.65	Zambia	6.7
India	30.27	Spain	6.51
Chile	29.5	Cameroon	6.32
Tanzania	29.31	Pakistan	6.32
Afghanistan	28.74	Albania	6.13
El Salvador	27.01	Egypt	6.13
Colombia	26.05	Sri Lanka	5.56
Guatemala	25.67	Serbia	5.36
Thailand	25.29	Angola	4.79
Georgia	23.56	Jordan	4.6

Indonesia	23.37	Mozambique	4.41
Ghana	21.46	Myanmar	4.21
Poland	20.69	Kyrgyz Rep.	4.02
Germany	19.73	Azerbaijan	3.83
Morocco	19.35	Bolivia	2.68
Malawi	19.16	Macedoni	2.68
Nigeria	19.16	Yemen	2.68
Ukraine	18.58	Tajikistan	2.3
Ecuador	17.62	Namibia	1.92
Peru	17.62	São Tomé	1.92
Croatia	17.24	Dem. Rep	1.53
Rwanda	15.9	Nicaragua	1.15
Argentina	15.71	Saudi Arabia	1.15
Sierra Leone	14.18	Cambodia	0.77
Bulgaria	13.98	Benin	0
Algeria	13.79	Chad	0
Dom. Rep	12.64	Eq. Guinea	0
Romania	12.26	Iraq	0
Russia	12.26	Lebanon	0
Czech Rep.	11.69	Niger	0
Mongolia	10.54	Qatar	0

Source: Own calculations (see section 3 for details)

Fig. 2: Index of citizens' capability of effective control over the budget and OBI index



Tab. 5: Variables used in the regression analysis. Label, description, source and summary statistics

Label	Variable	Obs	Mean	Std. Dev.	Min	Max	Source
CITIZENS_INDEX	Index of citizens' capability of control over public budget	100	18.21	19.25	0.00	100.00	Own calculation
logPOP	log of total population	100	2.87	1.51	-1.76	7.21	World Bank Indicators
logGDP	Log GDP per capita	100	8.34	1.41	5.44	11.57	IMF Outlook Data
legal_british	Dummy variable for countries with British legal origin	99	0.27	0.45	0.00	1.00	Schleifer et al. (2008)
legal_french	Dummy variable for countries with French legal origin	99	0.48	0.50	0.00	1.00	Schleifer et al. (2008)
legal_socialist	Dummy variable for countries with Socialist legal origin	99	0.16	0.37	0.00	1.00	Schleifer et al. (2008)
legal_german	Dummy variable for countries with German legal origin	99	0.06	0.24	0.00	1.00	Schleifer et al. (2008)
legal_scandinavian	Dummy variable for countries with Scandinavian legal origin	99	0.02	0.14	0.00	1.00	Schleifer et al. (2008)
POLITYSCORE	Polity score ranging from +10 (strongly democratic) to -10 (strongly autocratic)	88	5.11	5.31	-10.00	10.00	Polity IV Project
reg_eap	Dummy variable for World Bank East Asia & Pacific region	100	0.14	0.35	0.00	1.00	World Bank regional classification
reg_eca	Dummy variable for World Bank East Europe & Central Asia region	100	0.19	0.39	0.00	1.00	World Bank regional classification
reg_ssa	Dummy variable for World Sub Saharan Africa region	100	0.26	0.44	0.00	1.00	World Bank regional classification
reg_we	Dummy variable for World Bank Western Europe region	100	0.09	0.29	0.00	1.00	World Bank regional classification
reg_lac	Dummy variable for World Bank Latin America and Caribbean region	100	0.16	0.37	0.00	1.00	World Bank regional classification
reg_mena	Dummy variable for World Bank Middle East & North Africa region	100	0.10	0.30	0.00	1.00	World Bank regional classification
reg_sa	Dummy variable for World Bank South Asia region	100	0.06	0.24	0.00	1.00	World Bank regional classification

Tab. 6: OLS estimates, the dependent variable is CITIZENS_INDEX (see tab. 5 for details).
Notes on variables: (a) the omitted category is French legal origin; (b) the omitted category is East Asia & Pacific region

		(1)		(2)	
		coeff.	st. err.	coeff.	st. err.
logPOP		3.592**	-1.146	4.159**	-1.268
logGDP		5.035**	-1.814	5.285**	-2.081
legal origin (a)	legal_british	7.711*	-4.358	9.303*	-4.91
	legal_socialist	-4.911	-6.311	0.641	-7.531
	legal_german	14.95*	-8.007	15.27*	-8.606
	legal_scandinavian	46.03***	-12.74	47.45***	-13.08
Region (b)	reg_eca	-6.855	-6.057	-10.69	-7.099
	reg_ssa	-1.73	-6.13	0.329	-6.731
	reg_we	-9.135	-8.448	-14.46	-8.945
	reg_lac	-2.697	-6.469	-4.722	-6.88
	reg_mena	-18.30**	-7.309	-10.14	-8.754
	reg_sa	-11.44	-8.648	-17.54*	-9.885
POLITYSCORE				0.899**	-0.405
N		99		87	
R-squared		0.37		0.48	
BIC		866.6		771	

A Note on the Validation of Financial Literacy Questions

Monica Paiella

Abstract

I use expectations data to validate the financial literacy measures that researchers and policy makers use and draw methodological implications for survey design.

Keywords: Financial literacy questions; cognitive abilities; subjective expectations questions; survey data

JEL classification: A20, C80, D14

1. Introduction

In recent years there has been increasing interest in appraising individual financial literacy. The most recent studies rely on surveys which test respondents' knowledge and understanding of financial terms and their ability to apply financial concepts to particular situations.

The literature has made large use of these surveys to identify the determinants of financial literacy, to measure the effectiveness of financial education and the consequences of financial sophistication for households' financial decisions. An issue that has been overlooked is whether these questions measure actual financial competence or simply ability and cognition. Indeed, the correlation between the available measures of economic literacy and educational attainment and cognitive ability indexes is high (Jappelli, 2009). From the literature, it is not clear what kind of and how much extra information financial literacy indicators provide over the educational attainment ones. Assessing individual ability to understand finance as separate from general cognitive ability is crucial to identify its determinants and to design suitable policies to address deficiencies.

With this note, I intend to validate standard financial literacy indexes using expectations data. I argue that the willingness to answer subjective expectations questions on future asset returns can provide an excellent basis for a validation exercise.

Survey non-response to expectations questions on asset returns is typically high. It ranges from 27 to 36% in the Survey of Economic Expectations; it is around 20% in the Health and Retirement Survey and 50% in the Italian Survey of Household Income and Wealth. Non-response or meaningless answers to these questions are typically attributed to lack of relevant knowledge, and perhaps to troubles thinking probabilistically when questions ask for the probability of future returns. Leaving the issue of probabilistic reasoning aside for a moment, in order to form and declare expectations of future returns, one needs some *financial knowledge* and *skills* to put knowledge together. Financial literacy builds just on all these elements (PACFL,

2008). My plan is to predict the willingness to answer subjective expectations questions using standard financial literacy measures plus a broad set of controls capturing numeracy and cognitive abilities, and addressing the probability reasoning critique.

The rest of the paper is organized as follows. In section 2, I present the data. In section 3, I discuss the empirical evidence and conclude by drawing some implications for survey design.

2. Data

I run the analysis using the 2008 Italian Survey of Household Income and Wealth (SHIW) which asks 9 questions (in 6 sets) to assess financial literacy. The questions are designed like those of the Health and Retirement Survey, and most other surveys on financial literacy. These questions cover a range of topics and their exact wording is reported below.

Box 1 – Financial literacy questions
<p><i>1) Bank statement</i></p> <p>(Show card) Imagine you receive this statement from your bank. Can you tell me what sum of money is available at the end of May?</p> <p>(i) amount in euros €....; (ii) Don't know.</p>
<p><i>2) Mortgage types</i></p> <p>Which of the following types of mortgage would allow you from the very start to fix the maximum amount and number of instalments to be paid before the debt is extinguished?</p> <p>(i) Floating-rate mortgage; (ii) Fixed-rate mortgage; (iii) Floating-rate mortgage with fixed instalments; (iv) Don't know.</p>
<p><i>3) Supplementary pension schemes (4 questions)</i></p> <p>Which of the following statements concerning supplementary pension schemes do you believe to be true?</p> <p>(i) The investment has tax advantages compared with investment funds; (ii)</p>

<p>Part of the capital can be withdrawn at retirement; (iii) Some pension funds guarantee restitution of the capital paid in; (iv) Pension funds guarantee a fixed percentage of the last salary.</p> <p>(Possible answers: true, false, don't know.)</p>
<p><i>4) Inflation</i></p> <p>Imagine leaving 1,000 euros in a current account that pays 1% interest and has no charges. Imagine that inflation is running at 2%. If you withdraw the money in a year's time will you be able to buy the same amount of goods as if you spent the 1,000 euros today?</p> <p>(i) Yes; (ii) No, I will be able to buy less; (iii) No, I will be able to buy more; (iv) Don't know.</p>
<p><i>5) Diversification</i></p> <p>Which of the following investment strategies do you think entails the greatest risk of losing your capital?</p> <p>(i) Investing in the shares of a single company; (ii) Investing in the shares of more than one company; (iii) Don't know.</p>
<p><i>6) Shares vs. bonds</i></p> <p>A company can be financed by issuing either shares (equity securities) or bonds (debt securities). Which do you think is most risky for the investor?</p> <p>(i) Shares; (ii) Bonds; (iii) They are equally risky; (iv) I don't know the difference between shares and bonds; (v) Don't know.</p>

The incidence of responses to these questions is in table 1. Most households answer correctly the questions on the bank statement, on mortgage types and on inflation, although the percentage of incorrect and don't know answers is at 30% or higher. The proportion of incorrect and don't know answers to the questions on diversification and stocks versus bonds riskiness is around 60%. It is as high as 80% for some questions regarding pension funds. The proportion of

respondents who answered all questions correctly is only 1%. Table 2 relates the answers to these questions to individual characteristics.

The 2008 SHIW also asks two sets of questions aimed at eliciting individual expectations of future asset returns: one on safe assets; the other on stocks. For safe assets, the survey asks to report the chances that in a year's time the interest rate will be higher than today's, or $\Pr(r_{t+1}^f > r_t^f | I_{h,t})$. To those reporting a positive probability, it asks the chances that interest rates will exceed today's rates by more than 1 percentage point, or $\Pr(r_{t+1}^f > r_t^f + 0.01 | I_{h,t})$. For stocks, it asks the chances that an investment in the Italian stock market will yield a profit in a year's time, or $\Pr(r_{t+1}^s > 0 | I_{h,t})$. To those reporting a positive probability, it asks the chances of earning more than 10%, or $\Pr(r_{t+1}^s > 0.1 | I_{h,t})$.

The incidence of responses to the first question of each set is in table 3. Non-response, as captured by 'Don't know' answers, is widespread. Over half of household heads do not answer the first of the two questions.¹⁴

Table 4 relates the responses to the expectations questions to the questions for financial literacy and to individual characteristics. Among respondents, only 1% gives no correct answer to the questions on financial literacy (versus 17-18% of non-respondents) and answers correctly 5 questions on average (versus less than 3 questions for non-respondents).

3. Results and implications for survey design

Table 5 report the results of the estimation of probit models for $\Pr(r_{t+1}^f > r_t^f | I_{h,t})$ (first 3 columns) and $\Pr(r_{t+1}^s > 0 | I_{h,t})$ (last 3 columns). Marginal probability effects are reported. In all regressions I control for socio-economic characteristics that could influence the willingness to answer expectations questions. The coefficients of these controls, listed in the note to the table, are not reported for brevity, but they are generally significant with the expected sign.

¹⁴ I exclude from the analysis 15% (6%) of answers to the question pair on the interest rates (stocks) which are such to imply a declining cumulative distribution function.

The table displays the coefficients of a polynomial in the years of schooling and on 9 dummies for the 9 questions aimed at eliciting individual financial literacy (FL dummies). These dummies take on value 1 if the answer is correct. I treat ‘don’t knows’ as incorrect answers. Since ‘don’t know’s’ could reflect unwillingness to answer this type of questions, I add a dummy that takes on value 1 if the household answers ‘don’t know’ to all 9 questions (8% of cases). In columns (3) and (6), instead of the FL dummies, I include a polynomial in an index computed as ratio of the number of correct answers to the number of questions for financial literacy.

Most FL dummies and the index are statistically significant. In the probit for interest rates, only the dummies for shares versus bonds riskiness and risk diversification are insignificant. In the probit for stock returns, only the dummy for risk diversification is insignificant. The other dummies have sizable coefficients relative to the coefficients of years of schooling which double if I exclude the FL dummies. If I exclude schooling (regressions available upon request), the coefficients of the FL dummies would increase, but only slightly. Using the FL index one can get a sense of the predictive power of the questions for financial literacy. Those who answer correctly 6 out 9 questions (75th percentile) are over 45 percentage points more likely to answer the expectations questions than those who answer correctly only 2 questions (25th percentile), on average.

A frequent objection to probabilistic expectations questions is that non-response is due to problems with probabilistic reasoning, which the FL dummies might partly capture. To address this objection, I run a probit for the willingness to answer a question asking expected future risk free rates (‘point-forecast’ question). The predictive power of the FL dummies is confirmed (regressions available upon request).

In summary, from the estimation of simple probit models, I find strong evidence of positive correlation between responding expectations questions and answering correctly the questions designed to appraise individual financial literacy, even after controlling for formal education which captures numeracy and generic cognitive skills. This evidence suggests that these questions do capture individual financial literacy.

All questions appear to contribute to characterize individual financial competence. However, when designing a survey there is a trade-off between how much in detail one wants to analyse a phenomenon and the number of phenomena one wants to study. Determining which questions would characterize best individual literacy is beyond the scope of this validation exercise, which however suggests that restricting the set to just few can still do the job. The questions with the largest predictive power are those eliciting knowledge and skills which are at the basis of day-to-day financial decisions. These include the questions assessing the ability to read a bank statement and the understanding of the effects of inflation. A simple linear probability model suggests that the dummies for these two questions raise the adjusted R-squared of the regression by 14%. The four pension fund dummies contribute for 11%. Finally, the dummies for the questions on mortgage types, diversification and bonds versus stocks riskiness raise it each for 0.5% or less.

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Table 1. Responses to the financial literacy questions

a) Percentages of respondents

	Bank statement	Mortgage type	tax advantage	Pension funds lump sum	guaranteed capital	salary link	Inflation	Diversification	Shares vs. bonds
Correct	60%	66%	26%	33%	33%	20%	73%	44%	34%
Incorrect	3%	11%	20%	17%	15%	21%	6%	27%	34%
Don't know	36%	23%	54%	50%	52%	59%	21%	29%	32%
All	100%	100%	100%	100%	100%	100%	100%	100%	100%

b) Percentages of correct, incorrect and don't know answers

	None	1-3	4-6	7-8	All	Mean
Correct	10%	33%	42%	14%	1%	3.88
Incorrect	34%	53%	13%	0%	0%	1.55
Don't know	20%	30%	30%	12%	8%	3.57

Table 2. Financial literacy and socio-demographic characteristics

	All	None	Correct answers		
			1-3	4-6	7-9
Age	58	68	61	56	52
Males (%)	62	41	57	66	75
Living in the North (%)	47	28	42	53	54
in the Center (%)	21	17	19	21	26
in the South (%)	32	55	39	27	20
<i><u>Education (%)</u></i>					
Elementary school or less	31	72	43	20	7
Middle school	36	21	38	39	30
High school	24	4	15	29	42
University degree	9	1	4	11	21
<i><u>Occupation (%)</u></i>					
Payroll employee	34	15	28	38	52
Self-employed	10	3	6	12	15
Retired	46	72	54	41	29
Non-employed	10	11	12	9	5
<i><u>Wealth and income</u></i>					
Owner of (%): home	71	62	66	73	80
bank deposits	81	54	75	89	94

government bonds	11	2	6	14	16
stocks and shares	16	1	6	19	41
With mortgage (%)	26	10	20	31	37
Net wealth (median)	163,500	72,500	122,900	200,900	274,100
Household income (median)	26,700	15,900	21,800	31,200	39,500
Household consumption (median)	20,700	13,800	18,000	23,400	27,600
Observations	7,977	829	2,614	3,328	1,206

Table 3. Responses to the subjective expectations questions

	$r_{t+1}^f > r_t^f$		$r_{t+1}^s > 0$	
	N	Distribution	N	Distribution
0%	633	8%	797	10%
1-100%	1684	21%	2027	26%
Do not know	4480	56%	4642	58%
All	6797	100%	7466	100%

Table 4. Subjective expectations, financial literacy and socio-demographic characteristics

	Interest rate expectations		Stock price expectations	
	Response	Non- response	Response	Non- response
Age	56	61	55	60
Males (%)	69	56	69	57
Living in the North (%)	60	38	60	38
in the Center (%)	19	21	21	20
in the South (%)	21	40	19	41
<i>Financial Literacy</i>				
No correct answers (%)	1	18	1	17
Number of correct answers	5.2	2.8	5.23	2.86
<i>Education (%)</i>				
Elementary school or less	17	43	17	42
Middle school	38	35	37	35
High school	31	17	33	17
University degree	14	5	14	6
<i>Occupation (%)</i>				
Payroll employee	40	30	40	30
Self-employed	12	7	13	7
Retired	41	52	40	52
Non-employed	7	11	7	11

Wealth and income

Owner of (%): home	76	67	77	67
bank deposits	92	74	92	74
govern. bonds	17	6	17	7
stocks and shares	26	8	28	7
With mortgage (%)	35	19	36	19
Net wealth (median)	221,000	122,800	228,600	126,000
Household income (median)	34,200	21,900	34,900	22,200
Hh consumption (median)	25,200	18,000	25,500	18,000
Observations	2,317	4,480	2,824	4,642

Table 5. Probit for the willingness to answer expectations questions

	Interest rates			Stock returns		
	(1)	(2)	(3)	(4)	(5)	(6)
Education (yrs)	0.054*** (0.007)	0.027*** (0.007)	0.026*** (0.007)	0.052*** (0.007)	0.022** (0.007)	0.023*** (0.007)
Education squared/100	-0.170*** (0.030)	-0.087*** (0.030)	-0.084*** (0.030)	-0.173*** (0.030)	-0.079** (0.030)	-0.084** (0.030)
<i>Financial literacy (dummies)</i>						
Bank statement		0.199*** (0.013)			0.223*** (0.013)	
Mortgage type		0.070*** (0.014)			0.050*** (0.014)	
Pension funds: tax advantage		0.080*** (0.016)			0.091*** (0.016)	
lump sum withdrawal		0.080*** (0.016)			0.069*** (0.015)	
guaranteed capital		0.077*** (0.015)			0.121*** (0.015)	
link to salary		0.072*** (0.016)			0.073*** (0.016)	
Inflation		0.139*** (0.015)			0.146*** (0.015)	
Diversification		0.021 (0.014)			-0.003 (0.014)	
Shares vs. bonds		0.019 (0.014)			0.033** (0.014)	
Financial literacy index			1.337*** (0.111)			1.511*** (0.111)
Financial lit. index squared			-0.629*** (0.108)			-0.760*** (0.108)
Observations	6797	6797	6797	7466	7466	7466

Note: Coefficients are marginal effects. All regressions include age, gender, area of residence, occupation, wealth quartile dummies, second order polynomial in financial wealth and income, dummies for holding stock, debt and pension funds and a dummy for answering 'don't know' to all financial literacy questions. Standard errors in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

The Stability of Money Demand in the Long-run: Italy 1861-2010

Pasquale Foresti and Oreste Napolitano

Abstract

Money demand stability is a crucial issue in order to have monetary policy efficacy. Money stability is particularly endangered when substantial changes occur in the monetary system. By implementing several econometric techniques, this study intends to estimate a money demand in Italy, and its main aim is to assess the consistency and the stability of the estimated relations. Moreover, the degree of stability of money demand is tested using the monetary aggregates M1 and M2 as proxies. The results show that money demand in Italy has been considerably stable despite the several changes to its monetary system, and that the more stable relations are obtained, the narrower the monetary aggregate employed as a proxy for money demand.

Keywords: Money Demand Stability, ARDL, Kalman Filter.

JEL classification: E41, E52, C22.

1. Introduction

Despite the extensive number of studies investigating money demand, some of its aspects are still debated. One of the most relevant is the stability of the relation between money demand and its determinants, as it is a crucial prerequisite for the efficiency of monetary policy interventions. Moreover, money demand stability is the fundamental assumption to adopt monetary targeting. Poole (1970) argued that in the presence of an unstable money demand, the target of monetary policy should be the interest rate. Following this reasoning, many central banks switched from monetary aggregates to the interest rate as their target in the '70s when money instability increased sharply. However, regardless of the monetary instrument, money still plays an important role in the formulation of an efficient monetary policy strategy.

In this paper we intend to investigate the consistency of the stability of money demand in Italy. This country is an interesting case given that its monetary system has undergone several major changes that could have strongly affected money demand. We estimate the money demand function in Italy over a very long time, as our dataset spans the period 1861-2010. To this aim we adopt an autoregressive distributed lag (ARDL) estimation and the Kalman filter procedure. Given the very long period of time spanned, we are able to cover all the relevant changes occurring in the Italian monetary policy regime and financial system. Therefore, we think that this study can shed new light on the consistency of money demand in Italy. We perform our analysis on M2, which is the standard measurement of money demand, but we also focus on the narrow money aggregate, M1, in order to isolate the money demand from other portfolio choices.

As a matter of fact, our investigation reveals that, despite the several institutional changes, the Italian money demand can be considered to be relatively stable. The estimated coefficients are in line with the general results in the literature of money demand. Furthermore, thanks to the methodologies employed, our results show that the estimated relation adopting M1 as a proxy for money demand is more stable with respect to the estimation using M2.

The paper is organized as follows. Section 2 highlights the main historical happenings in Italy that could have affected the demand for money. Section 3 synthesizes the main results in the literature on money demand in Italy. Section 4 describes the methodologies employed and reports the main results obtained. Section 5 concludes the paper.

2. Historical Background

The Italian unification process started in 1848 and ended in 1861, when the Italian lira became the official currency of the newly born Regno d'Italia. Nevertheless, the lira was still issued by the banks of the formerly independent States. The presence of several issuing institutions endangered the monetary and banking stability, as each of them was subject to different rules and limitations. Moreover, the lack of homogeneity among the issuing institutions undermined the capabilities of monetary control.

In order to reduce such problems the number of issuing institutions was reduced to three in 1893, and among these there was the newly born Bank of Italy. With the banking system reform in 1926, the Bank of Italy became the only issuing institution, granting a more consistent monetary policy and a stronger monetary control.

During the period characterized by the two world wars the purchasing power of the lira decreased sharply and the Bank of Italy started printing different banknotes with higher values. The reforms continued also in the '60s, when the Bank of Italy started a process of harmonization with the other members of the European Economic Community (EEC). After World War II, fixed exchange rates were maintained until the Bretton Woods system collapsed. In the '70s strong public deficits and high inflation characterized the Italian economy, because inflation control was sacrificed in order to facilitate economic growth and reduce unemployment.

In 1979 Italy joined the exchange-rate mechanism (ERM) of the European Monetary System. In these years the Bank of Italy started also gaining monetary policy independence from the fiscal authority. In July 1981 the "separation" from the Treasury

took place, and after it the Bank of Italy was not obliged anymore to be a residual buyer at the government's bonds auctions. Another significant change concerning monetary control was the switch to M2 as an intermediate target in 1984. It resulted from the intention of the Bank of Italy to target long-run objectives and to focus more on price stability. In these years the Italian monetary system also faced new external constraints coming from the ERM. Although the ERM had been quite flexible with frequent realignments, starting from 1983 it became more stringent involving quasi-fixed exchange rates. As a result, the Italian Lira was forced to abandon the ERM in September 1992. In 1992 another step towards central bank independence was made, as the Treasury was no longer allowed to borrow from the Bank of Italy and only the central bank was allowed to fix the discount rate. In November 1996 the Italian currency rejoined the ERM thanks to the introduction of a new broader band in August 1993.

The lira has been the official currency till the end of 2001, as starting from 2002 there has been the adoption of the Euro. Starting from that point the ECB became the issuing institution and the reference monetary policy institution for all the members of the eurozone, including Italy as well.

3. Related Literature

Many studies have tried to estimate money demand functions in Italy by taking into account such major institutional and economic changes. As a result, the existing literature proposes different, and sometimes contrasting, results. Muscatelli and Spinelli (1996), with a single equation estimation based on annual data covering the period from 1861 to 1991, are able to detect one cointegrating relationship. The same result is obtained by Sarno (1999) for the period 1861-1990. Following the same approach, Angelini et al. (1993) estimate a money demand function in Italy for the samples 1975 to 1979 and 1983 to 1991, and they find M2 to be stable. Different methodologies are used by Gennari (1999), Bagliano (1996), Rinaldi and Tedeschi (1996) and Juselius (1998). They are not completely able to prove the stability of money demand in Italy and to provide an

unequivocal sign for the coefficients of its different components (i.e. interest rate and income). The inconsistency of such results can be explained by the several financial changes over the period and by the fact that they all cover different and limited periods of time. Mainly, these economists perform cointegration analysis by implementing a multivariate framework and assume more than one cointegration relationship. They identify three (Bagliano, 1996, finds two) cointegrating vectors, one of them being the money demand relationship.

While these studies can test for non-stationarity of time series data by means of cointegration analysis, they are unable to rigorously test for the suitability of the estimated models in forecasting and policy analysis. Moreover, none of these studies is able to provide a strong evidence for the stability of money demand in Italy. This limitation is partially overcome by Capasso and Napolitano (2012), but their sample is much shorter than the one adopted in our study. The present study provides some empirical evidence in order to contribute to this debate. It applies a novel approach to money demand stability, facilitated by Italian data availability, by focusing on long-term money stability. To this aim we use an annual dataset provided by the National Institute of Statistics (ISTAT) in the special series on the 150th anniversary of the unity of Italy. Due to these exceptional long series of data, it will be possible to test the stability of money demand throughout the changes that happened in monetary policy. Such changes have occurred along the entire sample under examination and they could probably have affected money demand and other monetary aggregates. Among others, our objective is, indeed, to fill this gap and to provide a valid empirical model which can account for the stability of money demand in Italy and be a viable tool for policy execution.

4. Empirical Analysis

Empirical investigations on money demand have usually focused on the variables that the theory has proved to influence the demand for liquidity, i.e. interest rates, price level, and income. The demand for real money is mainly determined by speculative and transaction

motives. Hence, we follow the existing literature and model the demand for real money as a function of GDP (Y_t), which measures the level of economic activity and underlines the transaction purpose for holding money, and as a function of the short-term interest rate (R_t) and inflation (P_t), which influence the opportunity cost for holding money and allow to consider the speculative motive. Concerning money demand, we choose to measure it using alternatively M1 and M2. In this way we are able to analyze if the stability of money demand is influenced by the type of monetary aggregate chosen.

Our reference money demand equation is the following:

$$\ln M_t^d = \alpha_i + \beta_1 \ln Y_t + \beta_2 \ln R_t + \beta_3 P_t + \varepsilon_i \quad (1)$$

where the coefficients β_1 and β_2 represent the elasticities of money demand with respect to income and interest rate, while β_3 is the semi-elasticity of money demand with respect to inflation.

As a first step of our analysis we check for the presence of breaks in the data. After this, we estimate an ARDL equation and specify the error correction model. It will allow us to assess whether there is a long-run relation between money demand and its explicative variables. As a final step of our study, we perform a Kalman filter analysis to retrieve time-varying coefficients. By this technique we will be able to compare the stability of the relations estimated with M1 and M2 respectively.

When money demand is studied, two main tasks are normally undertaken: 1) The estimation of the relation between the independent variables and the demand for money; 2) The degree of stability of such relations.

To this aim we run basic regressions of equation (1) with M1 and M2 in sequence as dependent variables. Then, we use the recursive residual test to investigate the presence of breaks in the series and the corresponding number of dummies. The results are shown in figures 1 and 2, where recursive residuals are plotted jointly with the zero line \pm two

standard errors. The test identifies two impulse dummies, corresponding to the two world wars. The Chow test for structural breakpoints in the sample of equation (1) confirms that these breaks are significant and decisively rejects the null hypothesis of no structural change for both the M1 and M2 (see table 1). Once detected the presence of breakpoints in the data and constructed the dummies in order to correct for the parameters instability, we turn to the investigation of the long-run and short-run relationships between money demand and its determinants in Italy.

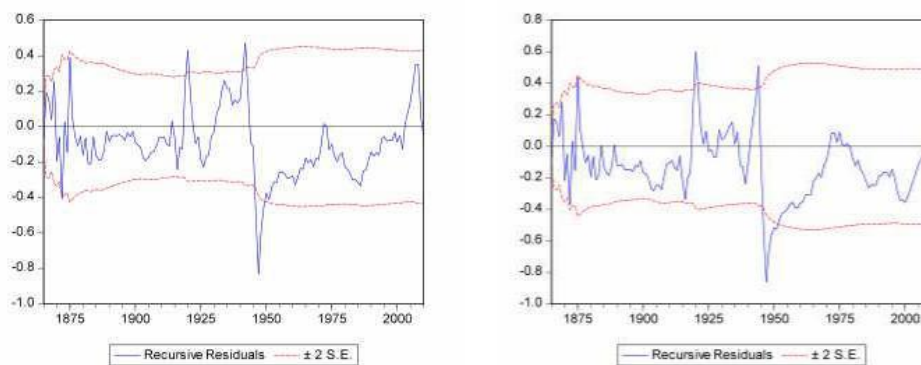


Figure 1: *Recursive residuals for M1 (left panel) and M2 (right panel)*

Many relevant studies have shown that standard cointegration analysis does not permit to fully explain the significance and the stability of the linkages between variables if it is not supported by other tests. Therefore, stability tests, error correction models and cointegration have been jointly applied to determine the features of money demand both in the short and in the long-run. Nevertheless, these analysis require a long pre-testing procedure to investigate variables stationarity and a reason-able large sample of data. Since our dataset spans a very long period of time we avoid the latter problem. Moreover, by applying the ARDL approach to cointegration (see Pesaran et al.; 2001), we circumvent the shortcomings of pre-testing for stationarity, because this methodology can be applied regardless of whether the regressors are $I(0)$ or $I(1)$.

Table 1: Stability Test

Chow Test for Structural Breaks Based on Equation (1)

Monetary Aggregate	Date	F – Statistics
M 1	1919 – 20	13.040 (0.000)
M 1	1942 – 47	31.299 (0.000)
M 2	1919 – 20	21.559 (0.000)
M 2	1942 – 47	36.309 (0.000)

Notes: Levels of significance in parenthesis.

The ARDL approach consists first in estimating a general distributed lag model in order to pinpoint potential structural breaks and to establish the suit-able significant lags in the variables. Then, it requires the specification of an error correction model which disentangles long-run dynamics from short-run disturbances.

It is worth noting that the model in equation (1) is more appropriate to represent the equilibrium relationships in the long-run, but it is not supposed to hold exactly in each single period. Therefore, we need a dynamic specification which allows us to explain the long-run relations but it is also able to represent the short-run dynamics in money demand. Thus, by following Pesaran et al. (2001), we specify an ARDL model in which the coexistence of level and difference variables allows for studying the short-run and long-run relations in the demand for money. In the specific, the empirical relationship of the model has the following dynamic representation:

$$\Delta M_t = \alpha_0 + \alpha_1 T + \sum_{i=1}^p \beta_{1,i} \Delta Z_{t-i} + \sum_{i=1}^p \beta_{2,i} \Delta M_{t-i} + \sum_{i=1}^p \gamma_{1,i} Z_{t-i} + \sum_{i=1}^p \gamma_{2,i} M_{t-i} + \sum_{k=1}^2 \gamma_{3,k} D_k + \varepsilon_t \quad (2)$$

where α_0 is the drift component, T the deterministic trend, M_t the change in real money balances (M1 and M2 alternatively), Z_t is a vector of fundamental variables (real income, interest rate and inflation) and D_k are the dummies. The long-run

Table 2: Bound Test

Equation	F - statistic	Upper critical value [I(1)]
M 1		
K = 1	F (14, 142) = 62.32 ^{**}	5.73
M 2		
K = 2	F (14, 127) = 60.31 ^{**}	4.85

Notes: The F-statistic is used to test for the joint significance of the coefficients of the lagged levels in the ARDL-ECM. Asymptotic critical values are obtained from Table CI(iii) Case III: unrestricted intercept and no trend for K=1 and K=2 (Pesaran et al., 2001, pp. 300-301).

** **Indicates that the statistic lies above the 0.10 upper bound.

multipliers are given by the vectors of γ coefficients, while the β s are the vectors of short-run dynamic coefficients, p represents the order of the underlying ARDL model and ε_t are white noise errors.

We determine the proper lag length p for each variable in equation (2) by applying the AIC and SBC criteria¹. Then, we can turn to the investigation of the long-run and short-

run effects of GDP, interest rate, and inflation on money demand. In order to detect long-run multipliers and to test for their significance we employ an F-test on the null hypothesis that the coefficients on the level variables are all jointly equal to zero (Pesaran and Shin, 1999; Pesaran et al., 2001). The F-statistic is basically a bound test on the ARDL error-correction model. This test does not rely on the conventional critical values, but it involves two asymptotic critical value bounds. The critical bounds depend on the degree of integration of the variables: $I(0)$, $I(1)$ or a mixture of the two. The critical values for the test are provided by Pesaran et al. (2001). In the case in which the calculated test-statistic lies above the upper bound, it implies that there is a long-run relation between the variables. When the test-statistic lies within the bounds, no conclusion can be drawn without knowledge of the time series properties of the variables. In this case, standard methods of testing would have to be applied. No long-run relations exist when the test-statistic is below the lower bound. We, estimate the model in equation (2) and compute the F-test for the joint null hypothesis $\gamma_{1,i} = \gamma_{2,i} = 0$, under the alternative hypotheses that there is a stable long-run level relationship between the aforementioned variables. The bound test results are reported in table 2.

