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Determinant Factors Affecting the Performance of Health Services of the Community Health Service Centre in Indonesia

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Abstract:

Recent studies advance in the public health literatures that examining determinant factors affecting the performance of the Community Health Service Centers in Indonesia have been limited. For this reason, this study aims at examining leadership commitment, health facilities, human resource quality and community participation are the significant factors determining the performance of health services of the community health center in Indonesia. The number of sample selected using probability sampling method was 350 respondents. The statistical method used was Multiple Regression Analysis.

The study found that leadership commitment, health facilities, human resource quality and community participation were significantly as determinant factors the performance of health services at the Community Health Service Center in Indonesia. Of these four variables, however, leadership commitment and health facilities were found to have greater effects on the performance of health services at the Community Health Service Centers. These suggest that serious attentions to improve these four factors are a must. If not, the performance of health services at the Community Health Services Center will not be effective. Thus, much remain to be done by the regional government as well as by the central government of Indonesia.

Keywords: leadership commitment; health facilities; human resource quality; community participation; performance of health services; community health services center.

JEL Classification: I11; I13; I15; I18.

Introduction

In the era of globalization today, any organizations or institutions are required to make adjustments in all matters. Of the many organizations, the Community Health Service Center or locally called as Puskesmas is one of the public organizations that needs to improve the performance of the quality of health services. The importance of the improvement of health services is partly to attain a higher community satisfaction index as a benchmark for assessing the quality of community health service center. This can be done in the forms of the improvement of leadership commitment, health facilities, human resource quality and community participation to name just a few factors.

The importance of leadership commitment, for instance, is to develop and empower all organizational resources to achieve goals, and to create a conducive and working atmosphere. By having leadership commitment, the organization can be well-managed and able to achieve the organizational goals. According to Davis (2010), there are four main characteristics of leadership success in organizations, namely: intelligence; social maturity and broad social relations; self motivation and encouragement of achievement; human relations attitudes. The importance of leadership commitment in improving the health service performance of the Community Health Service Centre is simply because the Community Health Center (Puskesmas) has a strategic role in improving the health of the community. This condition will further improve the productivity of the community. For this reason, the Community Health Service Center (Puskesmas) is required to provide quality services, satisfy their patients in accordance with the established standards operation procedure and can reach all levels of society (Ministry of Health 2014).

The present condition of the performance of health services given by the community health services center, however, is still far from the communities' expectations. Complaints that are often heard from the public relate to the quality of government apparatus, rigid bureaucracy, unfriendly behavior of the officials, and low performance of employees in providing better services (Ambar *et al.* 2013). Due to these reasons, this study aims at determining factors affecting the Performance of Health Services, by taking into account the Community Health Service Center in Bogor District as a case study. By taking this study, it is expected the government is able to formulate better policy solution to improve the performance of health services of the Community Health Service Center in Indonesia in general and in Bogor District in particular.

However, before the results of the study are given, section 1 will review relevant studies advanced in literatures on this subject. This is followed by the data collection method and method of analysis used the study in Section 2. Section 3 highlights and discusses the results of the study. Finally, concluding remarks are drawn.

1. Literature Review

The effect of leadership commitment on the performance of health services has been advanced in the literature. Kartono (2004) among others confirmed that leadership commitment was important factor in affecting the performance of health services. This is because leader is a person who has skills and strengths at least in one field, so as she/he is able to affect others to carry out certain activities in order to achieve one or several goals. There are three elements that become role models in leadership, namely, a group of people, power, influence, and the ability to use those three elements and recognize that abilities are related to values (Bangun 2008). Whilst commitment, according to Tjokroamidjojo (2001) is a situation where someone wants to unite in a "suitable" position, even though sometimes it is contrary to his/her conscience. When someone makes a commitment with the public, there is a tendency to be more extreme on himself and think about the design implications of the behavior that he/she wants to display. This means that commitment makes people more responsive and has messages that contain hopes of a positive reputation for themselves. In other words, there is a desire to get more confidence in the opinions of different people.