Tables 3 and 4 present the empirical results obtained from the ARDL estimation of equation (2) for M1 and M2 respectively. Both regressions fit reasonably well and pass the main diagnostic tests. The results for both monetary aggregates are in line with theoretical expectations: in the long-run all the components influence money demand with the expected sign. In fact, the null hypothesis of no long-run relationship is rejected since the F-statistic lies above the 0.10 upper bound.

In particular, almost all levels estimates (table 3-4, sections 2) are highly significant and have also the expected signs. These results suggest that there is strong evidence between what the theory predicts (about the relationship between money demand and the fundamental variables like income, interest rates and inflation) and the previous empirical studies. The income elasticity for M1 below one is in line with the works of Harb (2004), Hamori (2008), and Kumar et al. (2010), since their estimates income elasticities were below 1 for M1 in different groups of countries.

Table 3: ARDL Estimation (M1)

Section 1: Short-run coefficient estimates

	Lag order			
	0	1	2	3
Y	-0.04648 (0.13768)	0.45329 ^{***} (0.12151)	0.31644 ^{***} (0.12070)	0.15271 (0.09372)
R	-0.02862 ^{***} (0.01174)			
P	-0.00272 ^{***} (0.2124e ⁻³)	-0.9534e ⁻³ ^{***} (0.3515e ⁻³)	-0.3141e ⁻³ (0.2610e ⁻³)	0.6632e ⁻³ ^{***} (0.1875e ⁻³)

Section 2: Long-run coefficient estimates

C	Y	R	P
0.17609 (0.21176)	0.52 ^{***} (0.18752)	-0.02862 ^{***} (0.01174)	-0.00272 ^{***} (0.2124e ⁻³)
ecm	D ₁₉	D ₄₂	
-0.28856 ^{***} (0.01068)	0.13348 ^{***} (0.05084)	0.06712 (0.04097)	

Notes: *, ** and *** significance at 10%, 5% and 1% respectively; Obs. 152 (monthly). M, Y and R are natural logarithms.

Diagnostics: R-squared: 0.99837; Durbin-Watson stat.: 1.9372; Serial Correlation: $\chi^2_{SC}(1) = 0.12115(0.728)$

Functional Form: $\chi^2_{FF}(1) = 2.3472(0.126)$; Normality: $\chi^2_N(2) = 8.0945(0.017)$; Heteroscedasticity: $\chi^2_H(1) = 0.028505(0.866)$

M2 income elasticity shows a value of 1.15 and that is in line with the results obtained by Capasso and Napolitano (2010) for M2 in Italy (1.12) and Dreger et al. (2007) that employ Pedroni, Breitung and DOLS techniques for a panel of ten new member countries in EMU on M2 and they find income elasticities between 1 and 2. The estimated interest rates elasticity shows the coefficient with correct negative sign and is also statistically significant at 0.01 for M1 while for M2 the sign is correct and significant at 10%. The estimated interest rate elasticity is negative in the great majority of the existing literature. Noticeably, the low level of interest elasticity of money demand suggests that central bank may face more difficulties in controlling money stock. The sign of the coefficient on inflation is also what theory predicts. In both monetary aggregates, M1 and M2, the estimates of the semi-elasticity of money demand with respect to inflation are negative and significant. These results are consistent with Capasso and Napolitano (2010), but very small coefficients in comparison with what it has been found in the previous researches. Indeed, Dreger and Wolters (2006) find the inflation semi-elasticity to be about 4.52, which is a very large value in comparison to our estimates of the inflation semi-elasticity of M1 and M2, -0.00272 and -0.00441, respectively. The results of Equation (2) for the short run estimations (tables 3-4, sections 1) show the complex dynamics that seem to exist between changes in money demand and changes in the fundamental variables. The coefficients are all significant. Among them, R for M2 is the only one statistically not significant. The estimated equilibrium correction coefficients (ecm), are -0.288 for M1 and -0.0374 for M2, and are statistically significant at 0.01 and 0.05 with the correct sign. This implies that a deviation from the long-run equilibrium, following a short run shock, is corrected by about 28 per cent after one year for M1 and the adjustment process will be slower at 3.7 per cent after one year. Finally, Tables 3-4 (Section 2) show the results of the dummies used. Dummy '19 is statistically significant at 0.01 levels for both M1 and M2, while Dummy '42 for both monetary aggregates is not significant. Overall, our results are consistent with the main empirical literature regarding Italy and other developed countries.

Table 4: ARDL Estimation (M2)

Section 1: Short-run coefficient estimates

	Lag order			
	0	1	2	3
M 2		-0.33479 ^{***} (0.10984)		
Y	1.1586 ^{***} (0.1519)	0.16182 (1.0551)	0.13179 ^{***} (3.9352)	0.13154 [*] (1.9486)
	-0.02754 [*] (0.01791)			
P	-0.00441 ^{***} (0.7275e ⁻³)	-0.03401 ^{***} (0.9170e ⁻³)	-0.01228 ^{**} (0.6759e ⁻³)	

Section 2: Long-run coefficient estimates

C	Y	R	P
0.34591 (-0.68678)	1.15190 ^{***} (7.6271)	-0.02763 [*] (0.0176)	-0.0044188 ^{***} (-6.0740)
ecm	D ₁₉	D ₄₂	
-0.037481 ^{**} (0.01068)	0.31866 ^{***} (0.073619)	-3.0512 (0.053851)	

Notes: *, ** and *** significance at 10%, 5% and 1% respectively; Obs. 152 (monthly). M, Y and R are natural logarithms.

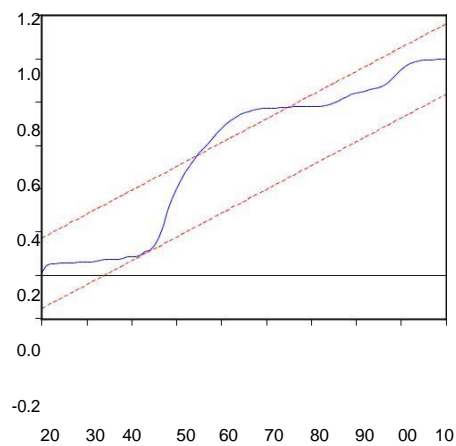
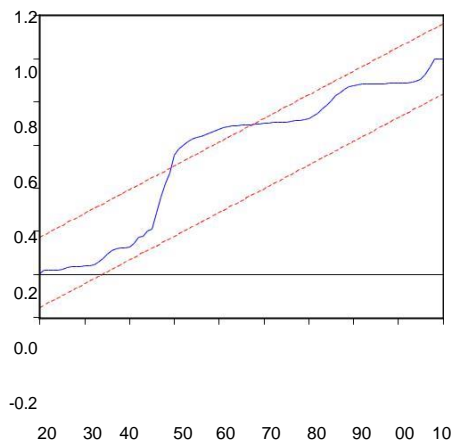
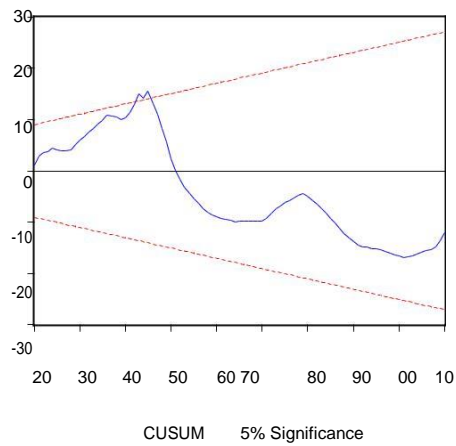
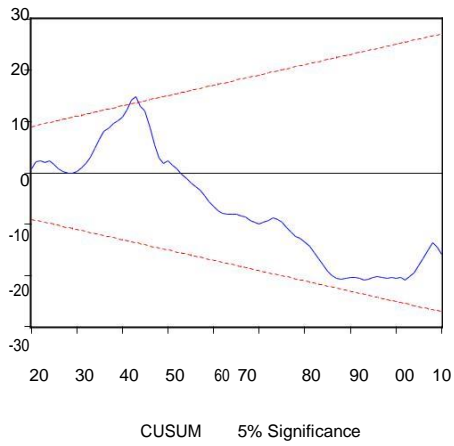
Diagnostics: R-squared: 0.99810; Durbin-Watson stat.: 1.9361; Serial Correlation: $\chi^2_{SC}(1) = 0.18135(0.670)$

Functional Form: $\chi^2_{FF}(1) = 0.58904(0.443)$; Normality: $\chi^2_N(2) = 358.87(0.000)$; Heteroscedasticity: $\chi^2_H(1) = 0.61708(0.432)$

We also perform a parameter stability test for the appropriately selected ARDL representation by employing the procedure developed by Hansen and Johansen (1993).

We do not use the Chow stability test for the error correction model since this requires a previous knowledge of structural breaks in the estimation period and because its shortcomings are well-documented. It is worth noting that the Hansen and Johansen (1993) stability tests cannot be applied to our model straightforwardly. In fact, these are normally used to investigate long-run parameter constancy in models that have no short-run dynamics and, they require that the variables are $I(1)$. These difficulties, however, can be overcome by employing the Brown et al. (1975) procedure (see Pesaran and Pesaran, 1997). The Brown et al. (1975) stability test technique, and also CUSUM and CUSUMSQ tests, are based on the recursive regression residuals. The CUSUM and CUSUMSQ statistics are updated recursively and plotted against the break points of the model. It can be assumed that the estimated coefficients are stable when the plot of these statistics lie inside the critical bounds of 5% significance. These tests are usually implemented and interpreted thanks to a graphical representation. The CUSUM test is based on the cumulative sum of the recursive residuals. In figure 2 we plot the cumulative sum together with the 5% critical lines. The movement inside the critical lines for both M1 and M2 are suggestive of parameters stability. Moreover, the CUSUM of squares (figure 2) are generally within the 5% significance lines, suggesting that the residuals variance is somewhat stable.

The last step of our study involves a time-varying coefficients analysis in order to compare the stability of the relations between money demand and its determinants. In order to be able to capture the dynamics of the parameters of the model we start writing equation (1) in its state-space form. The state-space representation can then be used to compute the estimates of a state vector for $t = k + 1; k + 2; \dots; T$ using the Kalman filter.



— CUSUM of Squares - - - 5% Significance

— CUSUM of Squares - - - 5% Significance

Figure 2: CUSUM and CUSUM of squares tests on M1 (left) and M2 (right)

This recursive algorithm computes the linear least square of the predicted state vector given data observed at time t. To illustrate the evolution of the coefficients, we estimated a time-varying parameter (TVP) model of the following form in compact matrix notation:

$$\ln M_t^d = Z\beta_t + \varepsilon_t \quad (3)$$

$$\beta_t = F\beta_{t-1} + \mu_t \quad (4)$$

where (3) represents the transition equation, while (4) is the measurement equation. Z is a matrix of dimension (T xK) and contains the fundamental variable. The elements of equation (3) have the following form:

$$Z = \begin{bmatrix} \alpha^1 & z_{t-1}^1 & \dots & \dots & z_{t-1}^k \\ \vdots & \vdots & \dots & \dots & \vdots \\ \vdots & \vdots & \dots & \dots & \vdots \\ \vdots & \vdots & \dots & \dots & \vdots \\ \alpha^k & z_{t-n}^1 & \dots & \dots & z_{t-n}^k \end{bmatrix}, \ln M_t^d = \begin{bmatrix} \ln M_{t-1}^d \\ \ln M_{t-2}^d \\ \vdots \\ \ln M_{t-n}^d \end{bmatrix}, \beta_t = \begin{bmatrix} \beta_{t-1} \\ \beta_{t-2} \\ \vdots \\ \beta_{t-n} \end{bmatrix}, \varepsilon_t = \begin{bmatrix} \varepsilon_{t-1} \\ \varepsilon_{t-2} \\ \vdots \\ \varepsilon_{t-n} \end{bmatrix}$$

We now have the state vector β_t that contains all the slope coefficients, which are now varying through time. The F matrix, of dimension (kxk), contains the autoregressive coefficients of β_t . We allow the coefficient β_t to follow a random walk process.

The error terms are assumed to be independent white noise $\sigma^2_{\varepsilon_t} = Q; \sigma^2_{\mu_s} = R;$

$Covar(\varepsilon_t, \mu_s) = 0$ for all t and s. For each endogenous variable of the model it is therefore possible to observe how the respective coefficients are changing over time due to changes in the fundamental variables. By this technique we will be able to compare the stability of the relations estimate with M1 and M2 respectively. Since we consider of great importance the time variation in parameters and its implication in defining a more reliable stability test, the models in equations (3) and (4) were estimated by maximum likelihood. However, as our attention is directed towards the issue of time variation in the parameters, we wish to establish the relevance of this modeling choice. The main results and estimates are reported in Figure 3 and in Table 5 for M1 and M2, respectively.

In order to specify the state-space model appropriately, we add lags to the dependent and independent variables such that the serial correlation can be removed from the equation. We found

that the AR(1) process was enough to tackle the problem of serial correlation. The variance of the transition function σ^2, ε_t is statistically significant for the two monetary aggregates (table 5) -3.092 and -2.839 respectively, hence confirming the time-varying behavior of the estimate coefficients. Moreover, the patterns of the fundamental coefficients β_t seem to capture well the economic dynamic of the long period.

Table 5: Kalman Filter Estimation

Dep.V variable	Y	R	P	z
				σ_{ε_t}
M 1	1.046*** (251.5)	-0.256*** (-5.595)	-0.001*** (3.597)	-3.092*** (-30.196)
M 2	1.429*** (302.9)	-0.006 (-0.117)	-0.002*** (-0.975)	-2.839*** (-23.036)

Notes: The Z-statistic is used to test for the significance of the coefficients.

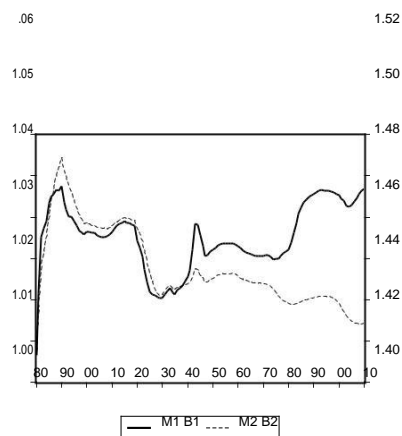
***, ** and * indicate the statistic significance at 1%, 5% and 10% respectively.

M, Y and R are natural logarithms.

The most important result is that the framework "works" in the sense that figure 3 shows that, for instance, the behavior of the income elasticity for the two monetary aggregates is substantially stable over time. In particular, the two β_1 coefficients exhibit an unremarkable variation over time and are characterized by similar movements until the Second World War and by the fact that each coefficient varies along its trend, which reflect a certain stability path along different monetary policies undertaken by the Bank of Italy in the period. In a different way, the coefficients β_2 show diverse trends for the same periods. β_2 for M2 rises sharply in the first part of the period reaching the peak at the beginning of 1930 and it remains stable till the end of the 70s. Afterwards, it

continues to rise till 2010 when it reaches a value close to zero. A possible explanation of this shift (1920-30) could be related to consequence of the contagious of the US great depression that affected the Italian banking system or the changes in the conduct of monetary authorities due to changes that occurred at political level (the fascist regime). The coefficient β_2 of M1 also shows this shift but its magnitude is less pronounced. Overall, β_2 for M1 seemed to be more stable. Finally the two coefficients β_3 show very similar paths that are developed in three steps down. The first one ends soon before the First World War. The second step is the most difficult to interpret because it is characterized by a first part in which the value of the coefficients are reduced and a second (late '30s) in which the coefficients increase. The final step shows stable paths for both coefficients. However, their impact on the demand for money is really limited.

The Kalman filter methodology allows also for an analysis of the stability of the estimated money demand. By comparing the standard deviation of the time varying coefficients, it is possible to compare the stability of the estimated relations when M1 and M2 are used as proxies of money demand. These results are reported in table 6 and they show that the standard deviations of the estimated coefficients adopting M1 as a proxy for money demand are more stable when compared to the ones referring to M2. Therefore, we can conclude that the estimated money demand using M1 as a proxy for money demand results to be more stable with respect to the money demand estimated using M2.



0.2
0.0
-0.2
-0.4
-0.6
-0.8

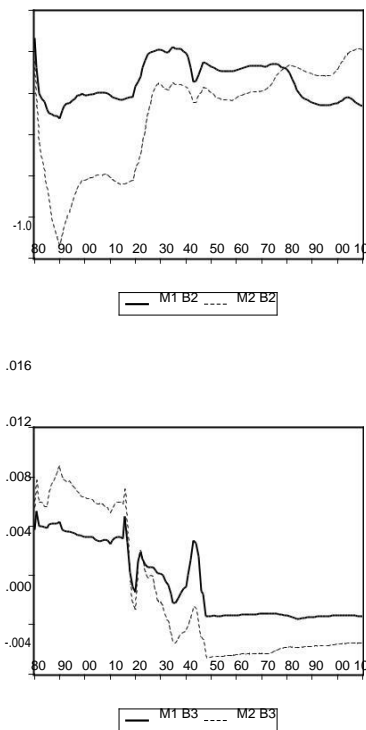


Figure 3: Time varying coefficients: Y(top panel), R(central panel), P(bottom panel)

Table 6: Standard deviation of time varying parameters

	β_1	β_2	β_3
M 1	0.007954	0.097964	0.002983
M 2	0.019373	0.253910	0.005491

Notes: β_1 , β_2 and β_3 are the coefficients of Y , R and P respectively

5 Conclusion

Given the very long period of time spanned in our sample, we have been able to analyze money demand in Italy including several major changes in its monetary system.

Nevertheless, our empirical analysis has evidenced a substantial degree of stability of money demand in Italy. By employing ARDL estimations, bound and CUSUM tests, we have obtained clear cut results and the stability of money demand has been evidenced in both the short- and long-

term and it has been shown to apply to both M1 and M2. Moreover, the elasticities obtained with the ARDL estimations are in line with the existing literature. We have also adopted the Kalman filter to further investigate long-term dynamics in the coefficients of money demand and to compare the stability of money demand when M1 and M2 are adopted as its proxies. Our estimation highlights that the relation obtained with M1 is considerably more stable. Needless to say, that this is a very interesting result and it has some important implications for monetary policy. Many studies on money demand in Italy have focused on M2 and M3 and they suggest that money demand in this country has been unstable. According to our results, this evidence could have been due to the monetary aggregate employed. In more general terms, our results suggest that a narrow monetary aggregate can provide a more stable money demand and that the main sources of instability of money demand are the less liquid assets considered in broader aggregates.

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Fiscal Sustainability and Foreign Debt in EMU Countries: Financial Markets as the Dissuasive Arm of the Stability and Growth Pact

Rosaria Rita Canale

Abstract.

Countries in the European Monetary Union have been divided into two major blocks according to their ability to respect fiscal criteria and ensure sound public finance. The widespread belief is that this ability influences the interest which the financial market applies and the long-run sustainability of deficit and debt. As a consequence, some countries are asked to achieve severe retrenchment to restore financial market confidence. The aim of this paper is to show that the increase in government bond yields is not directly linked to default probability; rather it is due to liquidity needs that cannot be satisfied on domestic markets. In times of crisis the deficit/GDP ratio goes up and sends the signal that governments are loosening their fiscal stance. As long as there are liquidity constraints, foreign markets increase the interest rates applied and, due to the sharp increase in refinancing costs, force governments into fiscal retrenchments. The latter have little probability of success because of their effect upon real GDP. The high cost of exiting from the EMU makes devaluation highly unlikely and gives financial markets – lacking a common policy structure - the power to exert political pressure without having sovereignty.

Keywords: Fiscal policy, sovereign debt crisis, external imbalances, EMU

JEL classification: E61, E65, F33

1. Introduction

After the financial crisis of 2007, countries in the European Monetary Union (EMU) have been divided into two major blocks according to their ability to respect fiscal criteria and have sound public finance. Some of them have been required to reduce their deficit and debt considerably in order to prevent speculative attacks and preserve the financial stability of the Currency Union.

Despite the current prescription of the European institutions, since the birth of the EMU, fiscal policy has not been defined by the same degree of rigidity. It started in 1999 with initial rigour, then there ensued an intermediate period with a certain tolerance, and now a new phase of greater rigidity has been ushered in by the European Council since March 2011: for the year 2012 the deficit/GDP ratio has to stay within the limit of 3% and in cases of high public debt the strategy has to be very rigid in order to consolidate the reduction trend.

After the financial crisis in 2007 many EMU countries were forced to use fiscal policy and automatic stabilizers to reduce output fluctuation and combat the lack of aggregate demand. “Unsound” public finance became, for a certain period of time, a shared problem. At present, some countries are said to have restored sustainable public finance while others appear have great difficulty complying with the Stability and Growth Pact.

These countries, known as PIIGS from the first letters of their names (Portugal, Ireland, Italy, Greece and Spain), are suffering the consequences of the increase in government bond yields. The widespread belief is that this increase reflects the country’s risk and probability of default: because the debt is unsustainable (Pagano, 2010), they might leave the Monetary Union, decide not to pay back the public debt or convert it into a devaluated currency. Hence financial markets increase the spread with respect to German bonds, asking for higher returns to offset the higher risk.

In considering a country - unlike when assessing a firm’s debt sustainability –evaluation of its default probability requires much more complex analysis.

In the EMU, where monetary sovereignty belongs to the European Central Bank, adopting default means both devaluing the currency and restoring monetary sovereignty. However, at the same time the country: 1) cannot have access to financial markets for a long time, 2) experiences an increase in interest rates; 3) experiences increased domestic inflation and reduced consumer purchasing power; 4) sees its (real) exchange rate devaluated and the cost of imported goods inflated¹⁵ and 5) suffers an increase in costs for Euro-denominated contracts (Eichengreen 2007 and 2010).

¹⁵ The interactions between monetary and fiscal policy under different currency regimes during debt crises are investigated in depth by Nersisyan and Wray (2010).

Defaulting thus means incurring a reduction in terms of aggregate demand that could be even higher than that resulting from IMF and European Council prescriptions to obtain aid. It derives that the conditions defining willingness to pay is a different matter from the ability to pay. So a question arises: if the probability of default for PIIGS countries is not so high, why do yield spreads over German bonds increase?

The PIIGS countries appear to have a current account deficit which has a high private and public debt towards foreign countries to counter the balance of payments accounts. This means that they are liquidity-constrained, and have – due to the identities of national accounts - great difficulty financing additional deficit and debt. The difficulty finding additional resources exposes PIIGS countries to the blackmail of foreign financial markets, forcing countries to adopt without appeal the European economic policy requirements.

Therefore financial markets – playing the role covered by the excessive deficit procedure (EDP) under the Stability and Growth Pact – may impose certain paths to be accepted by countries in difficulty, entailing very high social costs in the short term and perhaps a higher long-term growth. The premise, however, does not seem to be a good starting-point.

This paper aims to show that the increase in government bond yields is not directly linked to default probability; rather it is due to liquidity needs that cannot be satisfied on domestic markets. In times of crisis the deficit/GDP ratio tends to rise and sends the signal that governments are relaxing their fiscal stance. Under conditions of liquidity constraints, markets increase the interest rates applied. Due to the sharp increase in refinancing costs, governments which cannot rely on a national central bank are forced into fiscal retrenchments. Such retrenchments – other things being equal - have little chance of success due to their real effects upon the GDP. The high cost of exiting the EMU means that, in the absence of a shared bailout mechanism, financial markets give policy prescriptions and exert political pressure without having fiscal sovereignty.

The paper is organized as follows: the next section describes the evolution of fiscal policy in Europe in terms of how the Stability and Growth Pact has been applied during the past years. Section 3 discusses the fiscal policy and balance of payment conditions in PIIGS countries, France and Germany, with a view to evaluating the extent of the liquidity constraint. The last section draws conclusions underlying the recessive outcomes of both financial market behaviour and EMU policy structure.

2.The path of fiscal policy in Europe

Fiscal policy, since the EMU was launched in 1999, has pursued different degrees of rigidities oscillating from initial strictness towards a certain intermediate laxity and back again in recent times to stronger, more rigorous prescriptions for governments. The theoretical underpinnings have always been the crowding-out effects, the Ricardian equivalence theorem (Barro 1974) and the instability effects on expectation of long-run unsound public finance (Giavazzi and Pagano 1996). Because public expenditure is unable to change the long-run equilibrium income, it is better to avoid the real financial instability deriving from the excessive issue of public debt. Fiscal discipline is a necessary prerequisite for long-run stable growth. National governments belonging to the EMU are supposed to respect rigid parameters and cannot use fiscal policy freely to increase growth and employment.

Despite these theoretical foundations the attitude of European institutions towards fiscal policy has changed over time, reflecting the contingent difficulties of the main member countries. In the first phase, fiscal policy may be viewed as rigid: the Stability and Growth Pact (SGP) (1996) was the natural pursuance of the convergence criteria defined in the Maastricht Treaty (1992). The SGP defined the constraints for EMU member countries to adhere to fiscally virtuous behavior even after the adoption of the single currency.

Under the SGP government deficit /GDP ratio must not be exceeded 3%, except in cases where the decline in the rate of output growth in real terms has not fallen by more than two percentage points. The existence of a high level of debt has to be followed by a procedure of reducing the debt-to-GDP ratio by 0.5% per year. In the event of overshooting the limits, countries in deficit are subject to a so-called excessive deficit procedure (EDP).

The EDP consists of the following instruments:

- a) The preventive arm: Member States should submit the plans for sound public finances. The EU Commission and the Council expresses its opinion. If the assessment is negative, the Commission formulates: i) an early warning to prevent excessive deficit; ii) policy advice, suggesting policy recommendations to achieve the goal.
- b) The dissuasive arm: If the deficit exceeds the limit of a 3% ratio to GDP, the country is subjected to the excessive deficit procedure (EDP). The latter defines: i) time limits to return within the values and ii) the penalties for overrunning.

A second phase comprises changes in the direction of less rigidity. In March 2005, the ECOFIN decided to make some changes to the workings of the SGP ("Improving the Implementation of the Stability and Growth Pact" drawn up by the Ecofin Council in March 2005): its benchmarks, i.e. 3% for the government deficit and 60% for public debt ratio to GDP remained unchanged but a greater tolerance was allowed for countries showing high divergence of current growth from its potential

level. The changes included: a) no structural adjustment of debt; b) allowing, in the event of long-term sustainability of public finances, a temporary deviation from the path of adjustment over the medium term; c) the reduced implementation of the EDP case of a 2% reduction in GDP but also in cases of negative growth rates or long-term loss of production in respect to potential growth.

A third phase of fiscal policy in Europe was recently implemented. In May 2011, the European Council decided that Member States had to present a multi-year repayment plan with the goal of bringing the deficit below 3% and ensuring the long-term sustainability of public accounts. The principle of an annual structural adjustment for countries with an excessive debt/GDP ratio was re-introduced. This may exceed the structural adjustment of 0.5% provided by the first SGP in cases of countries with particular public finance imbalances.

The text states as follows: “In particular, Member States will present a multi-annual consolidation plan including specific deficit, revenue and expenditure targets, the strategy envisaged to reach the targets and a timeline for its implementation. Fiscal policy for 2012 should aim to restore confidence by bringing debt trends back on a sustainable path and ensuring that deficits are brought back below 3% of GDP in the timeframe agreed upon the Council. This requires in most cases an annual structural adjustment well above 0.5% of GDP. Consolidation should be frontloaded in Member States facing very large structural deficits or very high or rapidly increasing levels of public debt” (EU summit 2011)¹⁶. In addition the Commission asked for the introduction within a legal or constitutional framework of rigid rules ensuring respect of the SGP. And in fact many countries introduced it.

At the same time, the European Council announced the creation of a European Stability Mechanism (ESM), which from October 2012 is entered into force with the proportional contribution of all EMU countries. The ESM substitutes the European Financial Stability Facility (EFSF¹⁷) and its mandate is to safeguard financial stability in Europe by providing – through the ECB bond purchase on the primary market and under the condition of a fiscal retrenchment plan - financial assistance to euro area Member States. Furthermore the injection of new money will be completely sterilized so that the ESM will only affect interest rates on government bonds. For countries not asking for the

¹⁶ The full text of the EU Summit is available at <http://register.consilium.europa.eu/pdf/en/11/st00/st00010.en11.pdf>

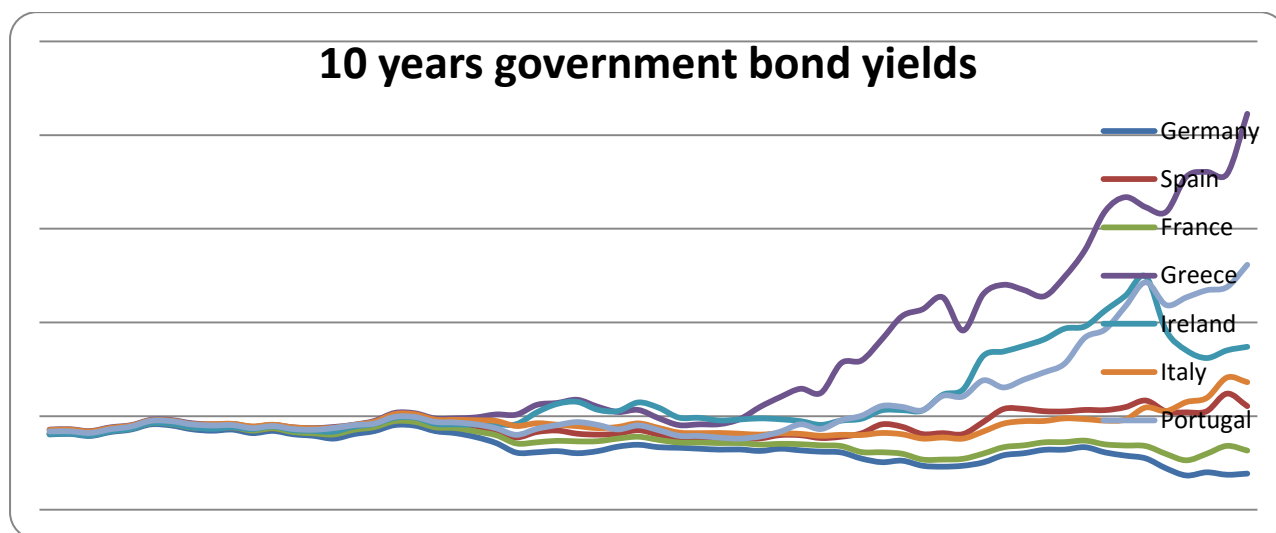
¹⁷ The European Financial Stability Fund (EFSF) had a capacity of 440 bln Euros and relied on the guarantee of member States and of the European Financial Stability Mechanism (EFSM 60 bln Euros with the guarantee of the EU Budget). It follows the principle of private sector involvement (PSI) which according to Bini Smaghi (2011) has not produced positive effects on government refinancing costs and could become an ultimate cdo (Zingales 2011). Even the EFSF was downgraded by rating agencies.

assistance of this bailout mechanism, the management of fiscal policy is in the hands of national governments, which in turn have to meet financial markets requests¹⁸.

3. Government bond yields, fiscal dynamics and liquidity needs

The widespread beliefs about the increase in government bond interest rates refer to two main causes: a) the need to increase returns to convince the public to buy additional bonds; b) the increasing risk associated to the likely occurrence of a credit event.

Figure 1a shows the Euro Area 10-year sovereign bond yields from January 2007 to December 2011. The crisis started at the end of 2007, yet the effects on public finance did not appear immediately¹⁹. At the beginning of 2009, Greek and Irish government bond yields started to increase. A few months later it was Portugal's turn. For these countries, especially for Greece, the situation became explosive at the end of 2009. Then in January 2010 Ireland government bond yields started to increase too, while French and German yields started to fall. Spain and Italy experienced no sharp increase in interest rates till October 2010. The situation changed during the year 2011, with a sharp increase for Italy and Spain during summer and an improving at the end of the year. Portugal and Ireland had more or less the same experience, while long term interest rates for Greece have been continuing growing. However governments borrowing conditions are changing day by day.



¹⁸ The discussion about Eurobonds and the German refusal to share this debt instrument in Europe goes in the same direction.

¹⁹ The transmission mechanism through bank balance sheets at the sectoral and international level is extensively explained in Krugman (2008) and Gandolfo (2010).

Figure 1. 10-year sovereign bond yields January 2006-December 2011 in PIIGS countries, France and Germany. Source: ECB

After the increase in spreads there was also an increase in credit default swaps (CDS) basis points, indicating a strengthening of the market's belief that default in these countries was becoming likely to occur. It is of some consternation that between June 1st 2009 and September 9th 2011 the situation changed so sharply that some European countries became –according to financial markets -more risky than many of the world's poorer countries (Bini Smaghi 2011).

Therefore, while the greater spread with German government bond yields is the evidence that refinancing costs more, it cannot be automatically concluded that greater spreads and CDS basis points anticipate the probability of default. This conclusion may be drawn from an analysis involving public accounts.

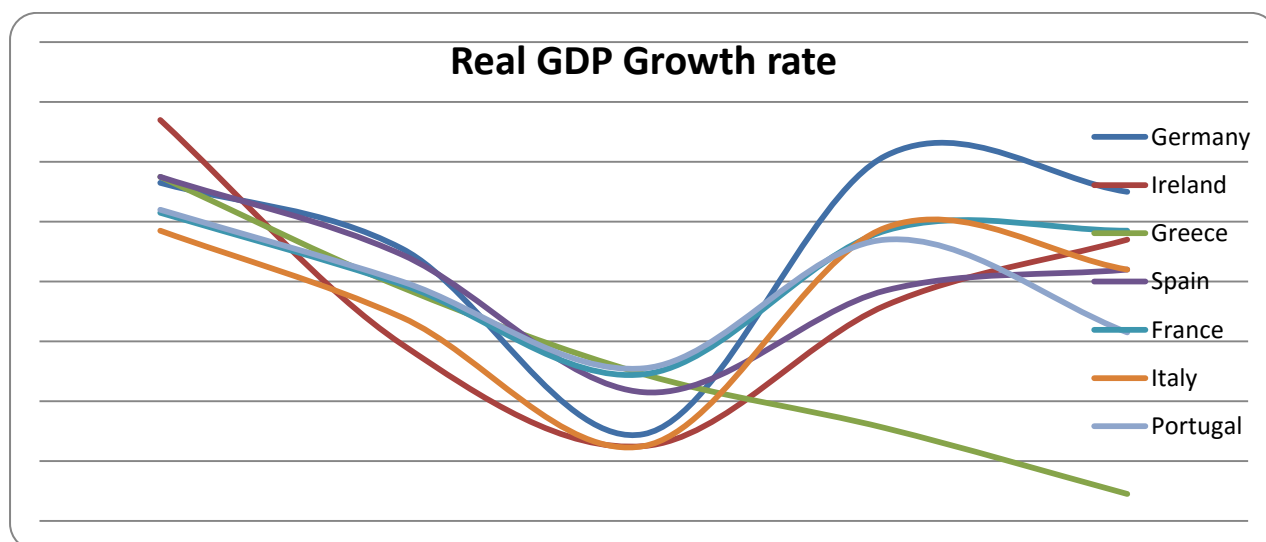


Figure 2. Real growth rate of GDP in PIIGS countries, France and Germany. Source: Eurostat.

Real growth rate till the year 2011 of the five PIIGS countries, Germany and France is shown in figure 2. After the crises all European countries experienced decreases in growth rates. All countries had a negative growth rate in the second half of 2007. In 2009 the negative trend inverted in all countries except for Greece, whose GDP growth rate is represented as still negative. The end of 2011 shows a slowdown for Germany and Italy, and a sharp decrease for Portugal. The fiscal retrenchment programs are spreading out direct and spill over effects.

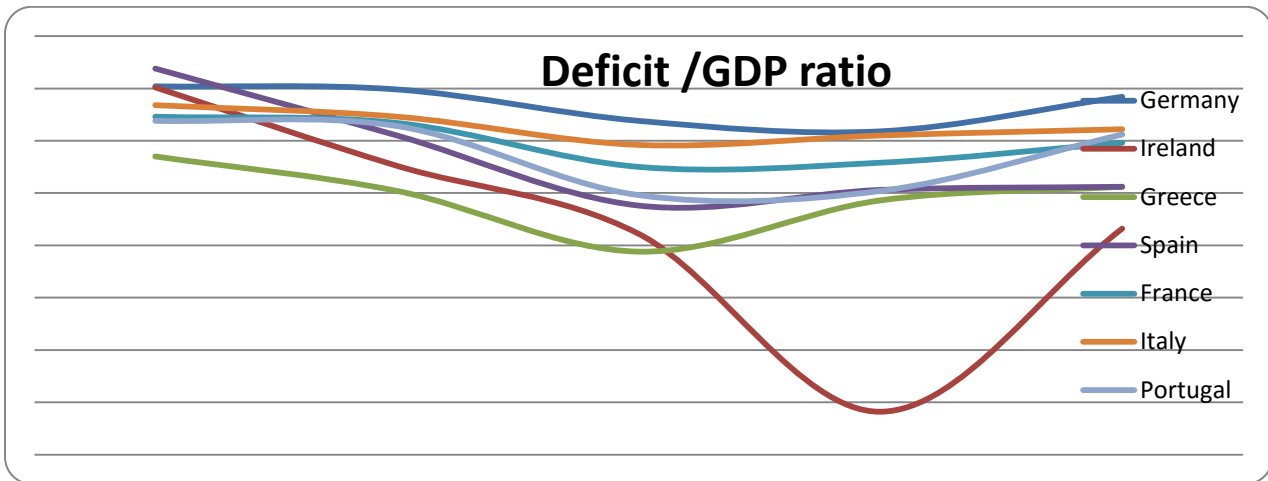


Figure 3. Net lending (+)/Net borrowing (-) under the EDP (Excessive Deficit Procedure) of the PIIGS countries, France and Germany. Source Eurostat

The financial crisis worsened the public accounts and increased the public deficit. Figure 3 shows the dynamic of the deficit/GDP ratio from 2007 till 2011. The best performance was achieved by Germany; Italy was also able to contain the deficit increase. The worst result is that of Ireland till the year 2010 which reached 32% of GDP (including bank recapitalization), followed by Greece whose deficit reached almost 15% in 2009 though in 2010 it is not very far from that of Spain, Portugal and France (10% of GDP). During year 2011 Ireland knew a sharp decrease of deficit/gdp ratio.

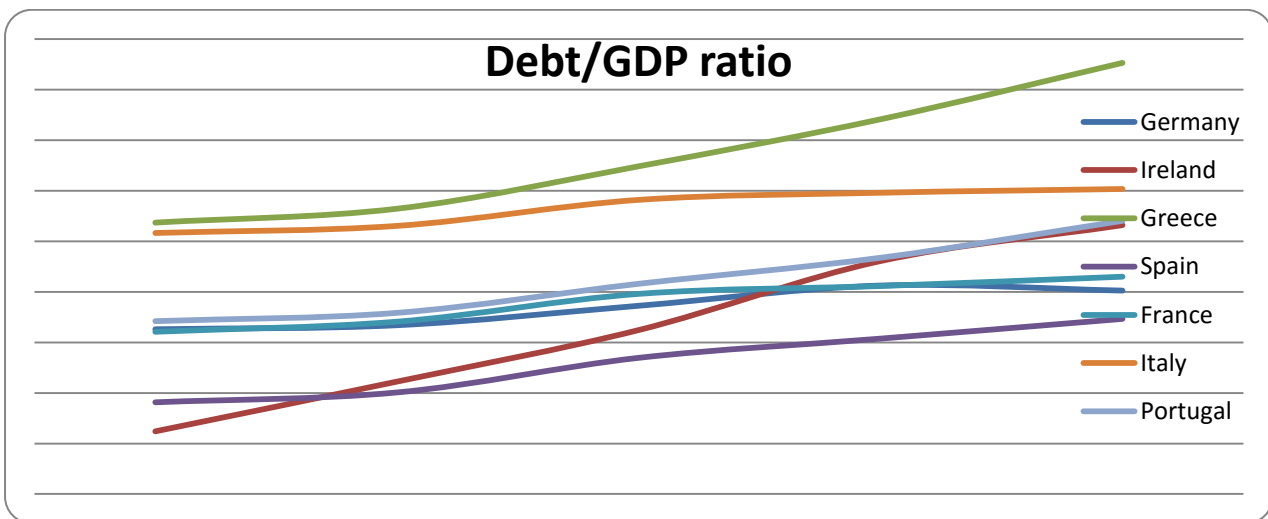


Figure 4. Government consolidated gross debt as a percentage of GDP of the PIIGS Countries, France and Germany. Source: Eurostat.

As regards the trend in the debt/GDP ratio (Figure 4), after the 2007 financial crisis, there was an upward trend in the debt for all of these countries. For Ireland the increase was much greater than the other countries. Greece and Italy have a very similar trend in the debt dynamic. Both countries are above 100% for the whole period and show an upward trend after 2007. As is widely known,

Greek authorities stated that the published accounts were not correct and the new government was obliged to revise its public balance for the worse. Surprisingly, the French and German debt/GDP ratio is well above that of Spain and almost equal to that of Portugal.

In summary, the following assertions may be made:

- 1) All countries considered experienced a slowdown in growth after the financial crisis, an increase (except Greece) during 2009 and a new slowdown during 2011
- 2) All PIIGS countries except Italy have seen a deficit/GDP ratio increase. The performance of countries such as France and Germany were not so different from the other five;
- 3) Italy and Greece have the highest debt/GDP ratio. Spain – considered a very fragile country – has the lowest debt/GDP ratio

What main feature do PIIGS countries have in common to experience such an increase in government bond yields?

Figure 5 shows the current account dynamics from 2007 as a percentage of GDP, in PIIGS countries, France and Germany. Germany has a current account surplus almost always above 5%. France has an - albeit low - current account deficit. Ireland's performance in recent months was better than France's. The other countries all have a current account deficit, with Greece and Portugal being the worst performers.

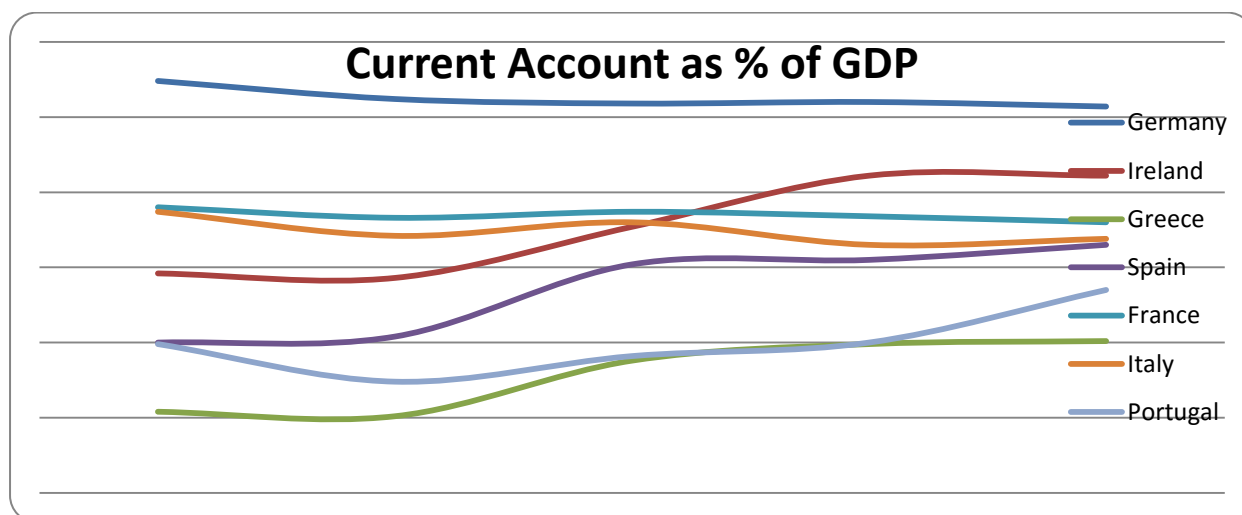


Figure 5. Current account balance as a percentage of GDP. Source: Eurostat.

Financial accounts show how these current account imbalances are offset within the balance of payments. Then, excluding FDI abroad and in the reporting economy we can have a measure of the

financial debt each country has with the rest of the world²⁰. This distinction between “good” and “bad” imbalances is discussed in Eichengreen (2010) and could be considered a good proxy of the liquidity constraint.

The dynamics of the financial account component of the balance of payments without foreign direct investments are shown in Figure 6. The values thus show how much each country is indebted with foreign ones in terms of bank lending and portfolio investments. Positive percentages show a net debt, while negative percentages show a net credit.

PIIGS countries, except Ireland, depend on foreign finance. Germany is a high net creditor, while France is a net debtor too. The post-crisis dynamics however, shows for Ireland, very sharp changes and an improvement of the balance of payment accounts in recent times.

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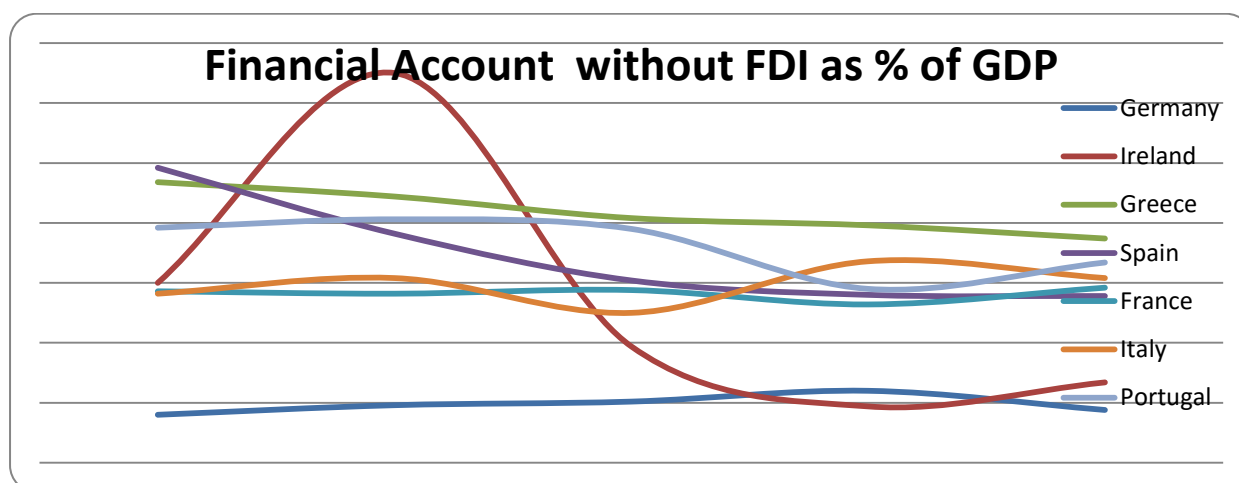


Figure 6. Net Financial Account without FDI in PIIGS countries, France and Germany as % of GDP

PIIGS countries, except Ireland, depend on foreign finance. Germany is a high net creditor, while France is a net debtor too. The post-crisis dynamics however, shows for Ireland, very sharp changes and an improvement of the balance of payment accounts in recent times.

It may be supposed that, when countries are liquidity-constrained, once a crisis has started and its real effects have spread through bank balance sheets, internal monetary and financial institutions

²⁰ The prevailing theoretical and empirical literature preceding the crisis demonstrated that the balance of payment imbalances result from the more attractive investment opportunities in peripheral countries and in the long run it would drive the lower per-capita GDP economies to catch up the richer ones. Furthermore financial integration within Europe accelerates the convergence process. However, distinguishing between “good” (FDI) and “bad” (financial debt) imbalances (Eichengreen 2010) could help to explain current macroeconomic imbalances and cast doubts on the positive role financial markets have on convergence process.

start to sell the debt on the secondary market to meet their liquidity needs and respect Basel II agreements (Krugman 2008 Gandolfo 2010). Increases in CDS transactions can be considered as a means to increase liquidity²¹; the increasing demand for liquidity makes interest rates and basis points go up and send the signal that default is likely to occur. Having greater liquidity, foreign financial markets start to perceive that they can increase their profits, especially when after a period of crisis it is difficult to find alternative remunerative destinations for their funds (this is confirmed by the fact that – if we exclude Ireland – for the year 2007 there is no significant outflow of capital from PIIGS counties In the case of Italy and Spain the inflow increases).

Further fragility can derive from the amount of public debt held abroad. From the ratio between external and internal sovereign debt weighted for the total debt/GDP ratio for each PIIGS country (Figure 7) $[(\text{Total gross external government debt}/\text{Total gross government debt}) * (\text{debt}/\text{GDP})]$ we observe that of the countries which are liquidity-constrained, in the worst condition are (besides Greece) Italy, Portugal and Ireland. Spain is somewhat below the others: this would explain, together with the better value of the net financial position, why spreads with German bonds are rather lower in respect to Italy.

When public debt is held abroad, interest rates increase more rapidly due to the non-coincidence between individuals on which the State has fiscal sovereignty and individuals that hold debt and will in the future receive repayment. This in turn, due to real effects, increases the perception of a likely default, justifying the increase in risk premiums.

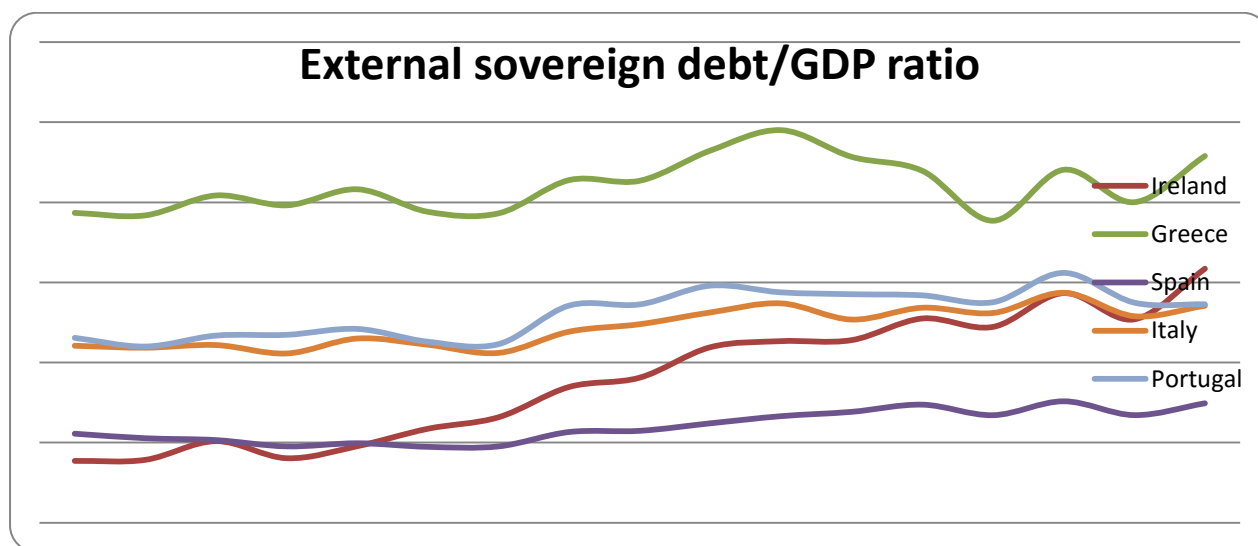


Figure 7. Ratio of total External Total Government debt on Total Government debt, weighted for the debt/gdp ratio. Own calculation on World Bank Data and Eurostat.

²¹ When, for example, an MFI buys a CDS contract can overcome the liquidity constraint without selling the underlying bond.

However, because exiting the EMU would be very costly, financial markets increase their gains and work as a dissuasive arm, forcing governments to raise liquidity through greater taxation or public asset sales. However, because the burden of this refinancing cost falls on domestic residents, a vicious spiral is started, according to which the initial liquidity needs further reduce the internal liquidity availability, due to the effects on aggregate demand and GDP growth.

At the same time, this mechanism cannot be taken forward for ever. The percentage of debt held abroad is also a good proxy for the country to release abroad the costs of retrenchment, devalue its currency and restore the competitiveness without excessive reduction of aggregate demand.

4. Conclusions.

Fifty years ago Mundell (1961) stated that if a country wanted to join a currency union it had to have great labour market flexibility in order to offset the shocks without using the exchange rate or other monetary policy instruments. However, once a country is already inside the currency union and experiences great difficulties in output growth without the possibility of using fiscal instruments to make output reach its potential level, it has to appraise, in the same way, the costs and benefits of remaining inside the EMU.

As happens in every fixed exchange rate mechanism, the cost of adjustment is borne on the shoulders of countries experiencing low aggregate equilibrium income, and current account deficit: therefore willingness to pay is measured by the evaluation of costs and benefits of remaining inside the currency area. If costs outweigh the benefits, the country defaults and exits the currency area, while the opposite occurs if benefits are greater than costs. This can be interpreted as an extension of the second and third generation models about speculative attacks in a fixed exchange rate area according to which the main cause of abandoning the exchange rate has to be found in the conflict between the objectives of the economic policy (Obstfeld 1986 a, b; Jeanne 1997; and Spadafora 1999). What should be evaluated is to what extent the difficulties raising funds may ultimately cause an unwillingness to pay, because of the negative effects on aggregate equilibrium income.

This self-fulfilling speculative mechanism has three main causes:

1. the foreign account imbalances inside the EMU
2. the behaviour of foreign financial markets
3. the rigidity of policy structure in Europe

For some countries this would appear to be a kind of trap: on the side of fiscal policy there are very strict limits to deficit spending. On the side of monetary policy the eventual primary market bond

purchase will be followed by a full sterilization. In few words countries in difficulty, neither have any instrument nor will receive any help on the side of aggregate demand to offset the crisis.

While the EMU future is uncertain, financial markets play the role of the dissuasive arm of the SGP, forcing PIIGS countries into fiscal retrenchments. They impose fiscal prescriptions without having fiscal sovereignty (de Grauwe 2011a and de Grauwe 2011c).

In the future two scenarios may occur: the first one, where single states are asked to make adjustments on their own. In particular peripheral countries have to bear the whole cost of rebalancing the currency area, while core ones – albeit they gained advantages from the weakness of the Euro – remain at the window. This would be a return back of twenty years when single independent states were part of a fixed exchange rate regime and had to decide whether or not to adhere to the currency area (Mundell 1961).

The alternative route relies on the premises that fiscal retrenchments are said to further depress the internal demand and widen the inability to repay the debts.

Peripheral countries, whatever their original sin, must bear huge costs, which, at the end, could even be completely useless because of their inability to reduce interest rates. This brings to consider that EMU asymmetries cannot be solved without a shared policy action and without taking into account the systemic shock coming from the crisis. In this context, a jump of quality toward a political union is required.

The absence of a political project will pave the way to those who are convinced that rather than bear such high social costs, it would be better to grant autonomy to the national economic policy. However in the globalization era this would likely be – following the “Rodrick’s trilemma”²² (Rodrick 2011) – a loser choice.

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²² The “old” trilemma states that perfect capital mobility, fixed exchange rates and autonomous management of monetary policy are not reconcilable (Obstfeld 1995), while the Rodrick’s trilemma states that it is impossible to have at the same time globalization, democracy and autonomous policy management.

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Does Decentralization Affect Regional Public Spending in Italy?

Rita De Siano and Marcella D'Uva

Abstract

This paper tests the presence of spatial interdependencies of Italian regional public spending and its determinants in the period 1996-2010 through spatial panel models. In particular, the analysis controls for the impact of the reform of the constitutional article no. 117, in the perspective of wider administrative decentralization. Results show that administrative decentralization has greatly increased spatial interdependencies of public spending choices that appear to pass mainly through neighbours' determinants. Other findings are the presence of congestion and mobility effects, a shift in demand to the private sector especially for education and a positive correlation between left-wing governments and total and general administration expenditures.

Keywords: regional public spending, spillover effects, administrative decentralization, spatial econometric analysis.

JEL classification: C21, H72.

1. Introduction

The variety of the social and economic contexts of different geographical units in a single country has recently led to several cases of fiscal decentralization. The experiences of countries which have implemented such fiscal programmes provide interesting insights for empirical evaluation of their economic and political benefits.

The consequences of a fiscal decentralization process have been extensively discussed in the economic literature. This political process increases local government accountability and, as a consequence, may improve the efficiency of the institutions involved (Besley and Case, 1995; Revelli, 2002, 2006). However, this process may induce local authorities to allocate the available resources according to their own preferences and political strategies, resulting in an increase in interregional differences and a drop in efficiency. At the same time, fiscal decentralization may generate spatial spillover effects in local public spending – in the sense that the public spending of a state/region may be affected by that in the neighbouring regions (Case *et al.*, 1993; Baicker, 2005; Costa-Font and Moscone, 2008). This influence takes place through different channels. First, state/regional policies may be conditioned by the fiscal pressure of neighbours due to the possibility of taxpayers' "migration" to locations imposing lower taxes. On the contrary, if a state/region has a more efficient welfare system, an incoming flow of individuals may be registered (Brueckner, 2000). Second, citizens can judge their politicians' behaviour by comparing the results of local administrations with those of neighbouring ones (Besley and Case, 1995). In particular, their benchmark is represented by those locations showing a more similar social and economic structure.

The origins of the theoretical literature dealing with spatial interdependencies of public spending lie in the 1960s (Breton, 1965; Williams, 1966; Brainard and Dolbear, 1967; Pauly, 1970; Oates, 1972; Boskin, 1973; Arnott and Grieson, 1981; Gordon, 1983). Empirical applications have also contributed over the years to produce extensive evidence of the presence of spatial spillovers using different public spending categories. Case *et al.* (1993) for example, considering four categories of the US public spending (health and human services, administration, highways, education) and different measure of neighbourliness, find significant spatial interdependencies in state expenditure during the period 1970-1985. More

recently, in a study of US public expenditures (social services, public safety, highways, miscellaneous administration) Baicker (2005) found evidence consistent with models of welfare and tax-motivated migrations.

A sizeable number of studies have analyzed the effects of fiscal decentralization in different countries, focusing only on health spending. Among them, Di Matteo and Di Matteo (1998) for Canada, Skinner and Wennberg (2000) for the US, Crivelli et al. (2006) for Switzerland, Giannoni and Hittris (2002) for Italy and Costa-Font and Pons-Novell (2007) for Spain. As regards the presence of spatial spillovers, some evidence of spatial interaction in the local organization of healthcare is given by Moscone and Knapp (2005), Costa-Font and Pons-Novell (2007) and Costa-Font and Moscone (2008).

This paper refers to the Italian regional (NUTS2 level) public spending in various sectors during the period 1996-2010, detecting different issues. First of all, following suggestions in the literature, we choose the determinants of public expenditure in different sectors. Second, we test for the presence of spatial interaction among neighbouring regions, looking for evidence of direct and indirect effects. To this extent we use different measures of neighbourliness in order to identify which channel best explains the presence of interregional spillovers. Third, since in 2001 the Italian central government modified constitutional article no. 117, in the context of broader administrative decentralization, redefining the legislative power of regions and their sectoral competence, we are keen to test whether this reform had a significant impact on regional spending spatial interdependencies. For the latter purpose our empirical investigation refers to two different sub-periods, before and after the reform (1996-2001 and 2002-2010, respectively). As far as we know there are no studies which have analyzed these issues for Italian regions.

The results of our investigation show that administrative decentralization has strongly increased spatial interdependencies of public spending choices. The matrices that best reveal the presence of regional public spending spillovers are those based on geographical distance. As regards the determinants of regional public spending the main findings are the presence of congestion and mobility effects, particularly strong after the constitutional reform, a shift in the demand to the private sector in particular for education, the mobility of individuals

towards richer regions for health services and, finally, a positive correlation between left-wing governments and total and general administration expenditures.

The paper is structured as follows: section two presents a brief overview of the administrative decentralization process in Italy; section three describes the empirical model and dataset; section four presents the econometric methodology and the measures of neighbourliness; econometric results are discussed in section five; section six concludes.

2. Italian context

The Italian Constitution recognizes administrative decentralization as one of the fundamental principles of administrative organization (Art.5, Art. 97; par. 2; arts. 114-133, Title V, Part II) designed to create effective participation of the community in the operation and care of the public interest.

Implementation of the administrative decentralization began in the 1970s with the transfer to the ordinary statute regions of administrative functions (Law no. 281/1970; the Presidential Decree of November 1st, 1972, D.P.R. no. 616/1977, Law no. 382/1975) and continued in the 1990s with the new system of local autonomy and the direct election of Mayors and the Presidents of provinces (Law no. 142/1990; Legislative Decree no. 267/2000).

In 1997, the Bassanini Law (Law no. 59/1997) transferred to the regions and local authorities responsibilities and administrative tasks referring to four specific areas: economic development and production; land, environment and infrastructure; services to individuals and the community, regional and local administrative police and the system of authorization.

But only in 2001 did the constitutional reform of Title V, Part II of the Constitution redefine the relations between State and Regions arguing that “*the legislative power is exercised by the State and Regions in accordance with the Constitution and with the constraints deriving from the EU and international obligations*” and specifies that the regions have general legislative power in all matters not expressly reserved to the State. The actual text of the Constitution lists the areas in which the State has exclusive legislative power and those in which regions may legislate whilst respecting the fundamental principles of State Law (concurrent power). The State has exclusive legislative power in justice, electoral legislation, foreign policy, immigration, defence, monetary policy, protection of the environment and cultural heritage,

and social security. Concurrent areas are the following: international relationships with European Union regions, international trade, labour health and safety, health, education, R&D, transport, energy, supplementary social security, public finance and the tax system, enhancing cultural heritage, local credit. All matters not explicitly reserved exclusively to the State are of regional legislative competence.

Prior to the reform the Italian Constitution defined specifically the areas of regional legislative power while the current text lists the areas in which the State has exclusive legislative power and those of concurrent power. This modification to the Constitution has contributed to assigning considerably enlarged powers to the regions.

3. Model and dataset

In order to detect the effects of the determinants of Italian regional public spending in this section we construct a model on the basis of the main empirical contributions in the literature (Case et al., 1993; Baicker, 2005; Costa-Font and Moscone, 2008).

$$PS_{it}^c = \beta X_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

where PS_{it}^c indicates the amount of public spending in category c of region i ($i=1, \dots, 20$) at time t ($t=1, \dots, T$), \mathbf{X}_{it} is a $(1, K)$ row vector of observations on the explanatory variables, β is a $(K, 1)$ vector of fixed but unknown parameters, μ_i is a spatial specific effect controlling for time-invariant variables and λ_t is a time-specific effect accounting for spatial-invariant variables.

Of the regional public spending categories (30 sectors) classified by the Economic Development Ministry in the Territorial Public Accounts System we consider the following: total public spending, general administration, health, education and transport¹. For the purpose of our study, the relevant sectors are those in which the legislative power of the regions is concurrent with state powers.

¹ This category is given by the sum of “road transport” and “other transport”.

~~As suggested by the empirical literature~~ we consider the following explanatory variables at a regional level: population density (popdens), population over 65 years old (pop>65), population under 15 years old (pop<15), per capita income (gdppc), central administration total transfers to families and firms (grants), and a political indicator (gov). A brief discussion of the relationship between the type of public spending and each explanatory variable together with the expected sign is given below.

The inclusion of population density among the explanatory variables is suggested by the possibility of accounting for scale economies and/or congestion effects in the provision of regional public services. In this framework we might expect a negative or a positive sign of the estimated coefficients, respectively. This variable is given by the population per square kilometre.

Different demands for public services may be explained by dissimilar regional demographic structures. To this extent we consider the fractions of population over 65 and under 15 years old which may be considered as the most dependent age classes. Beyond the potential scale/congestion effects on all the spending categories, for health we may expect a positive influence of the two explanatory variables while spending on education may be affected negatively by an aging population and positively by an increasing young population.

Per capita income is usually considered indicative of the tax base, and as a positive correlation exists between public expenditures and tax revenues we may expect the same between per capita income and public spending. However, in the richest regions the unsatisfied demand for public services may shift to the private sector, leading to a negative impact of per capita income on public spending.

Total transfers from the central administration to regional governments, given by the sum of current and capital account transfers to families and firms, are a measure of resources availability and hence may affect public expenditures positively.

Finally, a dummy variable, equal to one if the region is administered by a left-wing party and zero otherwise, is included in order to account for political effects. Most of the economic literature (Parkin et al., 1987; Henrekson, 1988; Costa-Font and Moscone, 2008, on health expenditure) suggests that left-wing governments tend to increase public expenditure more than those on the right. On the contrary, Tavares (2004) shows that left-wing parties enforce their credibility by cutting public expenditure while the right increase it by raising tax revenues. Given these frameworks the expected effect of the political indicator on public spending is not unique.

Although the overall period of our analysis covers the interval 1996-2010, we consider two different sub-periods in order to control for the impact of administrative decentralization introduced in Italy on October 2001. The econometric investigation will therefore examine the period prior to decentralization (1996-2001) and the period after (2002-2010).

Our data sources are as follows: Territorial Economic Accounts from ISTAT for GDP and population; the Territorial Public Accounts System of the Ministry of Economic Development for public spending categories and transfers to families and firms; Ministry of the Interior for political indicators.

In order to evaluate the spatial interdependencies of regional public spending we then introduce a spatial component and estimate the model through appropriate spatial panel techniques (section 4).

3.1 Descriptive analysis of public spending categories

In what follows we give a brief overview of the distribution and dynamics of regional public spending in Italy during the period 1996-2010. Tables 1 and 2 present the descriptive statistics while figure 1 shows trends over time for each spending category. Total spending represents on average 10.7% of regional GDP, with Valle d'Aosta and Lazio showing the highest and lowest percentage (26.5% and 4.9%, respectively). This category of public expenditure increased during the whole period although the Growth and Stability Pact imposed more severe criteria for the management of the public budget in all the Member States of the Economic and Monetary Union. As regards more disaggregated types of public spending, namely General Administration, Health, Education and Transport, they represent on average almost 80% of regional total spending. The largest share of spending is on health services (62.5%), which increased constantly during the period in question; Calabria and Sicilia showed the highest percentage value (9.15 and 8.06, respectively) while Veneto, with the lowest (4.94), spent approximately half (in percentage terms).

Regional spending on General Administration, Education and Transport showed a slight increase.

It is worth pointing out the interregional discrepancies which are notable for total spending and health. Besides, the dynamics of the variability during the sample period

indicates that interregional divergences increase in all spending categories except for General Administration.

4. Econometric methodology

Depending on the type of interaction between observations of different geographical units, different spatial econometric models may be used (Anselin 1988; Elhorst 2010, 2011):

- Spatial autoregressive models (SAR), when the dependent variable is influenced by

the dependent variable observed in the neighbouring regions

$$PS_{it}^c = \delta \sum_{j=1}^N w_{ij} PS_{jt}^c + \beta X_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (2)$$

where w_{ij} is the single element of the row-standardized weight matrix for neighbourliness. A positive δ coefficient indicates similar movements among neighbouring regions' spending, while a negative value suggests differences with respect to neighbours' spending.

- Spatial error models (SEM), when error terms are correlated across space

$$PS_{it}^c = \delta \sum_{j=1}^N w_{ij} PS_{jt}^c + \beta X_{it} + \mu_i + \lambda_t + \varphi_{it} \quad (3)$$

$$\varphi_{it} = \rho \sum_{k=1}^N w_{ik} \varphi_{kt} + \varepsilon_{it} \quad (4)$$

A significant ρ parameter indicates that a random shock in a spatially significant omitted variable that affects public spending in a region also extends to its neighbours.

- Spatial Durbin Models (SDM) containing a spatially lagged dependent variable and spatially lagged independent variables. For our analysis, this means that each region's public spending category also depends on the determinants of its neighbours' spending. This model enables us to distinguish between direct effects - that is the influence of a particular explanatory variable on the dependent variable on its own economy-and indirect effect-that is the presence of spatial spillovers. On the basis of this approach the model changes as follows:

$$PS_{it}^c = \delta \sum_{j=1}^N w_{ij} PS_{jt}^c + \beta X_{it} + \gamma \sum_{j=1}^N w_{ij} X_{jt} + \mu_i + \lambda_t + \varepsilon_{it} \quad (5)$$

where γ is a $(K,1)$ vector of parameters measuring the influence of neighbouring regions explanatory variables.