Further, Aranya and Ferris (2004) define leadership commitment is an agreement or attachment to doing something best in a particular organization or group. There are ten leadership commitments expected from each leader, namely, (1) Looking for Challenging Opportunities, (2) Daring to Try and Willing to Take the Risks, (3) Leading the Future, (4) Fostering Equality of Vision, (5) Raising Collaboration, (6) Strengthening Partners, (7) Demonstrating Exemplary, (8) Planning for Gradual Success, (9) Respecting Each Individual's Role, and (10) Appreciating every success. These suggest that leadership commitment will greatly influence health service performance.

In terms the effect of facilities and infrastructures, Hamalik (2003) defines facilities and infrastructure are all intermediary forms used by people to spread ideas, so that the idea can reach the recipient. Infrastructure in this case is related to access that is supportive and is an inseparable component of the implementation of regional autonomy in the field of infrastructure. Also, it includes access that supports efforts to improve performance and access related to policies and programs that will be pursued by the governments to meet resource needs by human beings reliably, professionally and adequately.

Some principles that must be given attention in managing facilities and infrastructure in the Community Health Service Center (Puskesmas) include: Principles of achieving goals; Principles of efficiency; Administrative principles; Principle of similarity.

While the purpose of management of health service facilities is:

- to strive for the provision of health service facilities and infrastructure through careful planning and careful procurement systems, so that health services center will have good facilities and infrastructure, in accordance with health service needs, and with efficient funds;
- to strive for the use of facilities and infrastructure services properly and efficiently;
- to keep maintaining health service facilities and infrastructures, so that they are always ready to be used.

The effect of human resources quality on the performance of health services has also been advanced in the literature. According to Lukman (2000), quality is anything that is capable of meeting customer needs or needs (meeting the needs of customers). Whilst Silalahi (2000) defined resource management includes planning to prevent excessive use of labor or below the level of labor utilization to achieve optimization of development work to ensure sufficient labor reserves that are skilled in interpersonal relations to ensure effective activities and industrial relations to realize participatory management and semi-trained utilization.

Furthermore, Hasibuan (2001) defined the development of human resources as an effort to improve the ability of technical, theoretical, conceptual and moral of individual in accordance with the needs of work / position through education and training. According to Bambang Wahyudi (2001), the steps that must be taken in carrying out the development of human resources begin with an assessment of the work performance of each individual in theorganization, so that itwill be knownwith certainty of the qualityofhuman resourcesheld foracertain period. By appraising the performance of individual works, the possibility of developing human resources in the education and training program can be known, as well as through career development programs. In addition to that,Moenir(2000)suggests that qualitycanalsobeinterpreted asconformity with requirements,conformitywith the user or free from damage/defects. Hence, by having quality of human resources, the performance of health services can be improved.

Finally, Siagian (2001) defined participation in principle has the same meaning and connotation with participation, namely taking part or role in it. Whereas, according to Mardiasmo (2002), community participation is defined as processes, methods, means for citizens, especially the poor and marginal groups to be involved and contribute to controlling resources (allocation) through various public policy making processes that directly affect their lives.

However, in terms of the benefit of community participation, Indra (2003) argues there are three benefits of community participation in policy making, namely:

- the creation of better publicpolicies;
- increased citizen trust in the executive and legislative branches;
- resource efficiency.

The main purpose of participation, according to Muhadjir (2004), is to bring together all the same and different interests in a process of formulating and determining policies (decisions) proportionally to all parties involved and affected by the policy that will be determined in it. The involvement of the public in the process of determining policy is an effective way to accommodate various diverse interests. Public participation manifested in participatory planning can bring substantial benefits. This is because public decisions taken will provide a sense of satisfaction and strong public support for a development process. Therefore, community participation is very importantfactorinimprovingthequalityofservice. Thisisbecausecommunity participationaimstobringtogether all the same and different interests in a process of formulating and determining policies proportionately to all parties involved and affected by the policy that will be determined in it.