In order to choose the proper spatial panel model specification for each public spending category (Anselin *et al.* 2008; LeSage and Pace 2009; Elhorst 2010, 2011), we performed the robust Lagrange-Multiplier test, namely the robust-LM lag and the robust-LM err tests. The null hypothesis for these tests is the absence of spatial dependence while the alternative hypotheses are, respectively, the presence of a spatial lag and spatial error dependence. We also undertook the likelihood ratio (LR) and the Wald tests to verify whether the SDM can be simplified to the spatial lag model or to the spatial error model (Elhorst 2010, 2011). The model specifications are estimated with Maximum Likelihood techniques, using the bias correction of Lee and Yu (2010), assuming that the disturbances are independent and identically distributed (i.i.d.) across i and t , with zero mean and variance σ^2 . Finally, an LR test is used to investigate the joint significance of time- and spatial-specific effects, which may be treated as fixed or random. In particular, we treat the time-specific effects as fixed because our panel includes all the Italian regions, and not a sample of them, and each sub-period is not sufficiently large (Elhorst 2010), as $T_1=6$ and $T_2=9$. Regarding the spatial specific effects we use the Hausman test in order to choose between a random and a fixed model approach.

4.1 Weight matrices for neighbourliness

Following Case *et al.* (1993) and Baicker (2005) we explore different types of weight matrices in order to find out which type of neighbourliness best explains the spillover effects of public spending choices. To this extent we consider four measures of proximity:

- Geographic distance (INVDIS). Following Le Gallo and Ertur (2003) we chose a row-standardized weight matrix computed on the k -nearest regions, whose weights are given by the inverse distance among regional administrative centres (regional capital). This type of matrix is preferred over contiguity and adjacent ones due to the presence of islands in the sample and the possibility of selecting the same number of neighbours for each region (De Siano, D’Uva, 2013). In this study we considered the six-nearest regions.
- Population-weighted geographical distance (POPDIS), where the six-nearest regions are weighted by their own population size.
- Per capita income (GDP). In this matrix the weights are computed on the basis of per capita income differences among regions as follows:

$$w_{ij} = \frac{1}{|Gdp_i - Gdp_j| S_i} \quad \text{with} \quad S_i = \sum_j \frac{1}{|Gdp_i - Gdp_j|}$$

where Gdp_i and Gdp_j are the initial levels (1996) of per capita income in regions i and j , respectively.

- Interregional mobility (MOB), where for each region i the weights are given by the share of immigrants from a region j (with $j \neq i$), with respect to region i 's total immigration. Data on migrants are taken from the Territorial Economic Accounts of Istat.

5. Econometric results

This section presents the results of the spatial econometric analysis for the sub-periods 1996-2001 and 2002-2010. We undertook this analysis for only those public spending

categories for which regions have a concurrent legislative power with the State, namely: total public spending, general administration, health, education and transport.

We performed the analysis using the four different weights matrices described above. As our results show that interregional mobility does not have a significant impact on regional spending spillovers, we present and discuss only the outcome obtained using the six nearest regions, the per capita income and the population-weighted geographical distance matrix

With regard to model specification tests, comparison of the two sub-period robust-LM² results reveals that administrative decentralization leads to considerable public spending spillover when the six-nearest regions matrix is used. Spatial interdependencies do not appear to be modified when different matrices are considered.

Robust-LM, Wald and LR tests enable us to identify the spatial econometric model that best describes the data in the presence of spatial interdependencies. Tables 3a and 4a show the results only for those spending categories for which spatial interdependencies are found. When using the geographical distance matrix the SDM is chosen in the first sub-period for general administration and health, and in the second for total spending, health, education and transport. The sample based on the per capita income matrix reveals that in the first sub-period the SDM is preferred for general administration and education and the SAR model for health and transport; in the second sub-period the SDM is chosen for general administration, health and transport and an SAR model for education. Finally, when the population-weighted geographical distance is used, the SDM always proves to be the best model for all the spending categories except for education in the first sub-period (SEM) and transport in the second (SEM).

As mentioned above, we treat the time-specific effects as fixed while the Hausman test reveals that the spatial specific effects should be considered in the first sub-period as random only for general administration when using the per capita income matrix. Regarding the second sub-period, spatial effects are random in the case of the geographical distance matrix for total spending, education and transport, for health and transport when using the per capita income matrix and, finally, for total spending and general administration when the population-weighted matrix is used.

Estimation of the SDM reveals that there is no spatial autocorrelation for the public spending categories, in the sense that spending in the neighbouring regions does not affect one region's own spending. Indeed, the corresponding coefficients are negative or not significant.

However, spatial interdependencies seem to pass through the neighbouring regions' determinants of public spending whichever measure of neighbourliness is considered. This

² These results are available upon request.

occurs mostly in the second sub-period, meaning that the constitutional reform had a significant impact on regional spending spillovers.

Regarding the measure of neighbourliness, our analysis reveals that the population-weighted geographical distance matrix is the one that best picks up the regional spillovers of public spending. The matrix gives the largest number of significant explanatory variables for all the expenditure categories, except for education where the distance between regions seems to be more crucial.

With regard to the determinants of regional public spending, below we present the overall findings of both the direct and indirect effects (tables 3b and 4b). The direct effects differ from their coefficient estimates due to the feedback effects in each explanatory variable on neighbouring regions, and then back on the regions themselves. In our study, these feedback effects appear to be mainly due to the coefficient of the spatially lagged value of the independent variables, rather than to the coefficient of the spatially lagged dependent variable, which is almost always negative or non-significant.

Congestion effects resulting from positive coefficients of the population density (popdens) direct effects are evidenced for all spending categories. Indirect effects are mainly positive, which may be due to population mobility among regions. When considering more similar regions in terms of per capita income we find a negative indirect effect for health and transport. Indeed, it is unlikely that individuals living in a rich/poor region move towards a region with a similar income level for transport or health services. All these effects are particularly strong after the constitutional reform, indicating that administrative decentralization drove regional interactions.

The population over 65 (pop>65) shows significant effects (positive) only for region own health expenditure, as expected. As regards indirect effects, coefficients are always positive (except for general administration) above all in the second period. This evidence confirms the presence of population mobility effects. The population under 15 years old (pop<15) does not have a significant direct effect on regional public spending while it seems to affect positively total and health expenditure of neighbouring regions.

Direct effects of income level, significant only in the first period, are positive on regional general administration and health spending while they are negative on education. The

results suggest that there is a shift of the demand to the private sector only for education. The negative spillover effect of the income level on neighbouring regions' health spending when using the population-weighted geographical distance matrix must be emphasized. This means that individuals tend to move towards richer regions that probably offer higher quality services in the health sector.

Transfers of the central government to families and firms of a region affect the region's own spending positively, as suggested by the theoretical literature, while they do not affect neighbouring regions' expenditure.

Finally, as regards the political indicator, our analysis shows that regional total and general administration expenditures have always been increased by left-wing parties while spending on education has been reduced. Neighbouring region spillover effects are of less relevance.

When, as indicated by diagnostic tests, the models that best describe the data are the SAR and SEM, the results do not show the presence of spatial autocorrelation in the dependent variables as in the error terms. As regards the determinants of regional public spending, they confirm the outcome given by direct effects in the SDMs.

6. Conclusions

This paper contributes to the empirical debate on the spatial interaction in public spending decisions at a local level. To this extent, on the basis of the literature, we built an empirical model including the determinants of Italian regional public expenditure in the following sectors: total public spending, general administration, health, education and transport. Besides, as the recent econometric theory has pointed out that ignoring spatial interdependencies may lead to inefficient estimates (Anselin 1988; Elhorst 2010; LeSage and Pace 2009), we included a spatial component in the model and estimated it through spatial econometric techniques. In order to check the robustness of the results and to find the measure of neighbourliness which best explains the interregional public spending spillover effects we used four measures of proximity: geographic distance, population-weighted geographical distance, per capita income and interregional mobility. The study covered two sub-periods,

1996-2001 and 2002-2010, so as to account for the importance of administrative decentralization, introduced in Italy with the constitutional reform of Art. 117 in 2001, and tested its impact on regional spending spatial interdependencies.

Regarding the measure of neighbourliness, the population-weighted geographical distance matrix is the one that best reveals the presence of regional public spending spillovers. However, the six-nearest regions matrix more clearly emphasized the effects of administrative decentralization in terms of interregional interdependencies.

In general, diagnostic tests revealed that the model specification to be preferred is the Spatial Durbin. This model enabled us to distinguish between the influence of a particular explanatory variable on the dependent variable on its own economy (direct effects) and the presence of spatial spillovers (indirect effects).

Estimation of the SDM shows that spending in the neighbouring regions does not affect one region's own spending (absence of spatial autocorrelation). However, spatial interdependencies seem to pass through the neighbouring regions' determinants of public spending mostly in the second sub-period, indicating significant impact of the constitutional reform on regional spending spillovers.

The signs of the explanatory variables coefficients are generally consistent with theoretical predictions. When considering demographic explanatory variables we found congestion and mobility effects. All these effects are particularly strong after the constitutional reform indicating that the administrative decentralization enforced regional interactions. The GDP explanatory variable suggests the presence of both a shift in demand to the private sector for education and a mobility of individuals towards richer regions for the health sector services. Transfers to a region positively affect only the region's own spending. The political indicator evidences a positive correlation between left-wing governments and total and general administration expenditures.

The main result of our analysis is that administrative decentralization in Italy has greatly increased spatial interdependencies of public spending choices. Therefore policy-makers in defining public spending programmes should make due allowances for the direct and feedback effects of their actions.

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Table 1. *Descriptive statistics of public spending categories by year*

Year	Total spending		General Administration		Health	Education		Transports		
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
1996	9.364	4.777	0.785	0.900	5.296	1.406	0.309	0.536	0.422	0.283
1997	9.403	4.745	0.794	0.946	5.458	1.429	0.348	0.555	0.424	0.311
1998	9.768	4.745	0.807	0.927	5.588	1.189	0.415	0.693	0.413	0.350
1999	9.812	4.707	0.809	0.761	5.547	1.244	0.370	0.878	0.473	0.490
2000	10.209	4.752	0.850	0.839	5.816	1.194	0.366	0.840	0.553	0.511
2001	11.516	7.477	0.894	1.031	6.186	1.485	0.370	0.867	0.661	0.505
2002	10.639	5.416	0.835	0.976	6.125	1.392	0.393	0.883	0.638	0.533
2003	10.832	5.151	0.876	1.021	6.172	1.153	0.389	0.902	0.682	0.554
2004	10.823	5.411	0.855	1.033	6.480	1.635	0.362	0.850	0.622	0.512
2005	10.690	5.289	0.820	0.997	6.399	1.733	0.351	0.825	0.532	0.480
2006	10.960	5.715	0.865	1.080	6.567	1.625	0.365	0.868	0.532	0.470
2007	10.834	5.366	0.865	0.956	6.565	1.772	0.357	0.880	0.541	0.480
2008	11.156	5.373	0.927	1.022	6.765	1.857	0.372	0.905	0.592	0.495
2009	12.848	8.590	0.949	1.126	7.373	2.103	0.582	1.675	0.740	0.888
2010	12.132	8.524	0.862	0.921	7.429	2.385	0.539	1.557	0.661	0.814

Table 2. *Descriptive statistics of public spending categories by region*

Region	Total spending		General administration		Health		Education		Transport	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Abruzzo	8.635	1.352	0.885	0.226	6.156	1.153	0.114	0.032	0.173	0.122
Basilicata	11.750	1.092	0.794	0.084	7.407	1.202	0.112	0.079	0.408	0.220
Calabria	13.415	1.241	0.662	0.160	9.152	1.188	0.090	0.045	0.762	0.459
Campania	10.601	1.143	0.760	0.298	7.866	0.940	0.086	0.027	0.792	0.240
Emilia Romagna	6.437	0.561	0.181	0.029	5.177	0.581	0.069	0.029	0.265	0.048
Friuli Venezia Giulia	9.281	1.397	0.691	0.202	4.917	0.340	0.099	0.035	0.381	0.119
Lazio	4.882	0.837	0.282	0.130	3.722	0.805	0.095	0.037	0.402	0.229
Liguria	7.554	0.864	0.550	0.436	5.589	0.643	0.041	0.025	0.510	0.158
Lombardia	5.770	1.000	0.138	0.021	4.751	0.958	0.055	0.022	0.340	0.055
Marche	7.444	0.443	0.506	0.189	5.709	0.465	0.103	0.020	0.225	0.074
Molise	11.265	0.995	1.270	0.152	6.474	0.612	0.094	0.133	0.763	0.247
Piemonte	7.011	1.201	0.274	0.060	5.278	0.918	0.072	0.017	0.390	0.186
Puglia	9.831	1.312	0.366	0.047	7.902	1.079	0.086	0.037	0.542	0.168
Sardegna	14.467	0.610	1.222	0.158	7.489	0.879	0.248	0.088	0.402	0.193
Sicilia	15.354	1.461	1.182	0.258	8.069	0.971	0.252	0.097	0.404	0.060
Toscana	6.923	0.326	0.283	0.082	5.561	0.481	0.115	0.038	0.310	0.072
Trentino	22.071	8.232	1.893	0.508	6.767	2.883	3.385	1.540	1.992	1.003
Umbria	9.209	0.859	0.552	0.127	6.797	0.715	0.099	0.019	0.398	0.113
Valle d'Aosta -	26.545	3.891	4.387	0.493	5.291	0.547	2.591	0.282	1.617	0.238
Veneto	6.202	0.633	0.182	0.026	4.949	0.678	0.046	0.032	0.237	0.057

Tables 3.a. *Spatial panel models results, sub-period 1996-2001*

Determinants	Total spending	General administration			Health			Education		Transport	
	SDM POPDIS	SDM INVDIS	SDM GDP	SDM POPDIS	SDM INVDIS	SAR GDP	SDM POPDIS	SDM GDP	SDM POPDIS	SAR GDP	SEM POPDIS
Popdens	7.31 (2.53)	-2.24 (-0.27)	0.34 (1.09)	-4.50 (-0.60)	222.38 (3.98)	320.08 (6.66)	370.76 (7.38)	-0.15 (-0.67)	-2.88 (-0.59)	9.30 (1.17)	8.81 (1.23)
Pop>65	129.8 (4.80)	30.62 (0.40)	-35.77 (-2.59)	-1.47 (-0.02)	1695.57 (3.38)	1958.8 (3.98)	2422.6 (5.15)	-30.21 (-2.90)	-198.23 (-4.37)	-141.04 (-1.77)	-114.2 (-1.60)
Pop<15	3.16 (0.61)	16.47 (1.16)	1.43 (0.12)	7.02 (0.52)	5.57 (0.05)	82.15 (0.80)	44.06 (0.49)	2.51 (0.31)	-6.09 (0.71)	-15.67 (-0.92)	-17.40 (-1.16)
Gdppc	-6.003 (-0.48)	22.57 (0.65)	31.87 (1.67)	20.64 (0.63)	887.62 (3.84)	777.34 (3.66)	618.77 (2.84)	24.19 (1.80)	-41.56 (-1.98)	-55.19 (-1.58)	-56.53 (-1.92)
Grants	1.41 (1.50)	7.03 (2.87)	6.45 (2.86)	8.90 (3.64)	39.61 (2.42)	45.11 (2.41)	53.55 (3.27)	-2.34 (-1.51)	-2.76 (-1.75)	3.53 (1.14)	4.67 (1.80)
Gov	16.66 (1.11)	132.11 (3.94)	114.09 (4.35)	81.96 (2.10)	574.87 (2.55)	659.46 (2.77)	302.24 (1.15)	-18.11 (-1.00)	-64.67 (-2.57)	-60.01 (-1.54)	-63.99 (-1.78)
W*Popdens	29.40 (3.02)	49.58 (1.38)	0.09 (0.20)	-0.18 (-0.007)	-889.12 (-3.67)		-100.1 (-0.57)	-0.19 (-0.55)	-20.94 (-1.28)	0.10 (-1.00)	
W*Pop>65	138.49 (1.33)	440.0 (2.32)	-65.60 (-2.45)	634.26 (2.40)	-58.13 (-0.04)		5432.33 (3.01)	17.22 (0.90)	261.92 (1.54)		
W*Pop<15	101.05 (2.82)	130.6 (2.12)	-98.15 (-3.43)	195.61 (2.13)	714.18 (1.70)		3364.0 (5.43)	17.51 (0.89)	13.80 (0.23)		
W*Gdppc	-21.79 (-0.58)	-135.05 (-1.64)	-65.12 (-2.63)	-154.85 (-1.61)	917.97 (1.62)		-716.25 (-1.10)	-5.65 (-0.32)	90.04 (1.45)		
W*Grants	-0.62 (-0.45)	-6.50 (-1.20)	1.90 (0.58)	-3.71 (-1.01)	-45.23 (1.25)		-28.05 (-1.17)	-0.06 (-0.03)	0.64 (0.28)		
W*Gov	39.53 (1.10)	-41.82 (-0.36)	52.68 (1.01)	-148.32 (-1.51)	714.53 (0.95)		-458.98 (-0.72)	33.52 (0.95)	-14.23 (-0.23)		
δ	-0.15 (-1.03)	-0.26 (-1.59)	-0.25 (-2.50)	-0.23 (-1.52)	-0.05 (-0.37)	-0.07 (-0.81)	-0.10 (-1.04)	-0.26 (-2.53)	-0.009 (-0.06)	-0.10 (-1.00)	
ρ											-0.23 (-1.64)
Theta			0.23 (4.55)					0.20 (4.53)			
R ²	0.98	0.90	0.88	0.90	0.97		0.97	0.88	0.91	0.88	0.89
Corrected R ²	0.28	0.39	0.51	0.39	0.62		0.62	0.41	0.26	0.06	0.85
Wald test spatial lag	32.37 (p=0.000)	10.49 (p=0.10)	22.67 (p=0.000)	12.24 (p=0.05)	40.87 (p=0.000)		43.24 (p=0.000)	2.57 (p=0.86)	5.84 (p=0.44)		
LR test spatial lag	34.40 (p=0.000)	12.59 (p=0.05)		13.30 (p=0.03)	42.34 (p=0.000)		41.20 (p=0.000)		6.30 (p=0.38)		
Wald test spatial error	30.92 (p=0.000)	11.25 (p=0.08)	19.04 (p=0.000)	13.35 (p=0.03)	39.99 (p=0.000)		42.50 (p=0.000)	3.89 (p=0.69)	5.87 (p=0.43)		
LR test spatial error	35.41 (p=0.000)	13.63 (p=0.03)		14.42 (p=0.02)	40.24 (p=0.000)		40.92 (p=0.000)		6.11 (p=0.41)		
Hausman test	31.83 (p=0.002)	58.03 (p=0.000)	4.60 (p=0.98)	28.04 (p=0.008)	99.41 (p=0.000)		107.34 (p=0.000)	9.49 (p=0.73)	23.10 (p=0.04)		

t-values and p-values in parentheses

Tables 4.a. *Spatial panel models results, sub-period 2002-2010*

Determinants	Total spending		General administration		Health			Education			Transport		
	SDM	SDM	SDM	SDM	SDM	SDM	SDM	SDM	SAR	SEM	SDM	SDM	SDM
	INVDIS	POPDIS	GDP	POPDIS	INVDIS	GDP	POPDIS	INVDIS	GDP	POPDIS	INVDIS	GDP	POPDIS
Popdens	0.80 (1.36)	1.30 (2.77)	11.84 (3.28)	0.89 (1.98)	95.40 (3.63)	22.30 (5.01)	155.28 (7.08)	0.38 (0.68)	-1.09 (-1.07)	-1.87 (-1.77)	1.71 (3.39)	1.14 (3.99)	11.11 (2.50)
Pop>65	7.41 (1.03)	14.20 (1.96)	-13.18 (-0.38)	-22.24 (-1.26)	64.73 (0.29)	-30.05 (-0.19)	525.56 (2.72)	5.02 (0.56)	-32.86 (5.52)	18.01 (1.78)	-20.31 (-1.34)	-12.83 (-0.88)	72.72 (-1.87)
Pop<15	-1.03 (-0.29)	-0.03 (-0.01)	-21.66 (-1.41)	6.21 (0.49)	-160.75 (-1.39)	66.75 (0.86)	-80.97 (-0.81)	4.48 (1.02)	12.44 (3.24)	14.56 (3.34)	63.22 (4.31)	54.40 (4.17)	57.46 (2.83)
Gdppc	0.23 (0.22)	-0.121 (-0.11)	1.87 (0.42)	2.89 (0.71)	-33.76 (-1.07)	-11.74 (-0.39)	-16.86 (-0.64)	-9.62 (-7.05)	-7.54 (-5.57)	-9.42 (-6.65)	5.23 (1.08)	4.47 (0.84)	4.19 (0.79)
Grants	-0.0001 (-0.02)	0.001 (0.37)	0.03 (1.65)	0.05 (2.74)	-0.28 (-1.44)	0.21 (1.72)	-0.18 (-1.45)	0.01 (1.19)	0.007 (1.50)	0.015 (2.49)	0.03 (0.95)	-0.004 (-0.19)	-0.03 (-1.36)
Gov	33.07 (4.61)	33.17 (4.64)	58.28 (1.87)	34.15 (1.20)	-445.77 (-2.15)	-671.74 (-3.27)	32.25 (0.18)	-16.76 (-1.78)	-21.23 (-2.36)	-20.92 (-235)	62.23 (1.82)	25.35 (0.72)	70.68 (-96)
W*Popdens	2.52 (1.13)	5.64 (3.59)	11.59 (2.08)	-1.69 (-0.86)	-23.98 (-0.25)	-7.34 (-1.00)	166.43 (3.13)	4.75 (2.17)			1.92 (0.93)	-1.08 (-2.36)	9.78 (0.91)
W*Pop>65	93.97 (5.00)	90.35 (3.51)	134.63 (-1.66)	-214.60 (-2.99)	2270.38 (3.91)	-313.00 (-1.32)	4658.24 (5.97)	118.68 (5.18)			-13.74 (-0.33)	-15.58 (-0.80)	364.54 (2.31)
W*Pop<15	26.32 (3.32)	15.89 (1.98)	-41.34 (-1.40)	-65.26 (-3.25)	536.13 (1.83)	-1.179 (-1.53)	607.77 (2.43)	14.65 (1.60)			-42.78 (-1.73)	-20.68 (-1.01)	-20.33 (-0.39)
W*Gdppc	5.27 (1.64)	-5.66 (-0.92)	-7.28 (-0.48)	42.18 (2.06)	13.39 (0.13)	111.53 (1.47)	-457.54 (-2.82)	-7.37 (-1.72)			20.58 (1.59)	13.29 (1.44)	91.42 (2.78)
W*Grants	-0.021 (-0.82)	0.001 (0.04)	0.002 (0.08)	2.02 (0.23)	-1.61 (-2.23)	-0.12 (-0.62)	-0.38 (-0.68)	-0.02 (-0.73)			0.23 (1.87)	0.03 (0.82)	0.09 (0.82)
W*Gov	4.71 (2.39)	22.14 (1.23)	29.18 (0.49)	-93.78 (-1.31)	779.08 (1.36)	-985.56 (-2.51)	1594.13 (3.56)	-22.77 (-0.86)			-58.39 (-0.59)	-157.78 (-2.29)	-32.51 (-0.36)
δ	-0.49 (-3.51)	-0.25 (-2.06)	-0.08 (-0.95)	-0.15 (-1.35)	0.25 (-1.87)	-0.23 (-2.72)	-0.30 (-2.94)	-0.49 (-3.47)	-0.086 (-1.00)	-0.11 (-0.96)	-0.22 (-1.67)	-0.05 (-0.56)	-0.14 (-1.23)
ρ						0.10 (4.49)						0.30 (4.63)	
Theta	0.02 (4.47)	0.03 (4.47)		0.14 (4.51)				0.04 (4.47)			0.25 (4.58)		
R ²	0.99	0.99	0.89	0.88	0.98	0.97	0.98	0.98	0.98	0.98	0.86	0.85	0.89
Corrected R ²	0.02	0.13	0.19	0.27	0.23	0.67	0.42	0.07	0.29	0.97	0.62	0.69	0.27
Wald test spatial lag	48.45 (p=0.000)	60.29 (p=0.000)	9.17 (p=0.16)	16.32 (p=0.01)	26.11 (p=0.000)	13.46 (p=0.03)	93.95 (p=0.000)	39.73 (p=0.000)			19.87 (p=0.003)	17.85 (p=0.006)	27.70 (p=0.000)
LR test spatial lag			11.63 (p=0.07)		25.07 (p=0.000)		73.33 (p=0.000)						29.85 (p=0.000)
Wald test spatial error	42.75 (p=0.000)	56.10 (p=0.000)	8.25 (p=0.22)	16.78 (p=0.01)	26.53 (p=0.000)	16.04 (p=0.013)	87.29 (p=0.000)	35.45 (p=0.000)			19.82 (p=0.003)	19.09 (p=0.004)	27.53 (p=0.000)
LR test spatial error			9.37 (p=0.15)		25.28 (p=0.000)		72.17 (p=0.000)						30.85 (p=0.000)
Hausman test	2.81 (p=0.99)	3.47 (p=0.99)	59.72 (p=0.00)	10.90 (p=0.62)	28.67 (p=0.007)	4.55 (p=0.98)	79.28 (p=0.000)	3.75 (p=0.99)			15.64 (p=0.27)	7.03 (p=0.90)	25.73 (0.018)

t-values and p-values in parentheses

Tables 3b. *Direct, indirect and total effects from Spatial Durbin models, sub-period 1996-2001*

Determinants	Total spending		General administration			Health			Education	
	POPDIS	INVDIS	GDP	POPDIS	INVDIS	GDP	POPDIS	GDP	POPDIS	
Direct effect Popdens	6.83 (2.39)	-4.17 (-0.54)	0.34 (1.09)	-4.75 (-0.64)	233.52 (4.10)	322.39 (6.73)	373.51 (7.69)	-0.14 (-0.61)	-2.97 (-0.61)	
Indirect effect Popdens	25.28 (2.62)	41.39 (1.34)	0.01 (0.02)	1.64 (0.07)	-862.92 (-3.50)	-21.02 (-0.81)	-122.79 (-0.78)	-0.13 (-0.44)	-20.85 (-1.19)	
Total effect Popdens	32.12 (2.87)	37.22 (1.04)	0.35 (0.70)	-3.10 (-0.11)	-629.40 (-2.19)	301.37 (5.66)	250.72 (1.37)	-0.27 (-0.72)	23.83 (-1.17)	
Direct effect Pop>65	126.64 (4.45)	14.50 (0.18)	-30.80 (-2.10)	-19.49 (-0.25)	1702.14 (3.47)	1974.03 (4.00)	2370.26 (5.11)	-32.94 (-2.99)	-198.32 (-4.48)	
Indirect effect Pop>65	101.83 (1.05)	353.25 (2.19)	-48.97 (-2.04)	532.72 (2.27)	-71.95 (-0.05)	-124.28 (-0.77)	4901.40 (2.92)	22.03 (1.24)	257.79 (1.54)	
Total effect Pop>65	228.48 (2.39)	367.76 (2.06)	-79.77 (-3.78)	513.22 (2.22)	1630.19 (1.15)	1849.74 (3.62)	7271.66 (4.34)	-10.90 (-0.72)	59.47 (0.35)	
Direct effect Pop<15	1.21 (0.21)	11.51 (0.78)	10.32 (0.78)	2.03 (0.14)	-5.05 (-0.05)	82.54 (0.78)	-5.63 (-0.05)	0.82 (0.09)	-6.39 (-0.74)	
Indirect effect Pop<15	89.36 (2.70)	103.51 (1.91)	-86.61 (-3.31)	162.85 (1.96)	724.74 (1.81)	-5.60 (-0.42)	3147.30 (5.26)	13.77 (0.77)	11.38 (0.18)	
Total effect Pop<15	90.57 (2.70)	115.03 (2.07)	-76.28 (-3.24)	164.89 (2.01)	719.68 (1.69)	76.94 (0.79)	3141.66 (5.20)	14.60 (0.91)	4.99 (0.08)	
Direct effect Gdppc	-6.32 (-0.51)	28.63 (0.79)	40.41 (1.83)	25.75 (0.74)	872.40 (3.70)	788.74 (3.76)	633.33 (2.83)	24.64 (1.65)	-41.30 (-1.94)	
Indirect effect Gdppc	-19.40 (-0.54)	-117.70 (-1.62)	-67.11 (-2.53)	-136.30 (-1.60)	837.67 (1.47)	-50.66 (-0.77)	-743.62 (-1.24)	-10.24 (-0.57)	91.88 (1.41)	
Total effect Gdppc	-25.73 (-0.75)	-89.07 (-1.25)	-26.69 (-3.04)	-110.54 (-1.36)	1710.07 (2.88)	738.08 (3.50)	-110.28 (-0.19)	14.39 (2.28)	50.57 (0.78)	
Direct effect Grants	1.42 (1.53)	7.35 (3.03)	6.45 (2.79)	9.13 (3.69)	40.37 (2.47)	44.73 (2.32)	54.39 (3.32)	-2.38 (-1.55)	-2.69 (-1.66)	
Indirect effect Grants	-0.70 (-0.54)	-6.81 (-1.52)	0.13 (0.04)	-4.77 (-1.47)	-43.57 (-1.23)	-2.89 (-0.72)	-32.96 (-1.42)	0.42 (0.21)	0.62 (0.27)	
Total effect Grants	0.72 (0.51)	0.53 (0.11)	6.58 (2.08)	4.35 (1.25)	-3.20 (-0.08)	41.84 (2.25)	21.42 (0.85)	-1.96 (-0.83)	-2.06 (-0.78)	
Direct effect Gov	16.09 (1.12)	134.99 (4.09)	112.46 (4.07)	87.06 (2.27)	565.36 (2.50)	681.04 (2.81)	301.42 (1.17)	-21.96 (-1.21)	-64.40 (-2.57)	
Indirect effect Gov	32.95 (1.05)	-64.14 (-0.71)	19.96 (0.43)	-142.56 (-1.83)	629.30 (0.85)	-43.50 (-0.73)	-467.47 (-0.82)	31.53 (1.03)	-12.44 (-0.20)	
Total effect Gov	49.05 (1.22)	70.84 (0.68)	132.42 (2.79)	-55.49 (-0.55)	1194.67 (1.40)	637.54 (2.70)	-166.04 (-0.22)	9.57 (0.29)	-76.85 (-1.01)	

t-values in parentheses

Tables 4b. *Direct, indirect and total effects from Spatial Durbin models, sub-period 2002-2010*

Determinants	Total spending		General administration		Health			Education	Transport		
	INVDIS	POPDIS	GDP	POPDIS	INVDIS	GDP	POPDIS	INVDIS	INVDIS	GDP	POPDIS
Direct effect Popdens	0.63 (1.21)	1.15 (2.46)	11.57 (3.31)	0.93 (2.02)	97.65 (3.95)	23.12 (5.19)	151.13 (7.04)	0.07 (0.15)	1.66 (3.44)	-1.55 (4.09)	10.94 (2.45)
Indirect effect Popdens	1.51 (1.00)	4.51 (3.17)	10.14 (1.90)	-1.63 (-0.91)	-37.56 (-0.48)	-11-11 (-1.82)	98.26 (2.29)	3.45 (2.24)	1.36 (0.78)	-1.11 (-2.50)	7.29 (0.74)
Total effect Popdens	2.14 (1.21)	5.66 (3.47)	21.72 (2.96)	-0.07 (-0.35)	60.09 (0.67)	12.00 (1.47)	249.39 (4.87)	3.53 (1.93)	3.02 (1.43)	0.04 (0.07)	18.23 (1.53)
Direct effect Pop>65	1.47 (0.19)	11.72 (1.54)	-10.20 (-0.28)	-19.35 (-1.09)	-14.73 (-0.07)	-2.69 (-0.01)	365.02 (1.87)	-3.75 (-0.39)	-19.72 (-1.26)	-12.47 (-0.86)	67.33 (1.71)
Indirect effect Pop>65	66.19 (4.61)	72.67 (3.32)	-129.34 (-1.65)	-187.49 (-3.06)	1929.11 (3.85)	-275.71 (-1.19)	3642.13 (5.66)	85.79 (4.89)	-7.86 (-0.21)	-14.30 (-0.73)	323.16 (2.21)
Total effect Pop>65	67.67 (5.30)	84.39 (3.57)	-139.54 (-1.54)	-206.83 (-3.32)	1914.37 (3.91)	-278.40 (-1.44)	4007.16 (6.02)	82.04 (5.18)	-27.58 (-0.73)	-26.77 (-1.50)	390.49 (2.51)
Direct effect Pop<15	-2.62 (-0.69)	-0.62 (-0.17)	-20.91 (-1.36)	6.67 (0.51)	-184.81 (-1.57)	83.24 (0.96)	-108.01 (-1.08)	3.53 (0.74)	64.87 (4.17)	55.00 (4.25)	58.33 (2.86)
Indirect effect Pop<15	19.76 (3.21)	13.39 (2.02)	-37.72 (-1.26)	-58.41 (-3.03)	486.45 (1.89)	-172.82 (-1.46)	510.91 (2.56)	8.92 (1.19)	-48.53 (-2.09)	-22.17 (-1.10)	-24.88 (-0.53)
Total effect Pop<15	17.14 (3.18)	12.77 (1.80)	-58.63 (-1.77)	-51.74 (-2.86)	301.63 (1.21)	-89.58 (-1.09)	402.90 (1.96)	12.45 (1.95)	16.35 (0.96)	32.83 (2.01)	33.45 (0.65)
Direct effect Gdppc	-0.17 (-0.16)	0.09 (0.08)	2.28 (0.49)	-1.99 (0.48)	-34.42 (-1.08)	-19.40 (-0.60)	-0.39 (-0.01)	-9.41 (-6.23)	4.63 (0.97)	4.48 (0.82)	2.22 (0.41)
Indirect effect Gdppc	3.79 (1.61)	-4.55 (-0.84)	-7.52 (-0.53)	37.51 (2.12)	22.05 (0.27)	100.34 (1.43)	-367.19 (-2.88)	-1.93 (-0.61)	16.22 (1.49)	12.26 (1.34)	79.65 (2.79)
Total effect Gdppc	3.62 (1.57)	-4.46 (-0.85)	-5.24 (-0.38)	39.50 (2.26)	-12.37 (-0.14)	80.94 (1.35)	-367.58 (-2.99)	-11.35 (-3.82)	20.85 (1.90)	16.74 (2.25)	81.87 (2.88)
Direct effect Grants	0.001 (0.22)	0.002 (0.40)	0.03 (1.70)	0.05 (2.72)	-0.23 (-1.24)	0.31 (1.76)	-0.16 (-1.37)	0.01 (1.65)	0.02 (0.74)	-0.003 (-0.16)	-0.03 (-1.45)
Indirect effect Grants	-0.01 (-0.92)	-0.000 (-0.001)	-0.0005 (-0.02)	0.01 (0.19)	-1.33 (-2.19)	-0.16 (-0.97)	-0.29 (-0.67)	-0.02 (-0.89)	0.19 (1.79)	0.03 (0.82)	0.08 (0.89)
Total effect Grants	-0.01 (-0.69)	0.002 (0.09)	0.03 (0.86)	0.06 (0.77)	-1.55 (-2.11)	0.06 (0.29)	-0.46 (-0.96)	-0.007 (-0.27)	0.21 (1.65)	0.02 (0.57)	0.05 (0.49)
Direct effect Gov	31.11 (4.36)	32.53 (4.65)	56.86 (1.94)	36.90 (1.27)	-486.65 (-2.40)	-601.99 (-3.05)	-34.01 (-0.20)	-15.83 (-1.80)	63.80 (1.92)	27.52 (0.83)	71.33 (2.09)
Indirect effect Gov	23.81 (1.71)	12.03 (0.78)	24.75 (0.45)	-90.39 (-1.41)	739.73 (1.60)	-737.90 (-2.22)	1281.97 (3.41)	-10.78 (-0.55)	-62.66 (-0.75)	-152.93 (-2.25)	-35.80 (-0.45)
Total effect Gov	54.93 (3.46)	44.56 (2.44)	81.61 (1.15)	-53.48 (-0.68)	253.07 (0.47)	-1339.89 (-3.21)	1247.96 (2.85)	-26.61 (-1.24)	1.14 (0.11)	-125.41 (-1.45)	35.53 (0.37)

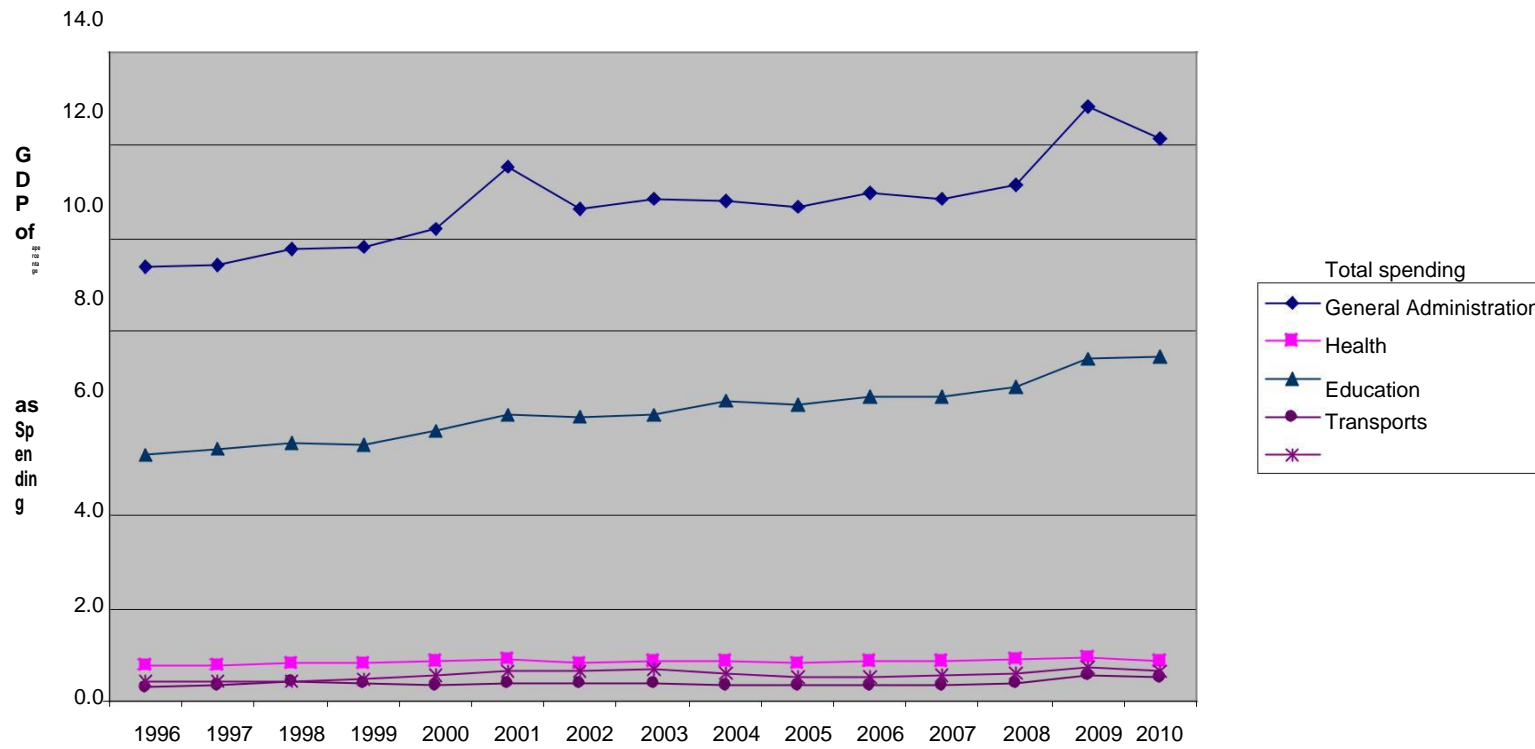


Figure 1. Regional public spending trends (annual average values)

The Italian Pension System before and after Monti-Fornero reform: a note.

Mariangela Bonasia

Abstract

This paper examines the most important reforms of the Italian pension system that have been adopted since the nineties, in an atmosphere of economic and demographic emergency, until 2011, the year of the Monti-Fornero reform, with the aim to curb the dynamics of spending on pensions. It then describes the structure of supplementary pensions and the measures adopted in Italy to encourage the take-off. Finally, it discusses the current situation of pension accounts to take stock of what has been really done and what still needs to be done.

Keywords: Pension System

JEL Classification: H55

1. La dinamica demografica e le difficoltà del sistema previdenziale: l'Italia nel contesto europeo

Per un quadro economico generale della situazione italiana inserita nel contesto europeo, per un confronto con i dati relativi agli altri paesi dell'Unione, possiamo dare un breve sguardo alle tabelle qui di seguito riportate.

Osservando le elaborazioni dei dati e le previsioni effettuate dall'OCSE (2009) e dall'EUROSTAT (2010) sull'andamento delle principali variabili demografiche e finanziarie relative ai paesi dell'Unione Europea e ad altri paesi OCSE può risultare più chiara la situazione difficile che i sistemi previdenziali, ed in particolare quello italiano, sono tenuti ad affrontare.

Nella tabella 1 viene riportata la struttura per classi di età della popolazione nei principali paesi dell'Unione Europea. Da essa si evidenzia che l'Italia (unitamente alla Germania) è al primo posto tra i paesi europei con la percentuale più elevata di anziani e pari al 20,6 per cento, seguita da Grecia, Portogallo, Svezia e Finlandia.

La tabella 2 mostra, invece, le previsioni OCSE in merito al peso percentuale della popolazione anziana tra il 2000 ed il 2050 nei paesi Ocse. Tali dati confermano lo scenario negativo a cui andranno incontro molti paesi europei ed in particolare l'Italia che, partendo da un peso percentuale della popolazione anziana complessivamente nella norma nel 2000 (pari al 18,3 per cento della popolazione totale), si troverà ad affrontare una percentuale molto più elevata nel 2040 e nel 2050, pari rispettivamente al 32,7 ed al 33,7 per cento. Non molto distanti dalle percentuali italiane sono quelle relative a Germania, Spagna, Giappone, Grecia e Portogallo.

Nella tabella 3 sono riportate le previsioni effettuate dall'EUROSTAT nel 2010 in merito ai tassi di dipendenza degli anziani per i principali paesi che lo compongono. Nel 2010 la situazione dell'Italia era già relativamente difficile con un tasso di dipendenza pari al 30,8 per cento della popolazione attiva e, dal 2020 è previsto che diventi uno dei paesi con il tasso di dipendenza più elevato, pari al 34,8 per cento, terzo dopo la Finlandia e la Germania.

Questi ultimi due paesi hanno rispettivamente con un tasso di dipendenza pari al 36,2 e 35,8 per cento. Secondo le previsioni nel 2060 l'Italia raggiungerà un tasso di dipendenza pari al 56,7 per cento, avvicinandosi sempre di più alla Germania che raggiungerà un tasso pari al 59,9 per cento.

TAB.1 *La struttura per classi di età della popolazione nei principali paesi europei al 2012 (valori percentuali)*

Paesi	Popolazione totale	Classi di età			
		0-14	15-44	45-64	65+
Austria	8.443.018	14.5	39.9	27.9	17.8
Belgio	11.094.850	17.0	38.7	26.9	17.3
Danimarca	5.580.516	17.7	38.2	26.8	17.3
Finlandia	5.401.267	16.5	37.1	28.3	18.1
Francia	65.327.724	18.6	38.0	26.3	17.1
Germania	81.843.743	13.2	36.8	29.3	20.6
Grecia	11.290.067	14.4	39.5	26.5	19.7
Irlanda	4.582.769	21.6	43.6	22.9	11.9
Italia	60.820.696	14.0	37.9	27.4	20.6
Norvegia	4.985.870	18.5	40.7	25.4	15.4
Olanda	16.730.348	17.3	38.4	28.0	16.2
Portogallo	10.541.840	14.8	39.1	26.7	19.4
Regno Unito	63.256.141	17.5	40.1	25.5	16.9
Spagna	46.196.276	15.2	41.7	25.7	17.4
Svezia	9.482.855	16.7	39.0	25.5	18.8

Fonte: Nostre elaborazioni su dati EUROSTAT

TAB. 2 *Percentuale della popolazione con età > 65 anni (2000 – 2050)*

Paesi OCSE	2000	2010	2020	2030	2040	2050
Australia	12.4	14.3	18.3	22.2	24.5	25.7
Austria	15.4	17.6	19.7	24	27.1	28.1
Belgio	16.8	17.2	19.4	22.8	25	25.7
Canada	12.6	14.1	18.2	23.1	25	26.3
Danimarca	14.8	16.7	20.7	23.9	26.1	25.3
Finlandia	14.9	17.3	22.8	26.2	27	27.6
Francia	16.1	16.7	20.3	23.4	25.6	26.2
Germania	16.4	20.4	22.7	27.8	31.1	31.5
Giappone	17.4	23.1	29.2	31.8	36.5	39.6
Grecia	16.6	18.9	21.3	24.8	29.4	32.5
Irlanda	11.2	11.9	14.9	18.5	22.4	26.3
Islanda	11.6	12.1	15.3	18.9	20.2	20.5
Italia	18.3	20.6	23.3	27.3	32.3	33.7
Lussemburgo	14.1	14.6	16.6	20	22.3	22.1
Norvegia	15.2	15	17.3	19.8	22.2	23.1
Nuova Zelanda	11.8	13.1	16.7	21.1	23.8	24.6
Olanda	13.6	15.5	19.8	23.4	25	23.5
Portogallo	16.2	17.5	20.1	23.9	28.2	31.6
Regno Unito	15.8	16.5	19	21.9	23.7	24.1
Spagna	16.8	17.4	20	25.1	31.6	35.7
Svezia	17.3	18.4	21.1	22.8	24	23.7
Svizzera	15.3	17.1	20	23.9	26.6	27.4
USA	12.4	13	16.3	19.7	20.4	20.7

Fonte: OECD Factbook 2009, Economic, Environmental and Social Statistics.

TAB. 3 Tasso di dipendenza degli anziani (65+/(15-64))

Paesi	2010	2020	2030	2040	2050	2060
Belgium	26.0	30.3	36.7	40.9	42.5	43.8
Czech Republic	21.6	30.4	34.3	40.1	50.1	55.0
Denmark	24.9	31.4	37.0	41.9	41.8	43.5
Germany	31.3	35.8	47.2	56.4	58.1	59.9
Ireland	16.8	22.8	27.6	33.1	39.7	36.6
Greece	28.4	32.6	37.7	47.8	57.4	56.7
Spain	24.7	28.9	35.5	46.7	56.9	56.4
France	25.7	32.7	39.1	44.4	45.5	46.6
Italy	30.8	34.8	41.1	51.7	56.3	56.7
Luxembourg	20.4	23.1	30.0	37.1	41.9	45.0
Netherlands	22.8	30.8	40.2	47.3	46.5	47.5
Austria	26.1	29.8	38.8	46.8	48.6	50.7
Portugal	26.7	31.3	37.9	46.7	55.6	57.2
Finland	25.6	36.2	42.7	43.5	44.9	47.4
Sweden	27.7	33.5	37.2	40.4	41.7	46.2
United Kingdom	24.9	29.6	34.8	38.9	39.4	42.1
Iceland	17.9	25.1	32.2	34.4	33.5	33.5
Norway	22.5	27.4	33.0	38.5	40.3	43.0
Switzerland	24.7	29.5	38.0	45.7	50.5	54.4

Fonte: Nostre elaborazioni su dati Eurostat

L'invecchiamento della popolazione costituisce di certo una delle principali cause delle difficoltà attuali che il sistema pensionistico italiano si trova ad affrontare insieme a molti dei paesi Ocse. Il suo effetto risulta evidente dall'andamento attuale della spesa previdenziale e dalle previsioni effettuate dall'Eurostat e dall'Ocse riportate nelle tabelle 4, 5 e 6 che indicano la prima la spesa per prestazioni sociali per funzione IVS (Invalidità Vecchiaia e Superstiti) nei paesi europei, la seconda la spesa per la protezione sociale e per le pensioni al 2009, in percentuale del totale della spesa e del reddito nazionale (secondo dati Ocse, *Social Expenditure Database*) e l'altra le proiezioni della spesa pensionistica per i prossimi 50 anni effettuate dall'OCSE (2011)

L'Italia presenta già dal 2001 una spesa per prestazioni sociali IVS in percentuale del Pil in media superiore a quella degli altri paesi europei considerati dalla tabella 4. Da quest'ultima possiamo notare che la spesa per prestazioni sociali alla vecchiaia è la più alta di tutti i paesi europei considerati con il 10.9 per cento del Pil, vicina solo alla Francia, secondo paese per spesa sociale IVS in Europa. Il fatto che la spesa per la protezione sociale sia in Italia ancora nella norma, risulta evidente dalla tabella 5. Risulta, infatti, che questa ammontava nel 2009 al 27,8 per cento del reddito nazionale, di poco superiore al valore medio dell'Unione Europea.

TAB 4 Spesa per prestazioni sociali per funzione nei principali paesi europei (% Pil)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Belgio										
Vecchiaia	7.2	7.3	7.3	7.3	7.3	7.3	7.1	7.5	8.1	8.1
Invalidità	1.2	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.6	1.6
Superstiti	2.2	2.2	2.2	2.1	2.1	2.0	1.9	2.0	2.1	2.0
<i>Totale</i>	<i>11.1</i>	<i>11.2</i>	<i>11.3</i>	<i>11.2</i>	<i>11.2</i>	<i>11.1</i>	<i>10.7</i>	<i>11.4</i>	<i>12.2</i>	<i>12.1</i>
Francia										
Vecchiaia	10.4	10.1	10.3	10.3	10.5	10.6	10.7	11.0	11.8	11.9
Invalidità	0.8	0.8	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8
Superstiti	1.5	1.8	1.8	1.8	1.8	1.6	1.5	1.5	1.6	1.6
<i>Totale</i>	<i>13.0</i>	<i>13.0</i>	<i>13.1</i>	<i>13.2</i>	<i>13.3</i>	<i>13.1</i>	<i>13.1</i>	<i>13.4</i>	<i>14.3</i>	<i>14.4</i>
Germania										
Vecchiaia	9.5	9.7	9.9	9.9	9.9	9.6	9.3	9.3	10.0	9.7
Invalidità	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Superstiti	2.4	2.4	2.4	2.4	2.3	2.2	2.1	2.1	2.2	2.1
<i>Totale</i>	<i>13.2</i>	<i>13.4</i>	<i>13.6</i>	<i>13.5</i>	<i>13.4</i>	<i>13.0</i>	<i>12.4</i>	<i>12.4</i>	<i>13.2</i>	<i>12.8</i>
Italia										
Vecchiaia	10.9	11.0	11.2	11.2	11.3	11.3	11.3	11.6	12.5	12.6
Invalidità	0.8	0.9	0.9	0.8	0.8	0.7	0.3	0.3	0.3	0.3
Superstiti	2.5	2.5	2.5	2.5	2.5	2.5	2.4	2.4	2.6	2.6
<i>Totale</i>	<i>14.3</i>	<i>14.5</i>	<i>14.6</i>	<i>14.6</i>	<i>14.6</i>	<i>14.6</i>	<i>14.5</i>	<i>14.9</i>	<i>16.0</i>	<i>16.0</i>
Regno Unito										
Vecchiaia	9.3	8.8	8.7	8.7	8.9	8.9	9.0	9.1	9.9	10.1
Invalidità	1.3	1.2	1.2	1.1	1.0	1.0	1.0	2.0	2.2	2.0
Superstiti	0.9	0.8	0.8	0.8	0.8	0.8	0.1	0.1	0.1	0.1
<i>Totale</i>	<i>11.5</i>	<i>10.9</i>	<i>10.7</i>	<i>10.6</i>	<i>10.7</i>	<i>10.7</i>	<i>10.2</i>	<i>11.3</i>	<i>12.2</i>	<i>12.2</i>
Spagna										
Vecchiaia	6.2	6.2	6.1	6.0	5.9	5.9	5.9	6.1	6.8	7.2
Invalidità	1.2	1.1	1.1	1.2	1.2	1.1	1.2	1.2	1.3	1.3
Superstiti	1.9	2.0	2.0	2.0	2.0	1.9	1.9	1.9	2.1	2.2
<i>Totale</i>	<i>9.4</i>	<i>9.3</i>	<i>9.2</i>	<i>9.1</i>	<i>9.1</i>	<i>8.9</i>	<i>9.0</i>	<i>9.3</i>	<i>10.2</i>	<i>10.8</i>

Fonte: Nostre elaborazione su dati EUROSTAT (2010)

TAB. 5 Spesa per protezione sociale e spesa pensionistica nei principali Paesi Ocse (2009)

Paesi	Spesa per la protezione sociale in % della spesa totale	Spesa per protezione sociale in % del Pil	Spesa pensioni in % della spesa totale	Spesa per pensioni in % del Pil
Australia	48	17.8	19.9	7.8
Austria	55.1	29.1	31.1	17.4
Belgio	55.3	29.7	23.6	12.7
Canada	43.3	19.2	12.4	5.4
Danimarca	52.1	30.2	22.6	13.4
Finlandia	52.5	29.4	27.3	15.2
Francia	56.5	32.1	28.3	16.3
Germania	57.8	27.8	28.3	14.8
Giappone	42.1	22.4	24	13.4
Grecia	44.4	23.9	26.2	14.1
Irlanda	48.4	23.6	16.3	8
Islanda	36.2	18.5	9.6	6.3
Italia	53.6	27.8	33.8	19.1
Lussemburgo	54.8	23.6	24.1	11.2
Norvegia	49.9	23.3	25.9	13.6
Nuova Zelanda	50.2	21.2	17.8	7.5
Olanda	45	23.2	17.7	9.8
Portogallo	51.4	25.6	29.3	14.8
Regno Unito	47	24.1	18.9	10.4
Spagna	56.1	26	27.3	12.6
Svezia	54.3	29.8	28.7	16.1
Media UE	52.2	27.1	25.5	13.7
USA	45.9	19.2	20.2	8.6
OCSE - Total	..	22.1	0	11.3

Fonte: Nostre elaborazioni su dati OCSE, Social Expenditure Database

TAB. 6 Previsione della spesa pensionistica 2007-2060

	2007	2010	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
OECD countries												
Australia	3.6	3.6	3.6	3.7		4.3		4.7		4.9		
Austria	12.8	12.7	12.8	13.0	13.4	13.8	13.9	13.9	14.0	14.0	13.9	13.6
Belgium	10.0	10.3	10.9	11.8	13.0	13.9	14.4	14.6	14.7	14.7	14.8	14.7
Canada	4.6	5.0	5.4	5.8	6.3	6.6	6.6	6.5	6.4	6.3	6.3	6.2
Chile												
Czech Republic	7.8	7.1	6.9	6.9	7.0	7.1	7.6	8.4	9.4	10.2	10.8	11.0
Denmark	9.1	9.4	10.2	10.6	10.5	10.6	10.5	10.4	10.0	9.6	9.3	9.2
Estonia	5.6	6.4	6.2	5.9	5.8	5.6	5.4	5.4	5.3	5.3	5.2	4.9
Finland	10.0	10.7	11.8	12.6	13.4	13.9	13.9	13.6	13.4	13.3	13.3	13.4
France	13.0	13.5	13.5	13.6	13.9	14.2	14.5	14.4	14.3	14.2	14.1	14.0
Germany	10.4	10.2	10.1	10.5	11.0	11.5	11.9	12.1	12.2	12.3	12.5	12.8
Greece	11.7	11.6	12.2	13.2	14.8	17.1	19.4	21.4	23.0	24.0	24.3	24.1
Hungary	10.9	11.3	10.9	11.0	10.9	11.0	11.4	12.2	12.7	13.2	13.7	13.8
Iceland		4.0								6.9		
Ireland	4.0	4.1	4.3	4.6	5.0	5.4	5.8	6.4	7.1	8.0	8.4	8.6
Israel												
Italy	14.0	14.0	14.0	14.1	14.3	14.8	15.2	15.6	15.4	14.7	14.2	13.6
Japan												
Korea	0.6	0.9	1.1	1.4	2.0	2.5	3.1	3.9	4.8	5.5	6.0	6.5
Luxembourg	8.7	8.6	8.9	9.9	12.1	14.2	16.6	18.4	20.7	22.1	23.7	23.9
Mexico		2.4								3.5		
Netherlands	6.6	6.5	7.2	7.8	8.4	9.3	10.0	10.3	10.3	10.3	10.4	10.5
New Zealand	4.0	4.7	4.8	5.3	5.9	6.7	7.3	7.7	7.8	8.0		
Norway	8.9	9.6	10.8	11.5	12.0	12.7	13.2	13.4	13.4	13.3	13.5	13.6
Poland	11.6	10.8	9.6	9.7	9.7	9.4	9.3	9.2	9.1	9.1	9.0	8.8
Portugal	11.4	11.9	12.1	12.4	12.6	12.6	12.3	12.5	12.8	13.3	13.1	13.4
Slovak Republic	6.8	6.6	6.3	6.3	6.9	7.3	7.8	8.3	8.8	9.4	9.9	10.2
Slovenia	9.9	10.1	10.6	11.1	12.0	13.3	14.7	16.1	17.3	18.2	18.6	18.6
Spain	8.4	8.9	9.2	9.5	10.1	10.8	11.9	13.2	14.6	15.5	15.6	15.1
Sweden	9.5	9.6	9.5	9.4	9.4	9.5	9.5	9.4	9.1	9.0	9.2	9.4
Switzerland	6.4	6.3	6.6	6.8	7.5	8.1	8.6	8.6	8.8	8.8		
Turkey		7.3								11.4		
United Kingdom	6.6	6.7	6.8	6.9	7.2	7.6	7.8	8.0	7.9	8.1	8.6	9.3
United States	4.3	4.6	4.8	4.9	4.9	4.9	4.9	4.8	4.8	4.8	4.7	4.7
OECD28		8.4	8.6	8.9		10.0		10.8		11.4		
Other major economies												
Argentina		5.9								8.6		
Brazil		8.5								15.8		
China		2.2								2.6		
India		1.7								0.9		
Indonesia		0.9								2.1		
Russian Federation	5.2	7.9		7.3		6.4		6.1		6.0		
Saudi Arabia		2.2								7.1		
South Africa	1.1	1.3	1.7	1.8	1.8	1.7	1.6	1.6	1.5	1.5	1.5	1.4
EU27	8.9	9.1	9.2	9.6	10.0	10.6	11.1	11.6	12.1	12.5	12.8	12.9

Fonte: Pension at Glance 2011: Retirement-Income System in OECD and G20 Countries; OECD 2011

Se guardiamo, invece, ai valori della spesa previdenziale in Italia, essi risultano essere di molto superiori ai valori medi dell'Unione Europea sia in percentuale del reddito nazionale che della spesa totale (pari rispettivamente al 33,8 e al 19,1 per cento contro i valori medi UE pari al 25,5 e 13,7 per cento). L'Italia si colloca, dunque, al primo posto tra i paesi dell'Unione per la spesa pensionistica più elevata.

La tabella 6 riporta le proiezioni della spesa previdenziale al 2060 per i paesi dell'Unione Europea. Confrontando la tabella 1 che riporta il processo di invecchiamento della popolazione nei diversi paesi Ocse, con la tabella 5 è facile riscontrare una crescita maggiore della spesa pensionistica in quei paesi che dalla tabella 1 risultano essere caratterizzati da un più marcato processo di invecchiamento della popolazione.

Secondo tali previsioni, nei prossimi cinquanta anni la Grecia raggiungerà un livello di spesa previdenziale rispetto al Pil pari al 24,1 per cento, seguita dal Lussemburgo (23,9 per cento), Spagna (15,1 per cento), Francia (14 per cento) e l'Italia (13,6 per cento).

Dalle previsioni e dai dati appena mostrati risulta evidente che i sistemi pensionistici pubblici dei paesi dell' Ocse ed in particolare il sistema italiano si trovano in una situazione di relativo squilibrio che richiede un intervento strutturale in grado di fronteggiare lo sfavorevole andamento demografico e le incoerenze tipiche del sistema a ripartizione che ha caratterizzato la maggior parte dei sistemi previdenziali dei paesi Ocse.

Si rende, quindi, necessario un ridisegno della previdenza pubblica che imponga il rispetto del vincolo di sostenibilità finanziaria e risolva gli squilibri finanziari e le anomalie che la caratterizzano; non potrà più sussistere un unico pilastro previdenziale pubblico a ripartizione, questi dovrà essere affiancato da una previdenza privata a capitalizzazione. In questo modo sarà possibile controbilanciare i rischi propri d'ogni componente, soppesare le ragioni dell'equità con quelle dell'efficienza e coniugare responsabilità individuale e solidarietà collettiva.

In Italia questo processo di ridisegno è iniziato negli anni '90 ed è segnato da due riforme pensionistiche: la riforma Amato e la riforma Dini.

La riforma Amato, nata nel 1992 e la riforma Dini del 1995 hanno introdotto diverse modifiche alla normativa all'epoca vigente allo scopo di eliminare gli squilibri finanziari del sistema previdenziale nel lungo periodo.

Dietro la spinta della crisi valutaria e finanziaria del settembre 1992 e dopo le discussioni di riforma mai attuate, che hanno caratterizzato gli anni Ottanta, con la legge delega del 23 settembre 1992 n.421 ha avuto inizio il processo di riordino del sistema previdenziale italiano.

L'insieme delle riforme Amato (DL. 593/92), Dini (L. 335/95), Prodi (art.59 della L.449/97), Maroni (L. 243/2004), Damiano (L. 247/2007) e Monti/Fornero (L. 214/2011) rappresenta un contributo radicale alla correzione delle anomalie di cui abbiamo già discusso, rappresentando una significativa rottura rispetto alla disciplina passata.

2. Le riforme degli anni '90

All'inizio degli anni '90 i temi generali della riforma del sistema previdenziale al centro del dibattito politico ed economico mettevano in evidenza la necessità di risolvere specificatamente quattro ordini di problemi.

- 1) Un problema di *equità distributiva*. Il tasso di rendimento sui contributi versati nel sistema previdenziale era estremamente iniquo. Il periodo di riferimento per il calcolo della pensione (l'ultima retribuzione per i dipendenti pubblici e le retribuzioni degli ultimi 5 anni per i lavoratori del settore privato) favoriva le carriere più dinamiche, cioè i lavoratori con redditi da lavoro cresciuti più rapidamente nel periodo finale della loro carriera. Inoltre, grazie alla pensione di anzianità, ciò costituiva un premio implicito alle carriere più precoci e continue. La previdenza sociale influenzava, quindi, la distribuzione del reddito, accentuando le disuguaglianze, provocando involontariamente una crescente insoddisfazione verso il sistema.
- 2) Un problema di *sostenibilità finanziaria*. Secondo i dati raccolti da Beltrametti (1996) e ripresi ed elaborati da Franco (2000) la spesa pensionistica era aumentata dal 5 per cento del Pil nel 1960 al 7,4 per cento nel 1970, il 10,2 per cento nel 1980 e il 14,9 per cento nel 1992, superando di molto la crescita delle altre voci della spesa sociale aumentate solo dal 5,1 al 6,7 per cento di Pil tra il 1960 ed il 1970 e dal 6,7 al 7,3 per cento tra il 1980 ed il 1992. Solo una parte ridotta dell'aumento della spesa previdenziale può essere attribuita a fattori demografici, il restante è da imputare ad altri fattori: l'irresponsabilità fiscale dei governi tesi al consenso facile ed immediato, la mancata applicazione di criteri di calcolo contributivo²³, il meccanismo finanziario implicito nei sistemi a ripartizione.

²³ Tale metodo verrà introdotto in Italia dalla riforma del 1995: i vantaggi verranno approfonditi nel paragrafo relativo alla riforma Dini.

Per coprire la spesa pensionistica, sarebbero state necessarie o delle aliquote contributive di equilibrio via via crescenti, fino a giungere a oltre il 50 per cento²⁴, oppure concorsi sempre più ingenti del bilancio pubblico. Entrambe queste alternative sono, però, inaccettabili (Castellino e Fornero, 2001).

- 3) Un *problema di incentivi* riguardo l'allocazione temporale del lavoro. La dimensione dei benefici pensionistici costituisce un incentivo al pensionamento anticipato essendo insito nel sistema previdenziale un'elevata tassazione implicita sul proseguimento dell'attività lavorativa oltre una certa età. Ciò si riflette sui bassi tassi di partecipazione alla forza lavoro delle persone anziane. Secondo le stime OECD (2000), nel 1990 solo il 32 per cento degli individui di età compresa tra i 55 ed i 64anni risultava impiegata. Nel 1995 questa percentuale è scesa al 27 per cento. Inoltre, la mancanza di una rigida corrispondenza tra i contributi versati e i diritti accumulati, incoraggia l'evasione contributiva.
- 4) Un *problema politico – istituzionale* dovuto alla presenza di meccanismi che permettevano all'elettore mediano di modificare a proprio favore il sistema previdenziale, attraverso giochi politici, scaricando gli oneri sulle generazioni più giovani e su quelle future.

Dopo le deludenti riforme discusse ma mai attuate che hanno caratterizzato gli anni Ottanta, le riforme introdotte negli anni '90, sotto la spinta della crisi valutaria e finanziaria del '92 prima e della prospettiva dell'ingresso nell'euro poi, rappresentano un contributo coraggioso e fondamentale per la soluzione dei problemi su esposti.

Prima di esaminare nel dettaglio le misure adottate ed i loro effetti sul sistema previdenziale è opportuno richiamare brevemente l'assetto pre-riforma della componente obbligatoria e di quella complementare.

La previdenza obbligatoria italiana si è organizzata nel tempo su tre comparti, quello dei dipendenti privati, quello dei dipendenti pubblici e quello dei lavoratori autonomi. Le differenze tra i comparti in termini di aliquote contributive, metodi di calcolo della pensione e

²⁴ Secondo le previsioni del Ministero del Tesoro (1994), l'aliquota contributiva di equilibrio per i dipendenti del settore privato era destinata a salire dal 44 per cento nel 1995 al 50 per cento nel 2010 e al 60 per cento nel 2025.

condizioni per la sua riscossione sono alla base dei problemi di iniquità distributiva discussi al punto 1 di questo paragrafo.

L'attività dell'Istituto Nazionale della Previdenza Sociale, che copre la quasi totalità dei dipendenti privati e dei lavoratori autonomi²⁵, si articola in quattro comparti:

- a) il comparto dei lavoratori dipendenti, che include il Fondo pensioni lavoratori dipendenti (Fpld) e la Gestione prestazioni temporanee lavoratori dipendenti²⁶;
- b) il comparto dei lavoratori autonomi composto da: i) coltivatori diretti, mezzadri e coloni (Cdmc); ii) artigiani; iii) esercenti attività commerciali;
- c) il comparto delle prestazioni assistenziali e di sostegno alle aziende attraverso la Gestione degli interventi assistenziali e di sostegno alle gestioni previdenziali (Gias)²⁷;
- d) lo svolgimento di servizi in conto terzi, che include la riscossione di contributi per il finanziamento del servizio sanitario nazionale e per conto terzi.

Per quanto riguarda le pensioni dei dipendenti pubblici e delle aziende autonome, queste vengono erogate direttamente dallo Stato, senza accantonamenti in particolari fondi. Le pensioni dei dipendenti delle Ferrovie dello Stato e dei postelegrafonici sono, invece, gestite dal Ministero del Tesoro. Nell'Inpdap, istituito nel 1993, sono confluite 4 casse: i dipendenti degli enti locali (Cpdel), insegnanti asili e scuole elementari parificate (Cpisel), sanitari (Cps) e ufficiali giudiziari (Cpug). Secondo dati del Cnel (1993), oltre il 95 per cento degli iscritti e delle pensioni erogate fanno riferimento a tre soli istituti: Inps, Tesoro e Inpdap (Peracchi e Rossi, 1996)²⁸.

2.1 La riforma Amato

La riforma introdotta con l'approvazione del d.lgs. 503/92, nota come la riforma Amato, aveva obiettivi sia di breve periodo (arrestare la crisi valutaria dell'autunno 1992) sia di medio e lungo termine (rendere sostenibile il peso finanziario ed economico della previdenza). Tale riforma, oltre a prevedere un aumento delle aliquote contributive e misure volte a limitare la spesa pensionistica, contiene una serie di interventi strutturali sul sistema

²⁵ Con l'eccezione dei dirigenti delle aziende industriali (coperti dall'Inpdai), dei giornalisti (Inpgi), i lavoratori dello spettacolo e gli sportivi professionisti (Enpals), dei medici (Enpam) ed i liberi professionisti (coperti dalle rispettive Casse di previdenza).