2. Methodology

This study used explanatory quantitative approaches. Method used to collect the data was by undertaking field observation, interview and by distributing questionnaires to the sample respondents. In addition to the above primary data, the secondary data was collected by using web search and other relevant literature. The sample was chosen by applying a stratified proportional random sampling technique. The number of sample collected using Slovin formula was 350 respondents. These respondents included the staff of the community health service center, patient families and communities around the community health service center (Puskemas). The field survey was conducted in Bogor District, West Java Province as this region was considered representative to represent the health service centre in Indonesia. The data collected was then analyzed by using the multiple regression analysis. The variables under estimation was the performance of health services as the dependent variable (Y), while the independent variables were leadership commitment (X1), health facilities (X2), Quality of Human resources (X3) and Community participation (X4).

The model can be written statistically as:

$$Y = a + b1\,X1 + b2\,X2 + b3\,X3 + b4\,X4 + e \quad (1)$$

where Y = the performance of health services; X1 = leadership commitment; X2 = Health facilities; X3 = quality of human resources; X4 = Community participation; a = intercept; b1... b4 = coefficients; e = error terms.

3. Results

3.1. Validity and reliability tests

It should be noted that before the above model was estimated partially and jointly, both validity and reliability of the indicators of all variables were tested. The validity of indicators were tested by examining whether or not the value of r calculated is greater than r table. While the reliability of indicators of all variables were tested by examining whether or not the alpha Cronbach is greater than *r* table.

The study found that all indicators of leadership commitment, for instance, are valid because the value of r counted was greater than *r* table. Statement of indicator with the highest value of validity was the fifth statement of planning indicator (0.640), followed by the thirteenth statement of cooperation indicator (0.633) and the fourteenth statement of success indicators (0.620). This means that these indicators have a dominant influence on Health Service Performance (Y). The lowest value of validity is the sixth statement of situation indicator with a validity value of 0.252. This means that special attention is needed to the situation indicators. In terms of the reliability test, all indicators were found to be reliable since the alpha Cronbach (α) is greater than *r* table.

For indicators of the health facility, the result of the validity test of all indicators are also valid since the value of *r* counted is greater than *r* table. The statement with the highest validity value is the fifth statement of the certification indicator (0.637), followed by the fifteenth statement of treatment (0.617) and the fourteen statement of usage indicators (0.616). This means that these indicators have a dominant influence on health service performance (Y). The lowest value of validity is the sixth statement of the indicator of sanitation of space and building with a validity value of (0.216). This means that special attention is needed to these indicators of sanitation of space and buildings. The reliability test of all indicators are reliable because of the value of alpha Cronbach (α) is greater than *r* table (0.720 > 0.1044).

Further, in terms of human resources quality, the results of the validity test of all indicators were valid because the value of *r* counted was greater than *r* table. The statement with the highest value of validity is the fifth statement of the indicators of self-development (0.640), thirteenth statement of the indicators of job description (0.635), and the fourteenth statements of the indicators of participation (0.620). This means that these indicators have a dominant influence on health service performance (Y). The lowest value of validity is the sixth statements of the exemplary indicator with a validity value of (0.252). This means that special attention is needed to the exemplary indicators. However, the reliability test confirmed that all indicators are reliable as the value of alpha Cronbach (α) was greater than *r* table (0.720> 0.1044).

Also, for community participation, the results of the validity test of all indicators are valid because the value of *r* count is greater than *r* table. Statement with the highest value of validity was the fifth statement of the indicator of identifying and making priority scale (0.638), followed by the thirteenth statements of creating policy indicator (0.623), and the fifteenth statement of indicators of efficiency (0.618). Again, this means that these indicators have a dominant influence on health service performance (Y). The lowest value of validity is the sixth statements of the indicator of developing and provides a response with a validity value of (0.245). This means that special attention is needed to indicators of developing and providing responses. In terms of the reliability test, all indicators are reliable because of alpha Cronbach (α) was greater than *r* table (0.720> 0.1044).

3.2. Ordinary Least Square (OLS) assumptions tests

Like many statistical analysis, Ordinary Least Square (OLS) regression has underlying assumptions. These assumptions should not be violated to produce the best estimate. However, if some of these assumptions are violated there is a need to employ remedial measure or use other estimation methods to improve the results. These assumptions are the assumption of linearity, homoscedasticity, no auto correlation, normality of errors, and multicollinearity. Of these assumptions, there are four assumptions are examined excluding the assumption of independence (no autocorrelation) as the data collected in the study was not time series data.

The above OLS assumptions were examined. The study confirmed that there was no violation toward the assumptions. In terms of the normality errors assumption, for instance, by using Kolmogorov-Smirnov test it was found that there is a significance value of leadership commitment (X_1) to the performance of health services (Y) since the value was 0.250 greater than 0.05. Similarly, the health facility (X_2) also significantly affect the

performance of health services (Y) with the value of 0.396 > 0.05. Also, for the influence of the quality of human resources (X_3) on the performance of health services (Y) with the value of 0.246 > 0.05 and for the community participation (X_4) against the performance of health services (Y) with the value of 0.390 > 0.05. In other words, the four independent variables were found to have normal distribution (Table 1).

Table 1. Normality test of the variables

One-Sample Kolmogorov-Smirnov Test						
		X_1	X_2	X_3	X_4	X_1, X_2, X_3, X_4
N		350	350	350	350	350
Normal Parameters [a,b]	Mean	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
	Std. Deviations	1.51049495	1.35367317	1.51071156	1.34949563	1.34916148
Most Extreme Differences	Absolute	0.250	0.396	0.246	0.390	0.388
	Positive	0.250	0.396	0.246	0.390	0.388
	Negative	0.156	0.310	0.155	0.306	0.306
Test Statistic		0.250	0.396	0.246	0.390	0.388
Asymp. Sig. (2-tailed)		0.000	0.000	0.000	0.000	0.000

Note: [a] Test distribution is Normal; [b] Calculated from data; leadership commitment (X_1); health facility (X_2); quality of human resources (X_3), community participation (X_4),
Source: Estimated from the data collected

3.3. Model estimation and hypothesestesting

As there were no violations toward the OLS assumptions, the results of the model were shown at Table 2. As can be seen from this Table, at least there are three independent variables that partly affected significantly the dependent variable. These three independent variables are the leadership commitment, health facilities and quality of human resources, while the community participation was found to be insignificantly affected the performance of health services. The significant effects of the variables of leadership commitment, health facilities and the quality of human resources on the health service performance were seen from both the estimated *t* values as well as from the probability Alpha value. The *t* values of these three independent variables were greater that the *t* values in the statistical table of 1.960. Also, in terms of the probability values, these three independent variables have probability values less than 5%. These indicate that the null hypothesis that said that leadership commitment, health facilities and the quality of human resources have no partly effects on the performance of health services were rejected. In other words, each of these three variables has significant effect on the performance of health services.

Unlike the three independent variables above, the independent variable of community participation has no significant effect on the performance of health services. This was shown from the estimated t value and the probability value. The t value of this variable was less than the *t* table. Similarly, the probability value of this independent variable was than 5% (Table 2). This suggests that the null hypothesis that stated the community participation has no partly effect on the health performance were accepted.

However, in terms of the jointly effects of the four independent variables, the study found that the four independent variables have significant effects on the performance of health services. This was shown from the estimated F value which is greater than *F* table. Also, in terms of the *F* probability value it was less than 5% (Table3). This indicates that all the four independent variables jointly have significant effects on the health service performance. Thus, this indicates that the leadership commitment, health facilities, quality and human resources and the community participation have significant roles in improving the health service performance at the Community Health Services Center in Bogor Regency.