²⁶ Cui fanno capo La Cassa integrazione guadagni, i sussidi di disoccupazione, le indennità di malattia, gli assegni familiari e di maternità.

²⁷ Il finanziamento di questa Gestione è, in linea di principio, a carico della fiscalità generale.

²⁸ Per un'analisi storica dei passaggi legislativi che nel tempo hanno concorso alla struttura attuale del sistema previdenziale obbligatorio appena descritto si veda Peracchi e Rossi (1996).

avente lo scopo di ridurre l'ammontare delle pensioni erogate e uniformare le diverse gestioni previdenziali.

Le principali novità introdotte da tale riforma furono²⁹:

- a) l'innalzamento graduale dell'età pensionabile dai 55 ai 60 anni per le donne e dai 60 ai 65 anni per gli uomini impiegati nel settore privato;
- b) l'ampliamento del numero delle retribuzioni pregresse prese a riferimento per il calcolo della retribuzione pensionabile; per l'iscritto con anzianità contributiva superiore ai 15 anni al 31 dicembre 1992, il periodo di calcolo è esteso agli ultimi 10 anni di attività; per i lavoratori più giovani, con meno di 15 anni di contributi versati alla stessa data, tale periodo viene esteso all'intero arco della vita lavorativa;
- c) l'aumento del requisito minimo di anzianità contributiva per la maturazione del diritto alla pensione di vecchiaia, da 15 a 20 anni entro l'anno 2002;
- d) l'indicizzazione dei trattamenti pensionistici in base all'andamento dell'indice generale dei prezzi e la conseguente cessazione del regime di indicizzazione delle rendite previdenziali al tasso di incremento reale dei salari;
- e) il numero minimo di anni contributivi necessari come requisito per la riscossione della pensione di anzianità per i lavoratori pubblici viene gradualmente aumentata a 35 anni (requisito già presente per i lavoratori del settore privato).

La riforma Amato, pur avendo contribuito solo in piccola parte alla riduzione della spesa previdenziale, colpì duramente le prospettive future degli attivi come viene evidenziato nella tabella 7 e dalla 8. Tali tabelle sono state estratte dal libro di Beltrametti (1996) e poi riprese e commentate da Peracchi e Rossi (1996). Gli autori, all'epoca dell'entrata in vigore della riforma Amato, effettuano una stima degli effetti che tale riforma avrebbe avuto sulla ricchezza pensionistica netta detenuta dagli attivi e dai pensionati alla fine del 1992.

Da tale stima risulta che l'effetto sugli attivi (pari al - 47 %) è stato di molto superiore a quello sui pensionati (-5%). Gli attivi colpiti più duramente dalla riforma sono i dipendenti privati (-55%) e i dipendenti pubblici all'epoca assicurati dall'Inpdap (-49%); gli agricoltori (Cdmc) ed i dipendenti pubblici assicurati dalla Gestione ordinaria del Tesoro sono, invece, i meno colpiti. Nella tabella 8 si considera una classificazione degli attivi in base alla classe di età e dalla stima risulta che il peso dell'aggiustamento è maggiore man mano che si passa ad una classe di età minore.

²⁹ Vedi Peracchi e Rossi (1996), Franco (2000), D'Amato e Galasso (2001), , Castellino e Fornero (2001).

Per le classi di età più giovani risulta che la ricchezza pensionistica netta post - riforma si è ridotta anche oltre il 100% rispetto alla situazione ante – riforma. Diversamente gli attivi con oltre 60 anni ed i pensionati avrebbero sopportato una riduzione che non va oltre il 5 per cento. La riforma Amato, avendo modificato notevolmente il livello e la distribuzione della ricchezza complessiva delle differenti generazioni e delle diverse categorie professionali, ha inevitabilmente avuto importanti ripercussioni sulle scelte di lavoro e di risparmio del cittadino italiano.

Dalle stime dell'età attesa di pensionamento e del tasso atteso di sostituzione (rapporto tra pensione ed ultima retribuzione) per alcune categorie demografiche e classi di reddito da lavoro presentate nel lavoro di Peracchi e Rossi (1996), l'andamento tra il 1991 ed il 1993 mostra una apprezzabile riduzione dell'età attesa di pensionamento.

Ciò che potrebbe essere accaduto è che i lavoratori attivi abbiano cercato di sfruttare la normativa sulla pensione di anzianità anticipando l'età di pensionamento, temendo interventi ancora più drastici negli anni successivi.

Possiamo concludere sottolineando che la riforma Amato ha certamente corretto una situazione esplosiva, ha attenuato la tendenza del sistema previdenziale allo squilibrio finanziario andando a colpire in particolar modo i nuovi entranti nella forza lavoro, ma lascia irrisolti due problemi fondamentali quali:

- aliquote contributive eccessivamente alte;
- ed un sistema previdenziale post-riforma che non sarebbe in grado di far fronte agli effetti della transizione demografica.

TAB 7 Stima degli effetti della riforma Amato sulla ricchezza pensionistica netta detenuta da attivi e pensionati (migliaia di miliardi di lire, 1992).

	<i>Prima della Riforma</i>	<i>Dopo la riforma</i>	<i>Variazione</i>	
			<i>Assoluta</i>	<i>%</i>
<i>Attivi</i>	3.406,9	1.801,9	-1.605,0	-47,1
- Fpld	2.084,9	936,2	-1.148,7	-55,1
- Cdmc	100,9	88,4	-12,5	-12,4
- Artigiani	138,5	89,0	-49,5	-35,7
- Commercianti	104,7	73,5	-31,2	-29,8
- Gest. Ordin. Del Tesoro	544,8	395,2	-149,6	-27,5
- Inpdap	433,3	219,5	-213,8	-49,3
<i>Pensionati</i>	2.660,5	2.527,4	-133,1	-5,0
- Vecchiaia	1.711,1	1.625,5	-85,6	-5,0
- Invalidità	502,8	477,6	-25,2	-5,0
- Superstiti	446,6	424,3	-22,3	-5,0
Totale	6.067,4	4.329,4	-1.738,0	-28,6

Fonte: Peracchi e Rossi (1996); Beltrametti L. (1994)

TAB. 8 Stima degli effetti della riforma Amato sulla ricchezza pensionistica netta detenuta dagli attivi per classi di età (migliaia di miliardi di lire, 1992)

Classi di età	<i>Prima della riforma</i>	<i>Dopo la riforma</i>	<i>Variazione</i>	
			<i>Assoluta</i>	<i>%</i>
15-19	28,0	-31,3	-59,3	-211,8
20-24	152,2	-49,9	-202,1	-132,8
25-29	275,5	-42,7	-318,2	-115,5
30-34	346,6	45,8	-300,8	-86,8
35-39	414,9	197,8	-217,1	-52,3
40-44	503,8	281,7	-222,1	-44,1
45-49	496,6	348,5	-148,1	-29,8
50-54	533,1	440,5	-92,6	-17,4
55-59	393,7	360,1	-33,6	-8,5
60-64	183,3	175,5	-7,8	-4,3
65+	79,2	75,8	-3,4	-4,2
Totale	3.406,9	1.801,9	1.605,0	-47,1

Fonte: Peracchi e Rossi (1996); Beltrametti L. (1994)

2.2 La riforma Dini

Nonostante la riforma del 1992, i piani di spesa rimasero comunque preoccupanti. Questi, insieme ad alti livelli dei tassi contributivi di equilibrio, sottolineavano la necessità di intervenire con una nuova e più incisiva riforma, che fu introdotta nel 1995 sotto il nome di riforma Dini.

Diversamente dalla precedente riforma, che aveva come obiettivo principale il taglio della spesa pensionistica, la nuova riforma varata dal Governo, mirava a stabilizzare l'incidenza della spesa previdenziale sul Pil, a ridurre gli effetti distorsivi del sistema pensionistico sul mercato del lavoro e a rendere il sistema più giusto. La riforma cerca, inoltre, di eliminare il trattamento di favore, garantito prima dal sistema, ai lavoratori con carriere corte o dinamiche. Ecco di seguito riportate le principali novità della riforma approvata con la legge dell'8 agosto 1995 n.335.

- *L'introduzione del sistema contributivo*, un criterio di calcolo delle pensioni che si basa sul totale dei contributi accreditati e rivalutati durante la vita lavorativa. Tale metodo di calcolo viene applicato a chi alla fine del 1995 non aveva maturato almeno 18 anni di versamenti. In base a tale metodo ciascun individuo risulta essere intestatario di un conto previdenziale capitalizzato ad un tasso pari alla media mobile quinquennale dei tassi di variazione del PIL nominale e alimentato dal versamento di contributi pari al 32,7 per cento della retribuzione pensionabile. La rata di pensione verrà poi determinata applicando al montante contributivo un coefficiente di trasformazione (rivedibile nel tempo e uniforme per uomini e donne) costruito in funzione della vita attesa della rendita da liquidare³⁰.
- *La flessibilità dell'età pensionabile*, scelta dall'assicurato in una fascia che oscilla tra i 57 ed i 65 anni: il trattamento pensionistico sarà naturalmente commisurato ai contributi versati e all'età di pensionamento e sarà conseguibile con un minimo contributivo di 5 anni.
- Sono previsti, inoltre, *incentivi a rimanere nella forza lavoro*: la pensione "piena" è fissata a 65 anni, un premio è previsto per chi lavora fino a 67 anni.

Tale manovra risulta più modesta, riducendo la ricchezza pensionistica degli attivi solo dell'11 per cento. Inoltre i costi vengono sopportati esclusivamente dagli individui attivi con

³⁰ Sulle complesse tecniche relative ai coefficienti di trasformazione si veda Peracchi e Rossi (1996)

meno di 40 anni. Questa è una delle ragioni dell'appoggio politico che tale riforma ha riscosso. Nel 1995, infatti, la maggioranza della popolazione votante aveva più di 40 anni e, quindi, la riforma è stata sostenuta da una maggioranza di elettori costituita da lavoratori anziani e pensionati.

Come sottolineato da Giarda (1998), la riforma del 1995 ha trattato in modo esplicito tutte le questioni rilevanti per la costruzione di un sistema previdenziale obbligatorio che risponda a quattro fondamentali obiettivi.

Il primo obiettivo è realizzare in maniera graduale un *equilibrio finanziario* tra i contributi versati e i benefici previdenziali erogati ed un mantenimento di tale equilibrio nel lungo periodo. Il secondo consiste nell'applicare *regole di equità* nella costruzione del nuovo sistema previdenziale. Entrambi questi obiettivi trovano soluzione nella principale innovazione introdotta dalla legge 335/1995, il metodo di calcolo contributivo. Con tale metodo la pensione liquidata riflette sia i contributi versati che la durata prevista del periodo di pensionamento. Nel metodo retributivo, invece, la pensione veniva calcolata moltiplicando la base pensionabile per un fattore pari al numero di anni di contribuzione moltiplicato per 0.02.

Nel lungo periodo viene, dunque, realizzato l'equilibrio finanziario, in quanto le pensioni vengono automaticamente adattate ai mutamenti delle condizioni demografiche e del mercato del lavoro ³¹. Il metodo contributivo garantisce, inoltre, anche una certa equità nel trattamento previdenziale di tutti gli individui appartenenti ad una stessa generazione i quali otterranno il medesimo tasso di rendimento dei contributi versati siano essi ricchi o poveri.

Il terzo obiettivo che la riforma Dini mira a perseguire è *l'armonizzazione dei regimi esistenti*, eliminando nel lungo periodo le differenze di trattamento esistenti nei diversi regimi previdenziali dell'ordinamento precedente la riforma quali contributi, prestazioni e condizioni di accesso ai benefici pensionistici. L'intento sarebbe quello di avvicinare al regime previsto per il Fondo pensioni lavoratori dipendenti le proprietà degli altri regimi esistenti sia nel settore privato che in quello pubblico.

Il quarto obiettivo è quello di definire un'*ordinata transizione dal preesistente al nuovo sistema previdenziale*. Ciò è reso possibile dalle disposizioni della legge 335 che impongono la piena applicazione del metodo contributivo per gli individui che entrano nella forza lavoro

³¹ Per un'esposizione analitica del metodo contributivo imposto dalla riforma Dini, confrontato con il metodo retributivo della riforma Amato si veda la Scheda 3.1.

a partire dal primo dicembre 1996. La pensione di coloro che hanno un'anzianità contributiva superiore ai 18 anni viene liquidata con metodo retributivo. Cambiano comunque le condizioni di età e di anzianità contributiva per l'accesso alla pensione di anzianità. La pensione degli individui con meno di 18 anni di anzianità verrà liquidata in base ad uno schema pro-rata.

In un articolo del 1998 Giarda commenta alcuni aspetti critici della riforma riaprendo, tra gli altri, il dibattito sulla separazione tra "previdenza ed assistenza". Visto che la legge 335/95 non prevede accantonamenti che servano a garantire il finanziamento di quelle prestazioni rivolte a coloro che dal metodo contributivo ricevono un pensione troppo bassa (a causa di una carriera lavorativa troppo corta oppure con una remunerazione bassa) di ciò dovrebbe farsene carico la fiscalità generale.

Vi è dunque stata un'esplicita esclusione di ogni contenuto assistenziale dal nostro sistema previdenziale e questa mossa, secondo Giarda, non è detto sia una "buona soluzione". La sua opinione è che la riforma Dini abbia garantito prestazioni previdenziali troppo elevate rispetto *i)* ai vincoli di concorrenza internazionale che impongono un minore prelievo obbligatorio sulle retribuzioni e rispetto *ii)* alla possibilità di reperire, da fonti diverse da quelle contributive, risorse sufficienti a finanziare un trattamento adeguato per coloro con un'insufficiente storia contributiva.

Scheda 3.1

Il retributivo della riforma Amato ed il contributivo imposto dalla riforma Dini³²

Formalizzazione generale degli schemi previdenziali

Possiamo delineare sia per la riforma Amato che per la riforma Dini uno schema comune che definisce la pensione erogata all'anno di pensionamento T con n anni di contribuzione, come una frazione del montante contributivo che è ottenuto sommando i contributi individuali capitalizzati annualmente ad un tasso g_j :

$$M_T = \sum_{t=T-n}^{T-1} \gamma_t a_t w_t \quad (1)$$

dove

n è il numero di anni di contribuzione;

T è l'anno di ritiro dal lavoro (pensionamento);

γ_t è il fattore di capitalizzazione dato da: $\gamma_t = \prod_{j=t}^T (1 + g_j)$;

g_j rappresenta il tasso di capitalizzazione dei contributi tra l'anno $j-1$ e l'anno j ;

a_t rappresenta l'aliquota contributiva versata sul reddito annuo da lavoro w_t ;

si assume, inoltre, che i contributi siano pagati al termine di ciascun anno a cui si riferiscono.

La pensione liquidata un anno dopo il pensionamento è dunque:

$$B_T = \beta_T M_T \quad (2)$$

dove

β_T è il coefficiente di trasformazione del montante contributivo che può dipendere dall'età anagrafica dell'individuo quando va in pensione.

Secondo uno schema comune, quindi, la pensione erogata all'anno di pensionamento T , dopo n anni di contribuzione e considerando un'aliquota contributiva costante nel tempo e indipendente dal reddito (a), è data da:

$$B_T = a \beta_T \left[\sum_{t=T-n}^{T-1} \gamma_t w_t \right] \quad (3)$$

dove possiamo interpretare e chiamare $\rho_T = a \beta_T$ il coefficiente di rendimento per anno di contribuzione e

$\bar{w} = \frac{1}{n} \sum_{t=T-n}^{T-1} \gamma_t w_t$ il reddito pensionabile oppure il reddito medio nel corso della vita lavorativa, per cui possiamo

riscrivere la (3):

$$B_T = \rho_T n \left[\frac{1}{n} \sum_{t=T-n}^{T-1} \gamma_t w_t \right] = \rho_T n \bar{w} \quad (3 \text{ bis})$$

infine, la pensione viene rivalutata automaticamente nel tempo secondo lo schema:

$$B_t = \nu_t B_T \quad \text{con } t=T+2, \dots, m$$

dove m è l'anno di morte e $\nu_t = \prod_{j=T+1}^t (1 + r_j)$ è un fattore di rivalutazione ed r_j è il tasso di rivalutazione della pensione tra l'anno $j-1$ e l'anno j .

³² Vedi Hamann (1997) e Peracchi e Rossi (1996)

Riforma Amato a regime

Sotto la riforma Amato:

- Il tasso di capitalizzazione dei contributi g_j è pari al tasso di inflazione (π) più l'1 per cento.
- Il tasso di rivalutazione r_j della pensione è pari al tasso di inflazione.
- Il coefficiente di rendimento per anno di contribuzione τ_e è pari al 2 per cento qualunque sia l'età anagrafica. Per cui $\rho_T = a\beta_T = 0.02$.

Dalla formula generale (3 bis) possiamo scrivere la pensione erogata sotto il regime Amato, all'anno di pensionamento T , con n anni di contribuzione (almeno 35):

$$B_T^A = 0.02 * n * \left[\frac{1}{n} \sum_{t=T-n}^{T-1} w_t (1.01 + \pi)^{T-t} \right]$$

In termini reali tale espressione può essere riscritta:

$$B_T^A = 0.02 * n * \left[\frac{1}{n} \sum_{t=T-n}^{T-1} w_t (1 + 0.01)^{T-t} \right]$$

dove il termine nelle parentesi quadre indica il reddito da lavoro medio del periodo contributivo, con il salario reale rivalutato al tasso annuo dell'1 per cento.

Riforma Dini

Sotto la riforma Dini:

- Il tasso di capitalizzazione dei contributi g_j è pari alla media geometrica quinquennale dei tassi di variazione del Pil nominale.
- Il tasso di rendimento per anno di contribuzione è dato dal prodotto del coefficiente di trasformazione β_T stabilito dalla legge (nella Tabella A allegata alla riforma Dini e qui di seguito riportata) in base alla speranza di vita attesa del pensionato e dell'aliquota contributiva che è pari al 32,7 per cento. Per cui $\rho_T = \beta_T a$

Dalla formula generale (3 bis) possiamo scrivere la pensione erogata sotto il regime Dini, all'anno di pensionamento T , con n anni di contribuzione:

$$B_T^D = [\rho] \left[\sum_{t=T-n}^{T-1} w_t \gamma_t \right]$$

Quindi entrambe le formule relative ai benefici previdenziali sotto le due riforme possono essere riscritte così:

$$B_T^D = [\beta_T a] \left[\sum_{t=T-n}^{T-1} w_t \gamma_t \right] \quad (4)$$

$$B_T^A = [0.02] \left[\sum_{t=T-n}^{T-1} w_t (1.01)^{T-t} \right] \quad (5)$$

Differenti tassi di rendimento e differenti tassi di capitalizzazione generano differenti livelli dei benefici pensionistici sotto i due differenti regimi.

TAB. A Coefficienti di Trasformazione

Divisori	Età Anagrafica T	Valori β_T
21,1869	57	4,720%
20,5769	58	4,860%
19,9769	59	5,006%
19,3669	60	5,163%
18,7469	61	5,334%
18,1369	62	5,514%
17,5269	63	5,706%
16,9169	64	5,911%
16,2969	65	6,136%

Fonte: dall'allegato alla legge d.lgs. 503/92

Possiamo fare un confronto tra i coefficienti di rendimento per anno di contribuzione sotto i due differenti regimi, prendendo in considerazione le differenze di età di pensionamento ed i differenti tassi contributivi.

Nella tabella B vengono messi a confronto i coefficienti di rendimento imposti dalla riforma Amato – secondo il punto (c) – e dalla riforma Dini – secondo il punto (2) e la Tabella A.

TAB B. Confronto coefficienti di rendimento sotto il regime Amato e Dini

Età anagrafica	Coefficiente di rendimento ρ	
	Riforma Amato	Riforma Dini $\rho_T = a\beta_T$
57	2.00	1.5436
58	2.00	1.589
59	2.00	1.636
60	2.00	1.688
61	2.00	1.744
62	2.00	1.803
63	2.00	1.865
64	2.00	1.932
65	2.00	2.00

Dalla tabella B risulta evidente che il sistema previdenziale sotto il regime Dini risulta essere meno generoso del regime Amato nei confronti degli individui che decidono di andare in pensione prima di aver compiuto i 65 anni di età. Solo per gli individui che vanno in pensione a tale età il tasso di

Come evidenziato in diversi lavori (si vedano Giarda, 1998, Gronchi e Aprile 1998, D'Amato e Galasso, 2002 a, Castellino e Fornero, 2001) l'obiettivo di sostenibilità finanziaria del nuovo regime nel lungo periodo non può essere considerato un risultato raggiunto.

Numerose sono, infatti, le correzioni da apportare alla riforma. Secondo Gronchi (1998) e Gronchi e Aprile (1998), il maggior difetto della riforma è la mancata indicizzazione reale delle pensioni. Il calcolo della pensione annua è effettuato applicando al montante contributivo (credito accumulato dal lavoratore verso il sistema pensionistico per effetto dei contributi versati e degli interessi maturati) un coefficiente di trasformazione (che consente di tradurre il montante stesso in una rendita), che varia al variare dell'età di pensionamento e tiene conto dell'indicizzazione al tasso di inflazione.

Limitare l'indicizzazione ai soli prezzi ha, da un lato, il vantaggio di conservare nel tempo il potere di acquisto di ogni pensionato ma, dall'altro, da origine alle cosiddette "pensioni d'annata", ossia alla riduzione nel corso del periodo di quiescenza del rapporto tra pensione media e salario medio corrente. Viene a crearsi una sorta di convivenza di annate di pensionati con redditi differenti tanto più bassi quanto più lontano è l'anno di decorrenza della pensione.

La riforma del 1995 diede vita alle "pensioni d'annata" al fine di offrire coperture in grado di ottenere il consenso sociale il più velocemente possibile. Ma, come sottolineato da D'Amato e Galasso (2002 a), molto forte potrebbe essere la pressione elettorale per l'approvazione di provvedimenti perequativi aventi lo scopo di agganciare il potere di acquisto della pensione ai salari, portando così nuovamente allo squilibrio finanziario del sistema. Per scongiurare le pensioni d'annata andrebbero ridotti i coefficienti di trasformazione a seconda dell'età di pensionamento prescelta, ma ciò porrebbe delle forti perplessità sul consenso sociale che tanto facilmente fu ottenuto nel 1995.

Problemi simili sono legati anche alla determinazione dei coefficienti di trasformazione. La riforma Dini non aveva l'urgenza di determinare i coefficienti di trasformazione in quanto le pensioni contributive da liquidare si sarebbero presentate solo dopo diversi anni. Tali coefficienti sono calcolati in modo tale da garantire, data l'età di pensionamento e la speranza di vita residua, un tasso di rendimento reale dei versamenti contributivi effettuati nella vita attiva pari all'1,5 per cento, con riferimento alla tavola di mortalità ISTAT per il 1990.

La legge dispone (art. 1, comma 11) che il Ministero del Lavoro, sulla base delle rilevazioni demografiche, ridetermini ogni dieci anni il coefficiente di trasformazione. Dato, però, l'aumento della longevità, l'adeguamento soltanto decennale alle tavole di mortalità effettive, può creare nel corso di un decennio un divario crescente tra i coefficienti applicati e quelli che

corrispondono alle tavole più recenti. Poiché non sarebbe possibile ridurre il valore reale delle pensioni già liquidate, l'aumento della speranza di vita che si manifesta durante il godimento dei benefici previdenziali, si tradurrebbe in aumenti di spesa con conseguente disavanzo del sistema.

Per evitare lo squilibrio finanziario, i coefficienti di trasformazione andrebbero determinati con maggiore frequenza (anche annualmente) in base alle previsioni demografiche di volta in volta disponibili. Le riforme poste in essere negli anni 2000 correggeranno tali anomalie, come vedremo nel paragrafo successivo.

D'Amato e Galasso (2002 a) presentano delle simulazioni che consentono di misurare il peso che la spinta politica degli elettori può avere sulla generosità delle pensioni, attraverso la manipolazione del coefficiente di trasformazione. Dalla simulazione risulta che, a fronte di un'aliquota contabile di equilibrio del 38 per cento nel 1992, l'aliquota stimata per il 2050 sarà del 53,2 per cento, se l'età di pensionamento sarà 62 anni oppure del 48,9 per cento se sarà di 65 anni. La ragione risiede nell'invecchiamento della popolazione: l'età mediana degli elettori è destinata a salire dai 44 anni del 1992 a ben 57 anni del 2050. Ciò comporta un inevitabile aumento dell'aliquota di equilibrio necessaria per consentire la sostenibilità politica della riforma del 1995.

Un'ulteriore misura volta a ridurre la spesa pensionistica è l'aumento dell'età pensionabile. Anche se, come già sottolineato da Gronchi (1998), nello schema contributivo l'età pensionabile non è una variabile che influenza l'equilibrio strutturale del sistema, politicamente età pensionabili basse si accompagnano ad elevate aliquote contributive al fine di garantire la copertura previdenziale desiderata (60 o 65 per cento) dato il minor numero di anni contributivi. Inoltre, la riduzione dell'aliquota contributiva condurrebbe ad aumenti di risparmio individuale e quindi al decollo della previdenza complementare.

E' opinione ormai diffusa che per risolvere il problema del sistema previdenziale sia indispensabile aumentare l'età di pensionamento. Di fronte all'invecchiamento della popolazione, è più che mai necessario che i lavoratori attivi rimangano più a lungo nella forza lavoro in modo che il numero di anni in cui contribuiscono al sistema pensionistico aumenti, mentre simultaneamente vada a ridursi il numero di anni in cui si gode della pensione. Per ridurre l'impatto della spesa pensionistica e incentivare la previdenza complementare deve necessariamente essere alzata l'età effettiva di pensionamento e per farlo, bisognerà studiare un sistema di incentivi per chi resta nel mercato e di penalizzazioni (in termini di riduzione dei benefici pensionistici) per coloro che decidono di andare in pensione anticipatamente (per

una breve analisi del fenomeno del pensionamento dovuto agli incentivi all'abbandono della forza lavoro spesso presenti nei sistemi previdenziali, si veda la Scheda 3.2).

Di tale opinione sono D'Amato e Galasso (2002 a) secondo i quali la misura più incisiva per ridurre la spesa pensionistica è l'aumento dell'età di pensionamento. Tale incremento, infatti, farebbe diminuire il rapporto di dipendenza degli anziani e, inoltre, ridurrebbe la spinta degli elettori in età vicina al pensionamento ad aumentare l'aliquota contributiva. Ciò sarebbe dovuto al fatto che i lavoratori si troverebbero a fronteggiare un maggior numero di anni contributivi di fronte ad un minor numero di quelli di godimento dei benefici previdenziali. A parità di aliquota contributiva, si avrebbe un monte contributivo più ampio (per effetto dell'aumento degli anni di contribuzione) e, quindi, potrebbero essere conferite pensioni più generose ad un numero di pensionati certamente minore (per effetto dell'aumento dell'età pensionabile). Le simulazioni effettuate dagli autori, mostrano che l'incremento di un anno dell'età di pensionamento si traduce in una riduzione dell'aliquota contributiva di almeno un punto percentuale.

2.3 La Riforma Prodi

Nonostante il radicale mutamento prodotto dall'introduzione del nuovo sistema di calcolo delle prestazioni previdenziali basato sulla formula contributiva e l'armonizzazione della normativa tra i diversi settori occupazionali, gli interventi sulle pensioni di anzianità non hanno condotto ai risultati sperati. Questa è la principale ragione dell'ulteriore intervento di riforma introdotto con la legge 449/97 e successivamente completato dai provvedimenti contenuti nel collegato alla legge finanziaria dell'anno successivo (legge 448/98).

Tale riforma che va sotto il nome di riforma Prodi, modifica alcuni punti della riforma delle pensioni del 1995 inasprando i requisiti per la pensione di anzianità.

Scheda 3.2

Incentivi al pensionamento

La tendenza all'allungamento della vita media richiede una crescita equilibrata del numero di anni lavorati e di quelli trascorsi in pensionamento, come sottolineato nell'Allegato 16 del Rapporto sulla valutazione degli effetti della legge n°335/95, redatto dalla Commissione Brambilla nel settembre del 2001. Un sistema pensionistico rigido, con età e condizioni di pensionamento prefissate e immutabili, e con forti incentivi all'uscita dal lavoro, non è in grado di svolgere questo ruolo.

Nell'allegato 16 sopra menzionato la Commissione utilizza l'espressione "sottoutilizzo del potenziale di lavoro" per riferirsi alle distorsioni provocate dai parametri del sistema previdenziale (alte aliquote contributive, requisiti di accesso e formule retributive) sulle scelte di partecipazione al mercato del lavoro e di pensionamento.

Dai dati della Rilevazione Trimestrale delle Forze di Lavoro dell'Istat, che considera la popolazione in età lavorativa dai 15 ai 65 anni di età, risulta che il rapporto tra inoccupati (disoccupati e non forze di lavoro) e occupati è aumentato quasi costantemente dagli anni '80 al primo decennio del 2000, passando dal 79% del 1980 all'87% del 2000, e ha raggiunto livelli assai elevati rispetto a quelli osservati negli altri paesi dell'Unione Europea.

Il rapporto è aumentato in particolare tra gli uomini più giovani di età compresa tra i 16 ed i 30 anni e quelli nella fascia di età più vicina al pensionamento (da 51 a 65 anni). Le donne nella fascia di età centrale (31-50 anni) sono l'unico gruppo demografico per il quale si osserva, per contro, una chiara tendenza alla diminuzione del rapporto.

Poiché è estremamente difficile che aumenti il tasso d'occupazione dei giovani tra i 15 ed i 25 anni, il problema del sottoutilizzo del potenziale di lavoro si manifesta in particolare nel gruppo delle donne e delle persone nella fascia d'età 51-65.

Per capire quali sono i fattori più importanti su cui intervenire al fine di invertire la tendenza alla riduzione dell'età di pensionamento è necessario considerare, tra gli altri, un importante aspetto: individuare le determinanti della scelta di in individuo ad andare in pensione ad una data età oppure proseguire con l'attività lavorativa.

I fattori che influenzano tale scelta sono di carattere oggettivo e soggettivo ed hanno dato vita ad un'ampia attività di ricerca.

La decisione di pensionamento presa dal singolo individuo, scaturisce dal confronto del valore che egli attribuisce a due alternative: uscire dal mercato del lavoro e, quindi, pensionarsi oppure rimanere nella forza lavoro e scegliere di pensionarsi ad un'età successiva.

Il valore di ciascuna alternativa dipende dal flusso atteso dei benefici netti che essa assicura e dal modo in cui il soggetto attualizza tale flusso, e quindi dal suo tasso di sconto intertemporale e dalle aspettative soggettive di sopravvivenza alle diverse età. Diverse sono le variabili che influenzano la determinazione del flusso atteso dei benefici futuri: importante è il ruolo svolto dal profilo di carriera atteso dal lavoratore ed anche dalle attese circa la congiuntura economica. Altre variabili cruciali sono le prospettive del lavoratore circa il suo stato di salute, le caratteristiche e l'evoluzione attesa del nucleo familiare di appartenenza, e le opportunità di occupazione nell'economia "sommersa".

Uno studio piuttosto recente di Brugiavini, Peracchi e Wise (2002) ha analizzato attentamente il fenomeno delle uscite anticipate dal mercato del lavoro ed ha mostrato come la scelta di pensionamento dipende da molte variabili, tra le quali spiccano la ricchezza, il livello di reddito, lo stato di salute e la struttura familiare, ma soprattutto la conoscenza che i lavoratori hanno delle regole del sistema di protezione sociale, quali le modalità di calcolo dei benefici.

Gli autori studiano il fenomeno del pensionamento, definito come uscita dal mercato del lavoro, in tre paesi: Italia, Spagna e Stati Uniti. Tali paesi presentano notevoli differenze sia dal punto di vista dell'assetto istituzionale in tema di welfare che dal punto di vista della configurazione del mercato del lavoro. Dal loro studio emerge che laddove i sistemi di sicurezza sociale permettono delle uscite per anzianità ed il vincolo dell'età di uscita non è stringente, vi è una elevata frequenza di uscite dal mercato del lavoro ad età molto al di sotto dell'età normale di pensionamento. Il 50 per cento dei lavoratori presenti nel campione italiano, avente un'età superiore ai 50 anni, risulta aver cessato l'attività lavorativa prima del compimento del 56-esimo anno di età. Quando i criteri di quiescenza diventano più stringenti (come si è verificato in Italia dopo il 1999) si osserva, come ci si aspetterebbe, un prolungamento dell'attività lavorativa. Ulteriori elementi che favoriscono l'uscita anticipata dal mercato del sono la presenza di altri programmi quali le pensioni di invalidità o i sussidi di disoccupazione elargiti agli ultra-50enni. Dallo studio risulta, inoltre, che la scelta di abbandonare l'attività lavorativa viene fortemente determinata dagli incentivi monetari presenti nei sistemi previdenziali. Nei sistemi in cui l'ammontare delle prestazioni varia con l'età di pensionamento secondo criteri attuariali (come accade negli USA) i lavoratori tendono a prolungare l'attività lavorativa fino alla maturazione completa dei loro diritti previdenziali. Nei sistemi in cui gli aggiustamenti attuariali non si applicano (come nel caso italiano) i lavoratori si avvantaggiano della generosità del sistema ad età relativamente giovani.

Da questo studio di Brugiavini, Peracchi e Wise (2001) emerge che i vincoli che si sono posti in Italia alle regole di quiescenza (quali età anagrafica e anzianità contributiva) hanno effetti positivi sulla partecipazione al mercato del lavoro, anche se ciò avviene in un certo lasso di tempo rispetto all'entrata in vigore delle regole del sistema.

Disegnare un piano del debito, invece, sulla efficacia delle regole basate su contributi

Le principali novità introdotte dal provvedimento legislativo sono:

- “accelerazione” della fase transitoria che porta gradualmente, per i lavoratori dipendenti, al conseguimento della pensione di anzianità con 35 anni di contribuzione ed un’età di almeno 57 anni oppure con 40 anni di contribuzione indipendentemente dall’età posseduta;
- possibilità di cumulare i trattamenti pensionistici di anzianità con i redditi da lavoro autonomo.

Secondo una valutazione critica di Giarda (1998) gli interventi correttivi alla legge 335/95 introdotti con la legge 449/97 porteranno nei prossimi anni a due importanti risultati: a) a stabilizzare la percentuale di spesa previdenziale rispetto alla ricchezza nazionale sui valori del 1997 e, attraverso l’aumento dei contributi previdenziali, b) a ridurre il peso derivante dal finanziamento degli Enti previdenziali.

Nel contempo, però, la legge Prodi non ha affrontato in maniera adeguata altri importanti problemi tra i quali porre rimedio alle eccezioni che erano state previste dalla riforma Dini in merito all’elevazione dell’età pensionabile per la qualificazione alla pensione di anzianità. Essa, inoltre, non cerca di accelerare il gradualismo con cui vengono aumentate le aliquote contributive versate dai lavoratori autonomi.

Le riforme descritte in questo paragrafo lasciano in eredità agli anni 2000 tre categorie di pensioni con un diverso ammontare di benefici previdenziali espressi in percentuale rispetto all’ultima retribuzione percepita dal lavoratore:

- con metodo retributivo: per chi alla data del 1 gennaio 1996 ha versato almeno 18 annualità di completa contribuzione (70-80 per cento);
- metodo misto: per chi ha più di un anno, ma meno di 18, di contributi versati al 1° gennaio 1996 (55-65 per cento);
- metodo contributivo: per chi ha iniziato a contribuire dopo il 1° gennaio 1996 (30-50 per cento).

Al fine di migliorare le riforme degli anni ’90 e di accelerare la sostenibilità del sistema previdenziale italiano, anche il primo decennio del nuovo millennio è ricco di interventi legislativi: la riforma Maroni del 2004, Damiano del 2007 e, più recentemente, la riforma Monti/Fornero del dicembre 2011, attuata anche a seguito dell’acuirsi dei problemi economici e finanziari dovuti alla crisi del 2008.

3 Le riforme del primo decennio del nuovo millennio

3.1 La riforma Maroni/Tremonti

Nel 2004 il legislatore interviene nuovamente sulle pensioni emanando la legge n. 243 del 23 agosto 2004 nota come riforma Maroni. Tale riforma, accanto all'obiettivo di ridurre la spesa pensionistica, ha consentito un rafforzamento del legame tra il sistema pensionistico statale e le forme previdenziali private che sono state ulteriormente sviluppate registrando così una consistente accelerazione. Sono state, inoltre, modificate le regole di pensionamento, innalzando gradualmente i requisiti minimi di accesso ai trattamenti di vecchiaia e di anzianità, fattore che ha contribuito a stabilizzare e frenare la dinamica futura della spesa per pensioni rispetto al prodotto interno lordo.

Alla luce di tale riforma, le regole di accesso al pensionamento di vecchiaia variano a seconda che le prestazioni del lavoratore siano calcolate sulla base del metodo retributivo e misto oppure sulla base del metodo contributivo. Gli individui assoggettati al metodo retributivo e misto possono accedere al pensionamento di vecchiaia all'età di 65 anni e 60 anni, rispettivamente per gli uomini e per le donne, con un numero di anni contributivi almeno pari a 20. I lavoratori integralmente assoggettati al sistema contributivo possono, fino al 2007, andare in pensione tra i 57 e i 65 anni di età (prima dei 65 anni è possibile pensionarsi solo se la pensione raggiunge un certo importo). Dal 2008 il requisito minimo per accedere alle pensioni di anzianità sia nel sistema retributivo che contributivo è di 35 anni di contribuzione e 60 anni di età (elevato a 35 e 61 anni nel 2010) ovvero 40 anni di contribuzione a qualsiasi età. Tale "scalone" (termine che nel gergo politico indica il brusco innalzamento di 3 anni dell'età anagrafica) è stato oggetto di aspre critiche nel dibattito politico ed economico che hanno portato ad un intervento del governo nel luglio 2007 che lo sostituisce con un meccanismo di aumento graduale dell'età pensionabile nell'arco di 4 anni destinato a produrre il medesimo effetto (i cosiddetti "scalini")

Inoltre, per il periodo 2004-2007 sono stati previsti degli incentivi per i dipendenti privati che matureranno, entro il 31 dicembre 2007, i requisiti anagrafici e contributivi per la pensione di anzianità e che decideranno di rimanere al lavoro. Per loro, il 100 per cento dei contributi sociali verrà versato in busta paga.

In merito alla previdenza complementare, la riforma Maroni prevede modalità tacite di conferimento del Trattamento di Fine Rapporto dei lavoratori ai fondi pensione, l'equiparazione tra forme pensionistiche complementari e la rimozione dei vincoli per il

trasferimento delle posizioni individuali. Viene, inoltre, ridefinita nuovamente la disciplina fiscale della previdenza complementare attraverso agevolazioni per la deducibilità della contribuzione alle forme pensionistiche complementari e rendendo più favorevole la tassazione delle stesse. Della previdenza complementare si discuterà ampiamente nel paragrafo 4.

3.2 La riforma Damiano

Nel 2007 si arrivò alla riforma del governo Prodi bis con la legge n. 247/2007, nota anche come riforma Damiano. In estrema sintesi le principali misure contenute nella legge sono di seguito riportate, utilizzando la classificazione riportata nel Rapporto della Ragioneria Generale dello Stato (2007).³³

1. Pensionamento anticipato.

Dal 1° gennaio 2008 al 30 giugno 2009, potranno andare in pensione anticipata i lavoratori dipendenti che hanno compiuto 58 anni di età (59 se lavoratori autonomi) ed hanno maturato 35 anni di contributi. Dal 2010 in poi, i requisiti minimi per l'accesso al pensionamento anticipato aumenteranno gradualmente fino a raggiungere dal 2013 un'età minima di 62 anni (63 anni per i lavoratori autonomi) con un numero di anni contributivi maturati sempre pari a 35 anni confermando così i requisiti previsti dal 2014 dalla riforma Maroni. Inoltre, dal luglio 2009, la legge Damiano consente di accedere al pensionamento con una età anagrafica inferiore di un anno rispetto a quella prevista in concomitanza con i 35 anni di anzianità contributiva, a condizione, tuttavia, di possedere almeno 36 anni di vita contributiva.

2. Lavori usuranti.

La legge Damiano prevede l'istituzione di un Fondo le cui risorse permetteranno ai lavoratori che svolgono una attività usurante di accedere al pensionamento anticipato con una riduzione rispetto alla normativa vigente fino ad un massimo di tre anni del requisito anagrafico e, comunque, non prima dei 57 anni di età e con un numero di anni contributivi almeno pari a 35. Il Fondo è di ridotte dimensioni e prevede un numero di beneficiari pari a 5 mila unità ogni anno con un anticipo del pensionamento fino ad un massimo di 3 anni. Le attività lavorative considerate usuranti sono definite con decreto del Ministro del lavoro del 19 maggio 1999 e comprendono i lavoratori notturni, i lavoratori addetti alla catena di montaggio, i conducenti di mezzi pubblici pesanti. Tali lavoratori vengono comunque selezionati anche in ragione del periodo lavorativo effettivamente trascorso in tale condizione.

³³ Box 2.1, pag 47.

3. Rideterminazione dei coefficienti di trasformazione.

Con decreto del Ministro del lavoro e del Ministro dell'economia e delle finanze i coefficienti di trasformazione verranno rivisti ogni tre anni anziché ogni dieci come previsto dalla riforma Dini. A decorrere dal 1 gennaio 2010, la tabella A allegata alla legge Dini (già esaminata e descritta nella scheda 3.1) viene sostituita con la tabella 9 qui di seguito riportata.

TAB. 9 Nuovi coefficienti di trasformazione a partire dal 2010

Divisori	Età Anagrafica T	Valori β_T
22,627	57	4,419%
22,035	58	4,538%
21,441	59	4,664%
20,843	60	4,798%
20,241	61	4,940%
19,635	62	5,093%
19,024	63	5,257%
18,409	64	5,432%
17,792	65	5,620%

La legge Damiano, inoltre, prevede la costituzione di una Commissione di esperti (due indicati dal Ministero del lavoro, due indicati dal Ministero dell'economia e sei indicati dai sindacati ed imprenditori) con il compito di proporre, entro il 31 dicembre 2008, modifiche dei criteri di calcolo dei coefficienti di trasformazione che tengano conto: i) delle dinamiche macroeconomiche, demografiche e migratorie; ii) dell'incidenza dei percorsi lavorativi discontinui con lo scopo di tutelare le pensioni più basse e di proporre meccanismi di solidarietà; iii) del rapporto tra età media attesa di vita e quella dei singoli settori di attività. Secondo le previsioni contenute nel Rapporto della RGS del 2007, le modifiche complessivamente introdotte dalla legge Damiano avrebbero comportato, a partire dal 2009, un incremento dell'incidenza della spesa in rapporto al PIL che avrebbe raggiunto il massimo nel 2011 (circa 0,1-0,15 punti percentuali di PIL) per poi ridursi progressivamente fino ad azzerarsi completamente a partire dal 2030-2035.

3.3 La riforma Monti/Fornero

Alla fine del 2011, il governo tecnico Monti pone in essere una nuova riforma pensionistica avente l'obiettivo di contribuire in maniera significativa al risanamento del bilancio pubblico attraverso una drastica riduzione dei requisiti per il pensionamento. Tale riforma, contenuta nella legge 214/2011, è stata realizzata con una misura di urgenza resa necessaria dall'acuta crisi finanziaria iniziata nel 2008. Essa introduce una serie di importanti modifiche all'assetto normativo del sistema previdenziale italiano allineandolo alla maggior parte dei paesi europei. Riportiamo la sintesi effettuata dalla RGS (2013)³⁴ dei requisiti di accesso al pensionamento secondo la suddetta riforma. Due sono i canali di accesso:

- il *pensionamento di vecchiaia* che prevede un requisito contributivo minimo di 20 anni;
- il *pensionamento anticipato* con un'età inferiore a quella di vecchiaia ma con requisiti contributivi più stringenti.

Il requisito anagrafico minimo per il *pensionamento di vecchiaia* è, a partire dal 2012, pari a 66 anni per gli uomini e le donne del settore pubblico, e 62 anni per le donne del settore privato (63 anni e mezzo per le lavoratrici autonome). Questo requisito viene gradualmente incrementato e pienamente allineato a quello degli altri lavoratori, a partire dal primo gennaio 2018 e pari a 66 anni e 7 mesi (allo stesso valore viene anche portato il requisito di età per l'assegno sociale).

L'accesso al pensionamento di vecchiaia richiede, oltre al requisito di età, anche un requisito minimo di contribuzione di almeno 20 anni e, nel solo regime contributivo, è richiesto che, al momento del pensionamento, il trattamento maturato debba essere almeno pari a 1,5 volte l'importo dell'assegno sociale (cioè non inferiore a circa 644 euro mensili nel 2012). In mancanza di uno di questi requisiti il lavoratore dovrà rimanere in attività fino ai 70 anni. Tali requisiti saranno poi adeguati nel tempo in funzione delle variazioni della speranza di vita.

Attorno al 2020, il requisito minimo di età per la pensione di vecchiaia raggiunge i 67 anni per tutti i lavoratori. E' prevista, inoltre, dalla legge 214/2011 una clausola di garanzia in base alla quale il requisito minimo anagrafico per la pensione di vecchiaia non potrà essere inferiore ai 67 anni per coloro che maturano il diritto alla prima decorrenza utile del pensionamento a partire dal 2021. Tuttavia, sulla base delle più aggiornate previsioni demografiche Istat con base 2011, il predetto obiettivo potrebbe essere assicurato già dal 2019.

³⁴ Box 2.2, pag.62.

In merito al *pensionamento anticipato*, questo è consentito al raggiungimento di un requisito contributivo minimo pari, nel 2012 per gli uomini, a 42 anni ed 1 mese (ulteriormente incrementato di 1 mese ogni anno fino al 2014) e per le donne, a 41 anni ed 1 mese (ulteriormente incrementato di 1 mese ogni anno fino al 2014). Tale requisito è indipendente dall'età ed adeguato nel tempo in funzione delle variazioni della speranza di vita.

La legge prevede, inoltre, per i lavoratori interamente assoggettati al regime contributivo, di accedere al pensionamento anticipato a 63 anni, se in possesso di almeno 20 anni di contribuzione effettiva ed a condizione che l'importo del trattamento pensionistico maturato sia pari ad almeno 2.8 volte l'assegno sociale nello stesso anno (circa 1.200 euro mensili nel 2012). Tale importo è indicizzato in funzione della media mobile quinquennale del PIL nominale.

Come sottolineato nel Rapporto della RGS (2013) "...il vincolo di un importo minimo di pensione relativamente elevato sostituisce, di fatto, il requisito contributivo minimo di 35 anni previsto dalla normativa precedente per l'accesso al pensionamento anticipato nel regime contributivo. Il valore soglia è stato determinato al fine di garantire, in media, l'equivalenza nell'età di accesso al pensionamento e preservare il livello di adeguatezza delle prestazioni garantito dalla legislazione previgente"³⁵.

A partire dal 2021, è previsto l'adeguamento automatico, con cadenza biennale, di tutti i parametri di età e contribuzione alle variazioni della speranza di vita.

Senza dubbio l'elemento caratterizzante della riforma Fornero è l'aumento dell'età di pensionamento. Tale processo, che ha avuto inizio con le riforme degli anni 90 del secolo scorso, porterà, a regime, l'età di pensionamento in Italia a livelli fra i più elevati in Europa. In realtà le età di pensionamento sono aumentate già dal 2000, molto più della speranza di vita e altrettanto succederà di qui al 2018.

Come sottolineato da Marano, Mazzaferro e Morciano (2012) il legislatore si attende importanti risparmi al bilancio pubblico derivanti dall'aumento dell'età di pensionamento. Questi sono quantificati nella relazione tecnica alla riforma nello 0,2%, 1,4%, 0,9% e 0,2% del Pil rispettivamente nel 2012, 2020, 2030 e 2040. Inoltre, oltre ai risparmi di spesa ci si attende anche un miglioramento dei benefici pensionistici, soprattutto per coloro che andranno in pensione con la regola contributiva. L'età effettiva media di pensionamento rimarrà ancora vicina ai 60 anni prima del 2012, ma è destinata a crescere fino ad arrivare a 70 anni nel 2050, mentre il tasso di sostituzione della pensione rispetto all'ultima

³⁵ Pag.63.

retribuzione, previsto in forte calo prima della riforma Monti/Fornero, supererà il 70 per cento nel prossimo decennio, per iniziare poi una lenta discesa, spiegata dall'entrata a regime del sistema contributivo, che, tuttavia, non lo porterà a valori inferiori al 60%.

Rimangono comunque dei problemi ancora aperti e che presto il legislatore si troverà a dover affrontare. Di certo tale riforma ha modificato in maniera strutturale il mercato del lavoro e non è chiaro, ad oggi, quali saranno gli effetti in termini di occupazione, di produttività e di PIL.

4. La Previdenza Complementare

Come abbiamo ampiamente descritto nel primo capitolo, tra gli scopi principali delle riforme poste in essere all'inizio degli anni '90 in Italia, così come nella maggior parte dei paesi industrializzati, c'era il graduale passaggio da un sistema previdenziale incentrato su un unico regime obbligatorio pubblico ad un sistema basato su tre pilastri come suggerito dalla Banca Mondiale nel 1994:

- primo pilastro: previdenza pubblica ridefinita in modo da garantire una maggiore rispondenza tra i contributi versati dai lavoratori e le prestazioni da essi percepite negli anni di pensionamento;
- secondo pilastro: la pensione integrativa aziendale o di categoria accumulata mediante l'adesione su base collettiva ai fondi pensione;
- terzo pilastro: la pensione integrativa individuale su base volontaria (FIP, forme individuali pensionistiche).

Accanto alla questione dei conti pubblici rimane aperta quella dei conti privati. Vi è la necessità di assicurare un adeguato sviluppo della previdenza integrativa al fine di colmare la graduale riduzione delle prestazioni pensionistiche pubbliche che danneggerebbero le condizioni economiche dei futuri pensionati.

L'istituzione della previdenza complementare in Italia è stata piuttosto tormentata, tanto da impedirne il decollo. La prima fonte organica di regolamentazione delle forme integrative di previdenza è rappresentata dal decreto legislativo 124/1993 che manifesta una chiara volontà da parte del legislatore di tutelare non solo la libertà di scelta dell'individuo ed il comportamento del gestore ma anche quella di garantire una copertura pensionistica adeguata in un sistema previdenziale pubblico in difficoltà.

L'eccessiva generosità del primo pilastro pubblico ha, però, sempre fortemente ostacolato lo sviluppo della previdenza integrativa ed in particolare dei fondi pensione con conseguente

squilibrio a favore della componente obbligatoria nella ricchezza pensionistica delle famiglie italiane. Una seconda ragione del mancato decollo della previdenza integrativa è da individuare nel tardivo ed ancora insufficiente riconoscimento da parte del legislatore di idonei incentivi fiscali al risparmio previdenziale. Solo con il decreto 47/2000, che è entrato in vigore il 1° gennaio 2001, si è giunti ad una disciplina fiscale uniforme per tutte le tipologie di risparmio previdenziale. Tale disciplina ha come obiettivo quello di stimolare il risparmio previdenziale e l'adesione ai fondi pensione attraverso l'introduzione di polizze individuali pensionistiche (PIP), offerte dalle compagnie di assicurazione in concorrenza con i fondi aperti. Inoltre, è stato uniformato il trattamento fiscale degli strumenti della nuova previdenza (fondi pensione, polizze assicurative, trattamento di fine rapporto (Tfr)) e sono state introdotte forme di agevolazione fiscale del risparmio previdenziale. Ciò che ha impedito a tale decreto di dare la giusta spinta al decollo della previdenza integrativa è stata l'applicazione di una aliquota fiscale sugli interessi pari all'11 per cento, in luogo dell'usuale 12,5 per cento previsto per altre forme di risparmio finanziario.

Nel 2004, un nuovo intervento in favore della previdenza complementare è stato effettuato con la legge Maroni già ampiamente descritta nel paragrafo 3.1. Accanto agli interventi relativi al primo pilastro (quali revisioni delle pensioni di anzianità e di vecchiaia, liberalizzazione-allungamento dell'età pensionabile col sistema degli incentivi e disincentivi, eliminazione dei divieti di cumulo tra pensione e reddito da lavoro) il decreto innova profondamente la previdenza complementare. Esso prevedeva il conferimento del Trattamento di Fine Rapporto maturato dal lavoratore nel corso della sua attività lavorativa alle forme pensionistiche complementari con il cd. silenzio-assenso. Inoltre, prevedeva l'introduzione di una tassazione agevolata delle prestazioni erogate, nonché agevolazioni fiscali e contributive in favore delle imprese, al fine di compensarle per la perdita del Tfr.

Il Tfr, infatti, rappresenta una forma di salario differenziata nel tempo che svolge, di fatto, una funzione previdenziale ed assicurativa in quanto costituisce una forma di risparmio forzoso a scopi pensionistici. Esso consiste nell'accantonamento annuo presso il datore di lavoro di una quota della retribuzione lorda di ciascun lavoratore, in totale esenzione fiscale e contributiva. Per le imprese costituisce una fonte di finanziamento il cui costo risulta di molto inferiore a quello dell'indebitamento corrente. Il dirottamento di tali accantonamenti ai fondi pensione si tradurrebbe in pesanti costi per le imprese quali costi di finanziamenti esterni ben maggiori rispetto al Tfr e diversi gradi di difficoltà nel reperimento di fonti alternative di finanziamento.

Per i lavoratori, invece, il Tfr può svolgere una triplice funzione: somma utilizzabile al termine della vita lavorativa (carattere previdenziale); somma da utilizzare, in via anticipata, per particolari esigenze quali spese mediche rilevanti o per l'acquisto di un'abitazione (superare i vincoli di liquidità); somma da utilizzare in caso di cessazione del rapporto di lavoro (funzione precauzionale o di *buffer stock*). Appare dunque giustificato che nelle adesioni ai fondi pensioni i lavoratori appaiano riluttanti anche in presenza di agevolazioni fiscali.

Con l'entrata in vigore del decreto 252/05, anticipata di un anno al 1° gennaio 2007, si è avuto un ulteriore passo avanti nel processo di sviluppo della previdenza complementare ma c'è ancora molto da fare per colmare il divario rispetto sia ai paesi anglosassoni, sia alle economie a noi simili quanto a caratteristiche istituzionali e struttura finanziaria, quali Francia, Germania e Spagna (Cesari, Grande e Panetta, 2007).

5 Situazione attuale dei conti previdenziali

Dal Rapporto del Nucleo di valutazione della Spesa Previdenziale (NVSP) dell'aprile 2012 si evince che nel 2010, la spesa per pensioni dell'insieme dei fondi del sistema obbligatorio è risultata pari a 232.339 milioni di euro, pari al 14,96 per cento del PIL, con un incremento di 6.268 milioni di euro (+2,8%) rispetto all'anno precedente, come evidenziato dalla tabella 10. Questa riproduce sinteticamente il quadro finanziario complessivo della previdenza obbligatoria, mostrando spese, entrate contributive e quota trasferita attraverso la gestione per gli interventi assistenziali (GIAS). Tali risultati confermano l'andamento degli aggregati relativi al 2009, come conseguenza del perdurare della crisi economica e finanziaria. Nel triennio che va dal 2006 al 2008 la spesa previdenziale era cresciuta in maniera percentualmente inferiore rispetto all'aumento delle entrate contributive, determinando un miglioramento dei saldi previdenziali. Nel 2008, infatti, il disavanzo totale delle gestioni pensionistiche risulta essere il più basso dal 1989 ad oggi e pari a 2.024 milioni di euro³⁶. Nel 2009 si registra un'inversione di tendenza con un disavanzo che sale a 9.310 milioni di euro ed arriva a 13.006 milioni di euro nel 2010. Nonostante la spesa pensionistica aumenti in misura inferiore rispetto all'anno precedente (del 3,7 per cento nel 2009 rispetto al 4,2 per cento del 2008) le entrate contributive rimangono stabili (con un incremento dello 0,1 per cento nel 2009), causando così un peggioramento del saldo.

³⁶ Si veda la tabella completa contenuta nel Rapporto del Nucleo di valutazione della Spesa Previdenziale (2012) pag. 55.

Nel grafico 1 è riportata la spesa per prestazioni pensionistiche del sistema obbligatorio (al lordo GIAS) in percentuale del Prodotto Interno Lordo per il periodo 1989-2010. I valori di questo importo sono condizionati sia dalla dinamica del PIL che dagli andamenti del numero e dell'importo medio delle prestazioni erogate, valori che hanno subito l'influenza delle riforme introdotte nell'ultimo ventennio ed ampiamente descritte nei paragrafi precedenti.

TAB. 10 Entrate contributive e spesa per pensioni e integrazioni assistenziali (milioni di euro) (1)

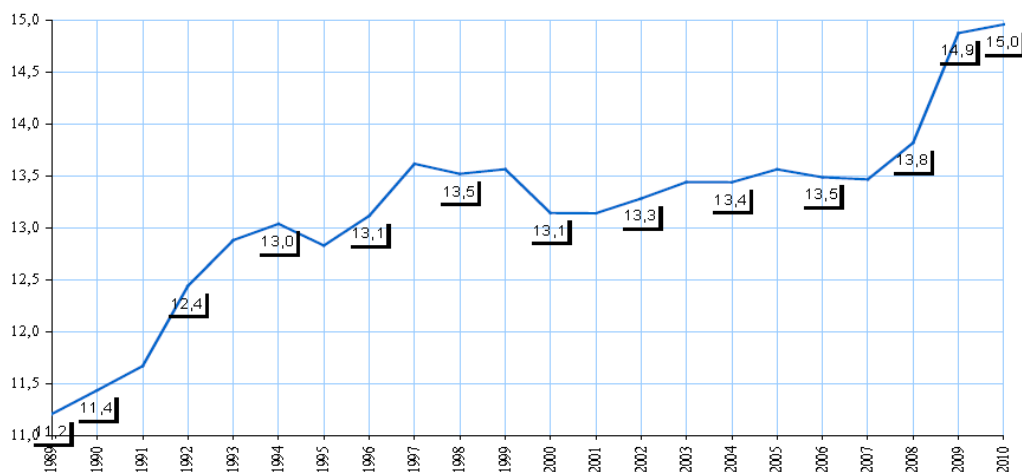
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
<i>TOTALE GESTIONI PENSIONISTICHE</i>											
- contributi	120.501	129.760	135.201	139.079	148.730	152.440	161.404	170.524	183.011	183.280	185.656
- prestazioni	132.039	138.128	144.249	151.080	158.035	164.722	170.457	177.540	185.035	192.592	198.662
- saldi	-11.538	-8.369	-9.048	-12.001	-9.305	-12.282	-9.053	-7.016	-2.024	-9.310	-13.006
<i>Quota Gias per le gestioni pensionistiche (2)</i>	25.462	26.891	28.677	29.280	29.816	30.100	30.913	31.766	32.626	33.481	33.677
<i>SPESA PENSIONISTICA</i>	157.504	165.019	172.926	180.360	187.851	194.821	201.370	209.306	217.661	226.071	232.339
<i>Spesa pensionistica in % del PIL</i>											
- al lordo Gias	13,14	13,14	13,28	13,44	13,44	13,56	13,49	13,47	13,82	14,88	14,96
- al netto Gias	11,02	11,00	11,08	11,26	11,31	11,47	11,42	11,42	11,75	12,67	12,79

(1) Le entrate contributive delle gestioni previdenziali comprendono l'ammontare dei contributi figurativi trasferiti dalle Regioni, da altri enti e da altre gestioni, tra cui Gias e Gpt. La spesa per prestazioni è al netto dei trasferimenti a carico dello Stato (Gias) o di altre gestioni.

(2)) I principali trasferimenti dalla Gestione per gli interventi assistenziali (Gias) alle gestioni pensionistiche riguardano i prepensionamenti, la "quota parte" stabilita dall'art. 37 della legge 88/89, le pensioni di annata e le pensioni di invalidità anteriori alla legge 222/84. Quest'ultima voce fa seguito al nuovo riparto tra spesa previdenziale ed assistenziale stabilito dalla legge 449/97, art.59. I dati disaggregati dei trasferimenti Gias sono riportati nel presente rapporto nelle tabelle relative alle singole gestioni.

Fonte: Rapporto del Nucleo di valutazione della Spesa Previdenziale (2012)

Grafico 1 Spesa pensionistica in rapporto al PIL (1989-2010)



Fonte: Rapporto del Nucleo di valutazione della Spesa Previdenziale (2012)

Possono essere distinti tre intervalli di tempo (indicati nella tabella 11).

- Dal 1989 al 1997 la spesa previdenziale in rapporto al PIL cresce in maniera considerevole, passando dall'11,2 al 13,6 per cento. A causa del blocco temporaneo dei pensionamenti di anzianità contenuto nella legge finanziaria del 1996, precedente la riforma Dini, nel 1995 si registra una riduzione del rapporto.

- Dal 1997 al 2007 i valori della spesa risultano piuttosto stabili oscillando tra un valore minimo pari a 13,1 per cento del 2000 ad un valore massimo pari al 13,6 del 1997. Ricordiamo che tale intervallo di tempo è quello in cui si concentrano le riforme più importanti in materia previdenziale. Tali riforme hanno modificato i requisiti minimi di accesso al pensionamento, introdotto posticipi delle decorrenze ed aumenti dell'età di pensionamento, influenzando notevolmente la dinamica del numero delle pensioni erogate. Inoltre, con la riforma Amato, dal 1993 le pensioni sono indicizzate alla sola dinamica dei prezzi e non più alla variazione reale dei salari, influenzando di certo il contenimento degli importi di spesa. Il metodo contributivo introdotto con la riforma Dini, invece, non ha influenzato l'andamento della spesa previdenziale data la lenta entrata in vigore della riforma.

- Dal 2008 al 2010 per effetto anche della crisi economica, il rapporto tra spesa previdenziale e PIL ha ripreso a crescere in maniera consistente, passando dal 13,8 del 2008 al 15 per cento del 2010.

Nella tabella 11 sono riportate i tassi di crescita medi del PIL e della spesa pensionistica che ci consentono di verificare se le variazioni del rapporto della spesa rispetto al PIL siano da attribuire maggiormente ad una variazione dell'uno o dell'altro fattore. In particolare, nel primo intervallo di tempo considerato è stata soprattutto la spesa previdenziale ad avere una dinamica più consistente, superiore di 2,7 punti percentuali rispetto alla crescita del PIL nominale. Nel secondo intervallo di tempo nella crescita del rapporto spesa/PIL gioca un ruolo maggiore la dinamica del PIL in valore corrente. Il tale periodo PIL e spesa previdenziale procedono con lo stesso ritmo di crescita garantendo una certa stabilità del rapporto. Nell'ultimo periodo considerato, la variazione pressoché nulla del PIL nominale, fortemente condizionata dagli effetti della crisi internazionale, ha comportato una rapida ripresa dell'incidenza della spesa pensionistica rispetto al PIL.

TAB. 11 Medie dei tassi annui di variazione del PIL e della Spesa per pensioni in valori correnti

	PIL (a)	Spesa per pensioni			
		Al lordo GIAS (b)	Al netto GIAS (c)	(b) - (a)	(c) - (a)
Media 1989 – 1997	6,5	9,2	9,7	2,7	3,2
Media 1998 – 2007	4,0	3,8	3,8	-0,2	-0,2
Media 2008 – 2010	0,0	3,4	3,7	3,4	3,7

Fonte: Rapporto del Nucleo di valutazione della Spesa Previdenziale (2012)

Se guardiamo ai dati al netto delle variazioni dei prezzi nel periodo 1989-1997 il PIL reale risulta essere cresciuto in media dell'1,4 per cento contro un incremento della spesa per pensioni del 4,4 per cento. Nel secondo periodo 1998-2007 il PIL a prezzi costanti è aumentato in media dell'1,6 per cento, mentre la spesa è aumentata in media in misura pari all'1,6 per cento, di molto inferiore al periodo precedente, grazie all'effetto delle riforme degli anni 90 e del primo decennio del duemila. Nell'ultimo triennio, la crisi economica ha fortemente influenzato negativamente la dinamica del PIL che in media si è ridotto dell'1,6 per cento contro una crescita relativamente contenuta della spesa per pensioni al netto delle variazioni dei prezzi (pari in media all'1,5 per cento). L'attuale crisi economica globale rischia quindi di offuscare gli sforzi normativi fatti negli ultimi due decenni aventi l'obiettivo di stabilizzare la spesa previdenziale rispetto al PIL.

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Numerical Methods for the Time of Ruin

Pietroluongo Mariafortuna

Abstract

In this paper we study the distribution of the time to ruin in the classical risk model. We employ the Gram-Charlier and Edgeworth series to approximate this distribution. We prove, by using numerical calculation methods, that the Edgeworth approximation gives better results. We also examine asymptotic behaviour of the moments of the time to ruin.

Keywords: Time of ruin; Ruin probability; Gram-Charlier and Edgeworth series; Asymptotic behaviour.

1. Introduction

A particular question of interest in classical ruin theory is the time of ruin. Identifying the distribution of the time to ruin is difficult since analytic expressions do not exist in most cases. In recent years, research in ruin theory has focused on moments of the time to ruin. There is an extensive literature on this subject: see for example Gerber and Shiu (1998), Lin and Willmot (1999 and 2000) and Dickson and Waters (2002). Further references can be found in the same papers. The aim of our paper is to obtain some approximate formulae for the distribution of the time to ruin by using classical methods of probability theory, Gram-Charlier and Edgeworth series. Subsequently, we deduce some asymptotic results for moments of the time to ruin.

In section 2, we introduce notation. In section 3, we show how the Gram-Charlier and Edgeworth series can be used to approximate the distribution of the time to ruin. In section 4, we illustrate asymptotic properties for moments of this distribution.

2. Notation

Consider the classical continuous time risk model, whereby the numbers of claims process $\{N_t; t \geq 0\}$ is a homogeneous Poisson process with intensity λ . The individual claims sizes $\{X_1, X_2, \dots\}$, independent of N_t , are an independent and identically distributed sequence of positive random variables with common distribution function

$$B(x) = \Pr\{X \leq x\} = 1 - \bar{B}(x)$$

and moments

$$m_j = \int_0^{+\infty} x^j dP(x) \quad \text{for } j = 1, 2, 3, \dots$$

The aggregate claims process is $\{S_t; t \geq 0\}$ where

$$S_t = X_1 + X_2 + \dots + X_{N_t}$$

with $S_t = 0$ if $N_t = 0$.

The insurer's surplus at time t , given an initial surplus u , is

$$U_t = u + ct - S_t$$

with

$$c = \lambda m(1 + \eta)$$

the insurer's premium income, received continuously at rate c per unit time, and $0 \leq \eta < 1$ the relative security loading.

The time of ruin T is the first time that the surplus becomes negative, so we define

$$T = \inf \{t : U(t) < 0\}$$

with $T = +\infty$ if $U(t) \geq 0$ for all $t > 0$.

The probability

$$\psi(u) = \Pr\{T < +\infty\}$$

is called the probability of ultimate ruin from initial surplus u . The probability of ruin by time t from initial surplus u is denoted $\psi(u, t)$ so that

$$(2.1) \quad \Omega(t) = \Pr\{T \leq t \mid T < +\infty\} = \frac{\psi(u, t)}{\psi(u)}$$

is the distribution function of the time to ruin given that ruin occurs. The moments of this distribution are

$$p_j = \int_0^{+\infty} x^j d\Omega(t) \quad \text{for } j = 1, 2, 3, \dots$$

3. Gram – Charlier and Edgeworth approximations

In this section we apply two classical methods for approximating distribution function when its moments are known.

We use the Gram-Charlier and Edgeworth series for the distribution of the time to ruin, given that ruin occurs. It should be possible also to make use of the Bowers or Esscher series, even if the second expansion requires identification of the moment generating function of T .

In the following numerical illustration the moments of $\Omega(t)$ are calculated using the formulae, developed by Lin and Willmot (2000), and numerical methods. In particular, for the integral over an infinite range, we have employed Gauss' formula (Conte, 2003).

If we denote Z as the standardized variable

$$Z = \frac{T - p_1}{\sigma}$$

with

$$\sigma = \sqrt{p_2 - p_1^2}$$

the standard deviation of T , it follows that

$$\Omega(\bar{t}) = \Pr\{Z \leq \bar{t}\} = \Omega\left(\frac{t - p_1}{\sigma}\right)$$

where

$$\bar{t} = \frac{t - p_1}{\sigma}$$

We can approximate $\Omega(t)$, by means of the Gram-Charlier series, as follows:

$$\Omega(\bar{t}) = \Phi(\bar{t}) - \frac{1}{3!} \frac{\mu_3}{\sigma^3} + \frac{1}{4!} \left(\frac{\mu_4}{\sigma^4} - 3 \right) \Phi^{(4)}(\bar{t}) + \frac{1}{5!} \left(-\frac{\mu_5}{\sigma^5} + 10 \frac{\mu_3}{\sigma^3} \right) \Phi^{(5)}(\bar{t}) + \dots$$

since

$$\Phi(\bar{t}) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\bar{t}} \exp\left(-\frac{v^2}{2}\right) dv$$

and where μ_k indicates the k -th central moments.

In the tables below we can compare the results obtained using the Gram-Charlier series (employing only the first two terms) with the exact values of $\Omega(t)$ when the individual claim amount distribution is exponential

$$B(x) = 1 - e^{-x}$$

with mean $m=1$. In this case the exact values are calculated using (2.1) where the ruin probability $\psi(u, t)$ is determined by the Arfwedson formula (Arfwedson, 1950).

Table 3.1

	$u = 20$		$u = 30$		$u = 40$	
t	Exact values	Gram Charlier approximation	Exact values	Gram Charlier approximation	Exact values	Gram Charlier approximation
10	0.002739	0.217400	0.000041	0.118600	0.0	0.062300
20	0.023057	0.244100	0.001224	0.135100	0.000039	0.072800
30	0.062481	0.271700	0.006542	0.152400	0.000430	0.084000
40	0.112617	0.299900	0.018155	0.170400	0.001924	0.095700
50	0.166679	0.328700	0.036282	0.189100	0.005413	0.108000
80	0.321596	0.416600	0.118576	0.248800	0.032919	0.148400
100	0.409311	0.475000	0.184484	0.291100	0.065388	0.177900
300	0.818143	0.829300	0.673851	0.694500	0.513568	0.530700
5000	1.0	1.0	1.0	1.0	1.0	1.0

Exponential claims, $\eta = 0.1$, Poisson parameter $\lambda = 1$.

Table 3.2

	$u = 20$		$u = 30$		$u = 40$	
t	Exact values	Gram Charlier approximation	Exact values	Gram Charlier approximation	Exact values	Gram Charlier approximation
10	0.009108	0.126600	0.000272	0.044800	0.0	0.008500
20	0.063924	0.184500	0.006285	0.074300	0.000385	0.023500
30	0.154223	0.249800	0.028414	0.109700	0.003429	0.042300
40	0.255178	0.320300	0.069545	0.150600	0.013051	0.065000
50	0.352803	0.393600	0.125622	0.196700	0.027421	0.091800
80	0.586510	0.602400	0.328363	0.357200	0.148603	0.196000
100	0.693759	0.709100	0.457019	0.470700	0.250932	0.281900
300	0.979578	0.982000	0.949215	0.920400	0.893468	0.868000
5000	0.998102	1.0	0.994807	1.0	0.978822	1.0

Exponential claims, $\eta = 0.2$, Poisson parameter $\lambda = 1$.

The tables show that this approximation is acceptable only when t is large.

Better results can be obtained by employing the Edgeworth series

$$\Omega(\bar{t}) = \Phi(\bar{t}) - \frac{1}{3!} \frac{\mu_3}{\sigma^3} \Phi^{(3)}(\bar{t}) + \frac{1}{4!} \left(\frac{\mu_4}{\sigma^4} - 3 \right) \Phi^{(4)}(\bar{t}) + \frac{10}{6!} \left(\frac{\mu_3}{\sigma^3} \right)^2 \Phi^{(6)}(\bar{t}) +$$

$$- \frac{1}{5!} \left(\frac{\mu_5}{\sigma^5} - 10 \frac{\mu_3}{\sigma^3} \right) \Phi^{(5)}(\bar{t}) - \frac{35}{7!} \frac{\mu_3}{\sigma^3} \left(\frac{\mu_4}{\sigma^4} - 3 \right) \Phi^{(7)}(\bar{t}) - \frac{280}{9!} \left(\frac{\mu_3}{\sigma^3} \right)^3 \Phi^{(9)}(\bar{t}) + \dots$$

where we have considered the terms up to the seventh inclusive.

Table 3.3

	$u = 20$		$u = 30$		$u = 40$	
t	Exact values	Edgeworth approximation	Exact values	Edgeworth approximation	Exact values	Edgeworth approximation
10	0.002739	*0.0	0.000041	*0.0	0.0	*0.0
20	0.023057	0.044103	0.001224	*0.0	0.000039	*0.0
30	0.062481	0.089792	0.006542	*0.0	0.000430	*0.0
40	0.112617	0.135894	0.018155	0.017326	0.001924	*0.0
50	0.166679	0.181848	0.036282	0.044406	0.005413	*0.0
80	0.321596	0.314050	0.118576	0.131617	0.032919	0.032601
100	0.409311	0.393892	0.184484	0.192477	0.065388	0.071958
300	0.818143	0.793772	0.673851	0.664809	0.513568	0.508658
5000	1.0	1.0	1.0	1.0	1.0	1.0

Exponential claims, $\eta = 0.1$, Poisson parameter $\lambda = 1$.

(*We set negative values of $\Omega(t)$ at equal zero)

Table 3.4

	$u = 20$		$u = 30$		$u = 40$	
t	Exact values	Edgeworth approximation	Exact values	Edgeworth approximation	Exact values	Edgeworth approximation
10	0.009108	*0.0	0.000272	*0.0	0.0	*0.0
20	0.063924	0.072504	0.006285	*0.0	0.000385	*0.0
30	0.154223	0.162237	0.028414	0.023249	0.003429	*0.0
40	0.255178	0.256842	0.069545	0.075569	0.013051	0.000020
50	0.352803	0.349805	0.125622	0.130282	0.027421	0.027421
80	0.586510	0.580849	0.328363	0.327495	0.148603	0.148603
100	0.693759	0.688094	0.457019	0.454731	0.250932	0.250932
300	0.979578	0.987118	0.949215	0.975144	0.893468	0.893468
500	0.998102	0.999732	0.994807	0.986817	0.978822	0.978822

Exponential claims, $\eta = 0.2$, Poisson parameter $\lambda = 1$.

(*We set negative values of $\Omega(t)$ at equal zero)

Each of the above tables, related to the exponential case, suggest that the Edgeworth approximation should give a good approximation. It is well-known that we can approximate the surplus process $U(t)$ by a Brownian motion process (or a Wiener process). In this case the conditional distribution of the time to ruin, given that ruin occurs, is Inverse Gaussian

$$\Omega(\bar{t}) = \exp\left(\frac{2m}{m_2} \eta u\right) \Phi(u_3) + \Phi(u_4)$$

with

$$u_3 = -\frac{u + \eta \lambda t m}{\sqrt{\lambda t m_2}} \qquad u_4 = -\frac{u - \eta \lambda t m}{\sqrt{\lambda t m_2}}$$

The following numerical illustrations show that the Edgeworth approximation, for most values of t , gives better results than Brownian approximation. Moreover, the Edgeworth approximation could be improved while this is not possible in the Brownian case.

Table 3.5

	$u = 20$			$u = 40$		
t	Exact values	Edgeworth approxim.	Brownian approxim.	Exact values	Edgeworth approxim.	Brownian approxim.
10	0.002739	*0.0	0.000020	0.0	*0.0	0.0
20	0.023057	0.044103	0.004076	0.000039	*0.0	0.0
30	0.062481	0.089792	0.025121	0.000430	*0.0	0.000001
50	0.166679	0.181848	0.112691	0.005413	*0.0	0.000418
80	0.321596	0.314050	0.270614	0.032919	0.032601	0.009741
100	0.409311	0.393892	0.364975	0.065388	0.071958	0.028057
300	0.818143	0.793772	0.810768	0.513568	0.508658	0.458023
500	0.928441	0.930058	0.927832	0.770527	0.764985	0.744925
2000	0.999578	1.0	0.999650	0.998231	0.999765	0.998329
5000	1.0	1.0	0.999999	1.0	1.0	0.999999

Exponential claims, $\eta = 0.1$, Poisson parameter $\lambda = 1$.

(*We set negative values of $\Omega(t)$ at equal zero)

Table 3.6

	$u = 20$			$u = 40$		
t	Exact values	Edgeworth approxim.	Brownian approxim.	Exact values	Edgeworth approxim.	Brownian approxim.
10	0.009108	*0.0	0.000052	0.0	*0.0	0.0
20	0.063924	0.072504	0.009741	0.000385	*0.0	0.0
30	0.154223	0.162237	0.056893	0.003429	*0.0	0.000009
40	0.255178	0.256842	0.137496	0.013051	0.000020	0.000293
50	0.352803	0.349805	0.232357	0.032190	0.027421	0.002204
80	0.586510	0.580849	0.496755	0.145978	0.148603	0.043119
100	0.693759	0.688094	0.627698	0.250173	0.250932	0.111575
300	0.979578	0.987118	0.978543	0.896400	0.893468	0.859303

500	0.998102	0.999732	0.998329	0.988013	0.978822	0.985340
1000	0.999991	1.0	0.999995	0.999935	1.0	0.999946
2000	1.0	1.0	1.0	1.0	1.0	1.0

Exponential claims, $\eta = 0.2$, Poisson parameter $\lambda = 1$. (*We set negative values of $\Omega(t)$ at equal zero)

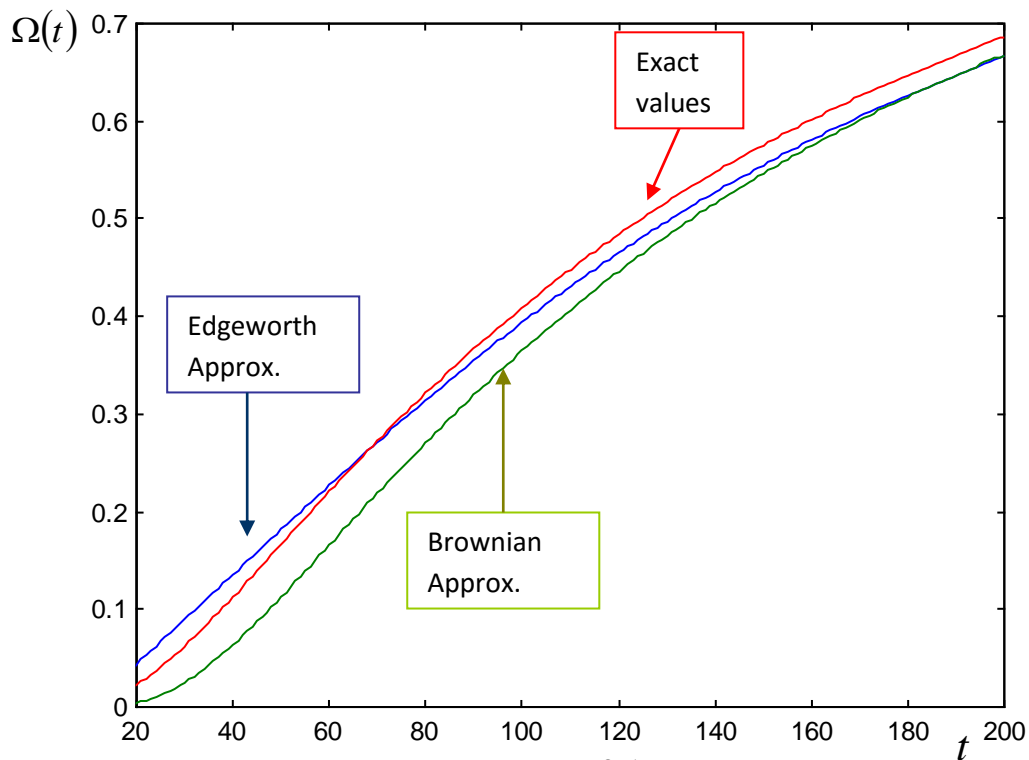


Figure 3.1: Exponential claims, $u=20$, $\eta=0.1$.

4.1 Moment approximation and asymptotic results

In this section we make some observations about the moments of $\Omega(t)$ when Lundberg's asymptotic formula holds. We consider the formula for the k -th moment

$$(4.1) \quad E[T^k] = \frac{\psi_k(u)}{\psi(u)} \quad \text{for } k = 1, 2, 3, \dots$$

obtained by Lin and Willmot (2000) where

$$(4.2) \quad \psi_1(u) = \int_0^u \psi_1(u-x)\beta(x)dx + \frac{1}{c} \int_u^{+\infty} \psi(x)dx$$

with

$$\beta(x) = \frac{1-B(x)}{m(1+\eta)}$$

Substituting Lundberg's asymptotic formula

$$(4.3) \quad \psi(u) \sim Le^{-Ru} \quad (u \rightarrow +\infty)$$

with

$$L = \frac{m\eta}{R \int_0^{+\infty} xe^{Rx}(1-B(x))dx}$$

and R , the adjustment coefficient, solution of the equation

$$(4.4) \quad \int_0^{+\infty} e^{Rx}(1-B(x))dx = m(1+\eta)$$

we have

$$\frac{cR}{L} \psi_1(u)e^{Ru} \cong \frac{cR}{L} e^{Ru} \int_0^u \psi_1(u-x)\beta(x)dx + 1$$

or

$$(4.5) \quad v(u) \cong \int_0^u v(u-x)e^{Rx}\beta(x)dx + 1$$

where

$$(4.6) \quad v(u) = \frac{cR}{L} \psi_1(u)e^{Ru}$$

Applying the iterative method (the same method to obtain the Neumann series) to solve the (4.5) it follows

$$v_1(u) = 1$$

$$v_2(u) = 1 + \int_0^u e^{Rx} \beta(x) dx = 1 + \beta_1(u)$$

and observing that

$$\lim_{u \rightarrow +\infty} \beta_1(u) = 1$$

for (4.4), we deduce

$$\lim_{u \rightarrow +\infty} v_2(u) = 2$$

Similarly, from

$$v_3(u) = 1 + \int_0^u e^{Rx} \beta(x) dx + \int_0^u e^{Rx} \beta(x) \beta_1(u-x) dx = 1 + \beta_1(u) + \beta_2(u)$$

we have

$$\lim_{u \rightarrow +\infty} v_3(u) = 3$$

If we generalize this procedure, we infer

$$v_n(u) \sim u \quad (u \rightarrow +\infty)$$

This asymptotic result suggests the following approximation for the solution $v(u)$

$$(4.7) \quad v(u) \cong u$$

and from this formula we get

$$(4.8) \quad \psi_1(u) \cong \frac{L}{cR} e^{-Ru} u$$

which, using (4.2) and (4.6), involves the following approximation for the first moment

$$(4.9) \quad E[T] \cong \frac{u}{cR}$$

It is possible to verify the relation (4.7) substituting it in (4.5). In this case we have

$$u \cong \int_0^u (u-x)e^{Rx} \beta(x) dx + 1 \cong u \int_0^u e^{Rx} \beta(x) dx + 1 \quad (u \rightarrow +\infty)$$

and, consequently, for large values of u

$$u \cong u + 1$$

The same result could be deduced substituting the (4.8) in (4.2).

We can also obtain a different approximation employing the Lin and Willmot (2000, formula (6.23)) formula

$$(4.10) \quad \psi_1(u) = \frac{1}{\lambda m \eta} \left(\int_0^u \psi(u-x) \nu(x) dx + \int_u^{+\infty} \psi(x) dx - \frac{m_2}{2m\eta} \psi(u) \right)$$

where we have to calculate the second integral, which is generally unknown. Substituting the (4.3) it follows that

$$(4.11) \quad \psi_1(u) = \frac{L e^{-Ru}}{\lambda m \eta} \left[Lu + \frac{1}{R} - \frac{m_2}{2m\eta} \right]$$

and, by (4.1)

$$(4.12) \quad E[T] = \frac{1}{\lambda m \eta} \left[Lu + \frac{1}{R} - \frac{m_2}{2m\eta} \right]$$

In the following tables we report the approximate values from (4.9), (4.12) and the exact values of the first moment. In particular we consider two different distribution of claim amount: the tables (4.1) and (4.2) are related to the exponential distribution

$$B(x) = 1 - e^{-x}$$

(with mean $m=1$), while the tables (4.3) and (4.4) are related to the Erlang(2) distribution

$$B(x) = 1 - (1 + x)e^{-x}$$

(with mean $m=2$). The exact values are calculated by numerical integration of (4.10). We also give the results obtained from

$$(4.13) \quad E[T] \cong \frac{u}{\lambda m \eta}$$

which derives from Brownian approximation (see Dickson and Waters, 2002).

Table 4.1

u	Exact values	Brownian Approximation	Approximation (4.9)	Approximation (4.12)
5	55.45	50.0	50.0	55.45
10	100.91	100.0	100.0	100.91
15	146.36	150.0	150.0	146.36
20	191.82	200.0	200.0	191.82
30	282.73	300.0	300.0	282.73
40	373.64	400.0	400.0	373.64
50	464.54	500.0	500.0	464.54

Exponential claims, $\eta = 0.1$, Poisson parameter $\lambda = 1$.

Table 4.2

u	Exact values	Brownian Approximation	Approximation (4.9)	Approximation (4.12)
5	25.83	25.0	25.0	25.83
10	46.67	50.0	50.0	46.67
15	67.50	75.0	75.0	67.50
20	88.33	100.0	100.0	88.33
30	130.00	150.0	150.0	130.00
40	171.67	200.0	200.0	171.67
50	213.33	250.0	250.0	213.33

Exponential claims, $\eta = 0.2$, Poisson parameter $\lambda = 1$.

We note that in the tables (4.1) and (4.2), for an exponential distribution, the (4.9) and (4.13) approximation agree, while the (4.12) formula corresponds to the exact value. Moreover, the tables (4.3) and (4.4) below show that, for an Erlang(2) distribution, the approximation (4.12) gives better result than the Brownian approximation.

Table 4.3

u	Exact values	Brownian Approximation	Approximation (4.9)	Approximation (4.12)
5	29.54	25.0	37.10	29.61
10	52.52	50.0	74.21	52.59
15	75.50	75.0	111.31	75.57
20	98.48	100.0	148.42	98.55
30	144.43	150.0	222.63	144.51
40	190.40	200.0	296.84	190.47
50	236.36	250.0	371.05	236.43

Erlang(2) claims, $\eta = 0.1$, Poisson parameter $\lambda = 1$

Table 4.4

u	Exact values	Brownian Approximation	Approximation (4.9)	Approximation (4.12)
5	13.88	12.5	18.37	13.95
10	24.53	25.0	36.75	24.59
15	35.17	37.5	55.12	35.24
20	45.82	50.0	73.50	45.89
30	67.11	75.0	110.25	67.18
40	88.41	100.0	146.99	88.48
50	109.70	125.0	183.74	109.77

Erlang(2) claims, $\eta = 0.2$, Poisson parameter $\lambda = 1$

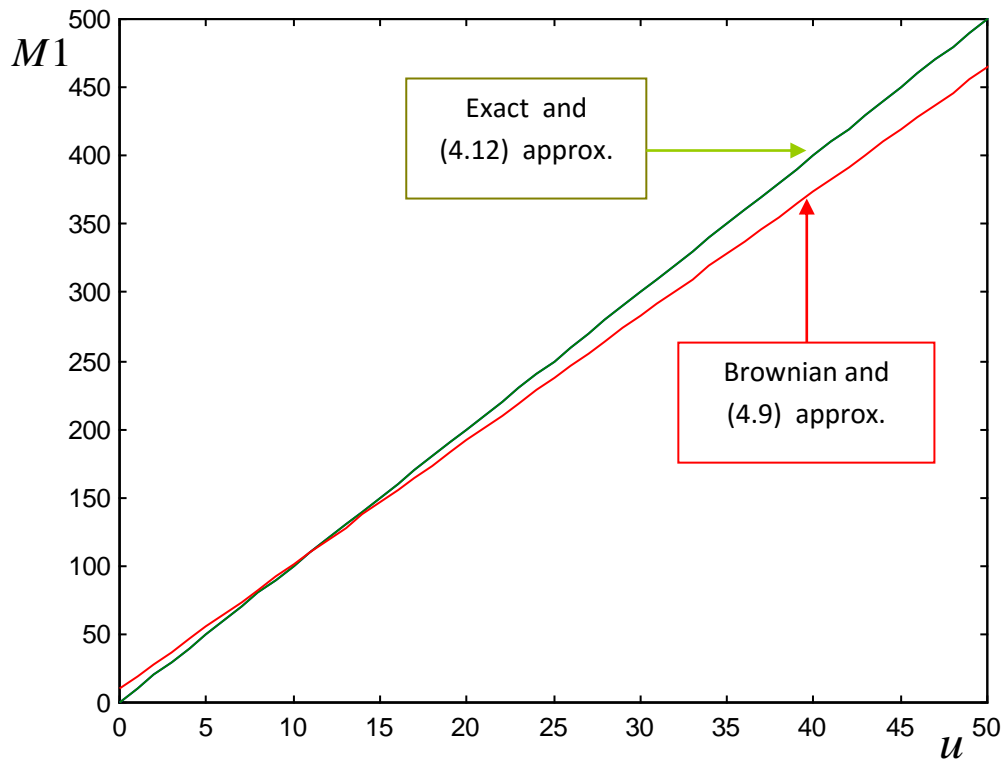


Figure 4.1: First moment, exponential claims, $\eta=0.1$.

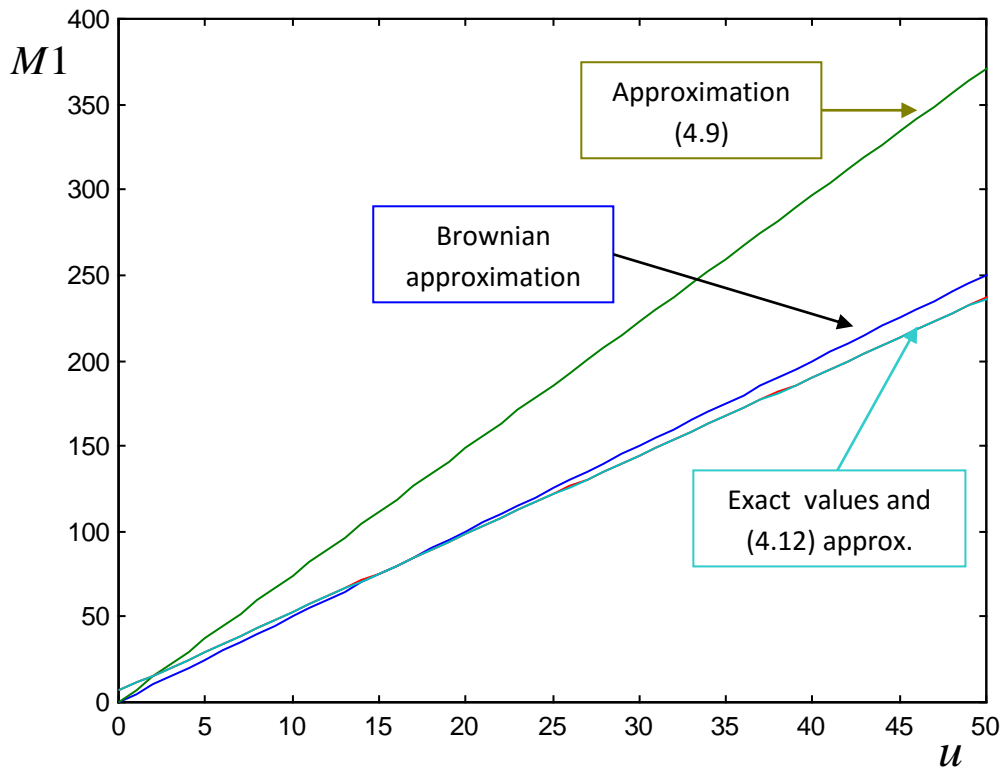


Figure 4.2: First moment, Erlang(2) claims, $\eta = 0.1$

If we consider the formula

$$\psi_2(u) = \int_0^u \psi_2(u-x)\beta(x)dx + \frac{2}{c} \int_u^{+\infty} \psi_1(x)dx$$

we can obtain an approximation value for the second moment. Substituting the (4.8) relation and using the same method employed before we have

$$\psi_2(u) \cong \frac{2L}{c^2 R} e^{-Ru} u^2$$

and consequently from (4.1)

$$(4.14) \quad E[T^2] \cong \frac{2}{c^2 R} u^2$$

Similarly, using the Lin and Willmot (2000, formula (6.29)) formula

$$(4.15) \quad \psi_2(u) = \frac{2}{\lambda m \eta} \left(\int_0^u \psi(u-x) \psi_1(x) dx + \int_u^{+\infty} \psi_1(x) dx - \psi(u) \int_0^{+\infty} \psi_1(x) dx \right)$$

and substituting the (4.11) we deduce the following approximation

$$(4.16) \quad E[T^2] = \frac{2}{\lambda^2 m^2 \eta^2} \left[\frac{L}{2} u^2 + L^2 \left(\frac{2}{R} - \frac{m_2}{2m\eta} \right) u + \frac{L}{R} \frac{m_2}{2m\eta} (L-1) + \frac{L}{R^2} (1-L^2) \right]$$

whereas, by substituting the (4.8), we can obtain another approximation

$$(4.17) \quad E[T^2] = \frac{2}{\lambda m \eta} \frac{1}{cR} \left[\frac{L}{2} u^2 + \frac{u}{R} + \frac{1-L}{R^2} \right]$$

In the tables below we report the approximate values from (4.16), (4.17) and exact values of the second moment when the claim amount distribution is exponential (with mean $m=1$) and Erlang(2) (with mean $m=2$). In these cases the exact values are calculated by numerical integration of (4.15). We also give the results obtained from

$$(4.18) \quad E[T^2] \cong \frac{u m_2}{\lambda^2 \eta^3 m^3} + (E[T])^2$$

that derives from Brownian approximation.

Table 4.5

u	Exact values	Brownian Approximation	Approximation (4.16)	Approximation (4.17)
5	15175.21	13074.70	14190.08	15472.73
10	32282.64	30182.83	30925.62	33290.91
15	53522.31	51421.25	52206.61	55654.54
20	78894.21	76829.45	78033.06	82563.64
30	142034.71	139936.25	143322.31	150018.18
40	221704.13	219606.85	226793.39	235654.54
50	317902.48	315806.70	328446.28	339472.73

Exponential claims, $\eta = 0.1$, Poisson parameter $\lambda = 1$.

Table 4.6

u	Exact values	Brownian Approximation	Approximation (4.16)	Approximation (4.17)
5	2192.36	1917.19	1986.11	2320.83
10	4952.78	4678.09	4763.89	5383.33
15	8581.25	8306.25	8583.33	9487.50
20	13077.78	12784.53	13444.44	14633.33
30	24675.00	24400.00	26291.67	28.50.00
40	39744.44	39470.59	43305.55	45633.33
50	58286.11	58009.69	64486.11	67383.33

Exponential claims, $\eta = 0.2$, Poisson parameter $\lambda = 1$.

Table 4.7

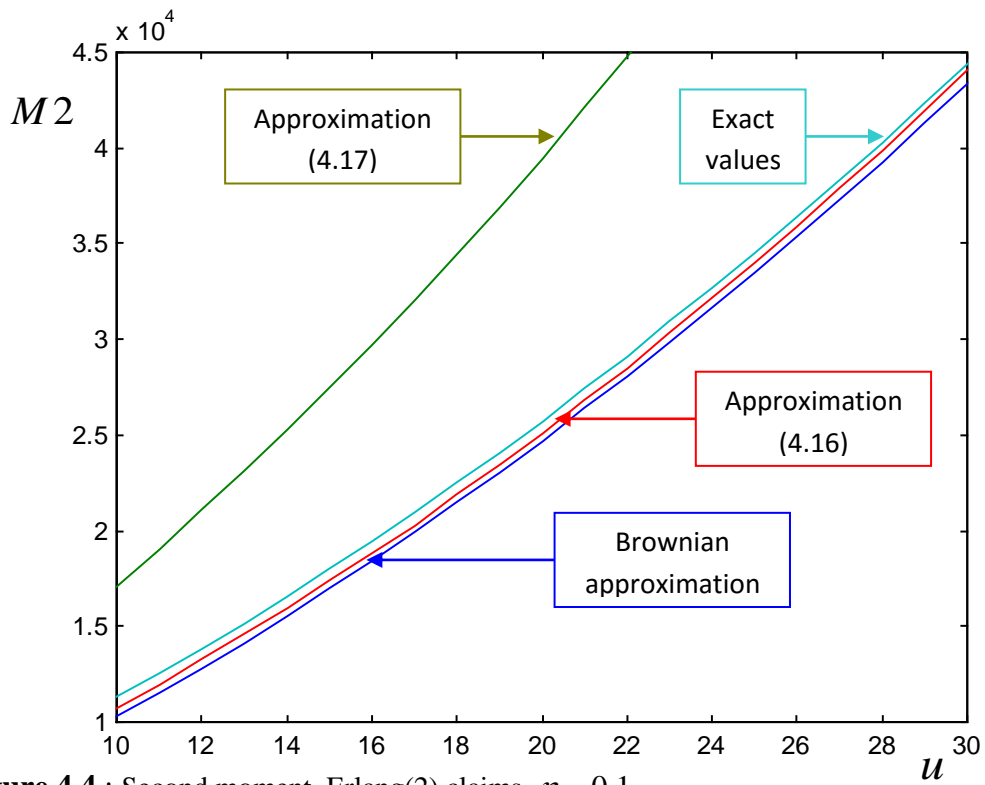
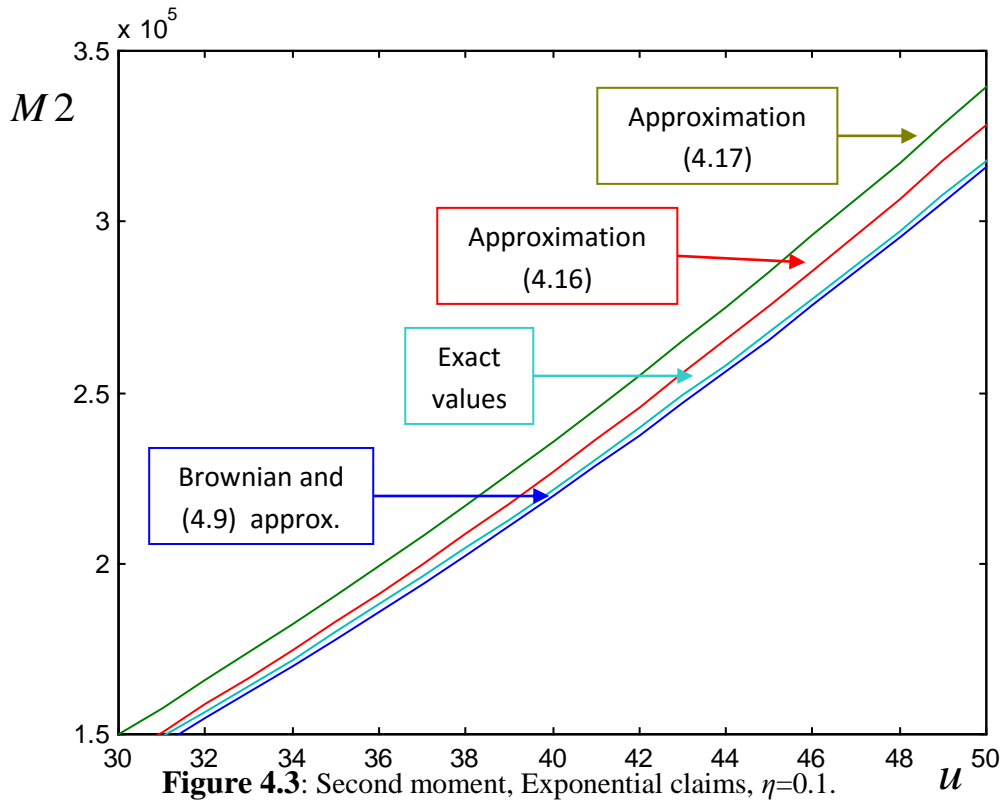
u	Exact values	Brownian Approximation	Approximation (4.16)	Approximation (4.17)
5	5656.37	4622.61	5293.57	8509.11
10	11291.97	10258.35	10745.70	17124.98
15	17983.85	16950.25	17346.81	27446.18
20	25731.85	24698.31	25096.90	39472.70
30	44396.21	43362.91	44044.03	68641.71
40	67285.06	66252.16	67587.07	104632.01
50	94398.40	93366.05	95726.04	147443.61

Erlang(2) claims, $\eta = 0.1$, Poisson parameter $\lambda = 1$

Table 4.8

u	Exact values	Brownian Approximation	Approximation (4.16)	Approximation (4.17)
5	794.89	661.40	715.82	1217.76
10	1672.57	1538.73	1574.89	2614.97
15	2777.02	2643.18	2700.16	4403.47
20	4108.21	3974.47	4091.61	6583.25
30	7450.74	7316.25	7673.08	12116.66
40	11700.31	11566.33	12319.29	19215.20
50	16856.77	16721.59	18030.25	27878.87

Erlang(2) claims, $\eta = 0.2$, Poisson parameter $\lambda = 1$.



Of course the formulae (4.16) and (4.17), but also (4.9) and (4.12), could be applied for any distribution, always if Lundberg asymptotic result holds. The advantage of these formulae is their simple form and proof.

The formulae (4.16) and (4.17), according to (4.14), show that the second moment and u^2 are of the same order of magnitude ($u \rightarrow +\infty$). If we want generalize this result we can prove that, for the first values of k , the order of magnitude of the k -th moments is the same as u^k

$$(4.19) \quad E[T^k] \cong H_k u^k$$

where H_k depends on some parameters like η , λ , m , R and k .

We wish to give further details about this result in a next paper.

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