Table 2. The estimated regression results

Model		Unstandardized coefficients		Standardized coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.956	0.865		2.262	0.024
	Leadership commitment (X_1)	0.266	0.043	0.260	6.124	0.000
	Health facilities (X_2)	0.474	0.236	0.486	2.011	0.045
	Quality of human resources (X_3)	-0.191	-0.097	0.195	-1.970	-0.044
	Community participation (X_4)	0.422	0.219	0.433	1.924	0.065

Note: a. Dependent Variable: Health services performance (Y)
Source: Output SPSS 25 from data collected.

Table 3. ANOVA Test

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	6845.533	4	1711.383	1331.225	.000[b]
	Residual	443.522	345	1.286		
	Total	7289.054	349			

Note: a. Dependent Variable: The performance of health services (Y); b. Predictors: (Constant), community participation (X_4), quality of human resources (X_3), Health facility (X_2), and leadership commitment (X_1).

Source: Estimated from the survey data collected

In terms of the estimated regression model, as can be seen at Table 2 the estimated regression model is as follows:

$$\hat{Y}=1.956+0.266X_1+0.474X_2-0.191X_3+0.422X_4 \quad (2)$$

From this regression model, it can be seen that health facilities have the largest coefficient, followed by community participation, leadership commitment and the quality of human resources. However, of these four variables, community participation as mentioned previously has no significant effect on the performance of health services. This is shown from the estimated *t* value which less than the value of *t* table. Also, it is from the probability value which is greater than 5%. The meaning of the coefficient of health facilities of 0.474 was that for every changes of 1 unit of health facilities, it will change the health services performance by 0.474. Similarly, for every changes of 1 unit of community participation and leadership commitment, there will be changes on the health services performance by 0.422 and 0.266 respectively. However, changes of 1 unit ofthe quality of human resources will adversely or negatively changes the health service performance by 0.191. The adverse effect of the quality of human resources on the health services performance may be due to the fact of the lack of quality of human resources in the community health center in Bogor Regency.

The coefficient determination of the estimated regression model or R adjusted square (R2) was found to be about 0.938 (Table 4). This indicates that the effect on the health service performance can beexplained by 93.8% of leadership commitment, health facilities, quality of human resources and community participation. It is only about 6.2% of the effect on the health service performance can be explained by other variables that were not examined in this study.

Table 4. The Coefficient determination

Model	R	R Square	Adjusted R Square	Std. Error of the estimate
1	0.969[a]	0.939	0.938	1.134

Note: a. Predictors: (Constant), Community participation (X_4), quality of human resources (X_3), Health facility (X_2), Leadership commitment (X_1); b. Dependent Variable: The performance of health services (Y).

Source: estimated from the survey data collected.

Conclusion

This study found that leadership commitment, health facilities, quality of human resources, community participation jointly have significant effects on the performance of health services in the Community Health Service Center (Puskesmas) in Indonesia in general and particularly in Bogor District. However, the partial effect of each independent variable differs between one variable and another. The leadership commitment, health facilities and quality of human resources were found to be significant in influencing the performance of health services of the community Health Service Centre, while the community participation showed insignificant effect on the performance of health services of the Community Health Service Centre.

The findings of this study suggest at least the following three implications. First, there is a need to increase the leadership commitment in promoting equitable, affordable, quality and equitable health services. Second, there is a need to improve the availability of health facilities and medical devices in the community health services center. Third, there is a need to improve quality of human resources by developing and optimizing health resources equitably. Without these improvements, the performance of health services of the Community Health Service Centers in Indonesia in general and in Bogor District in particular will still far from theexpectationin increasing productivity and the social welfare of the people. Thus, much remain to be done by both the central and the regional Governments to improve the Community Health Service Centre in Indonesia.

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Impact of Population Ageing on the Italian Pension Expenditure

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Abstract:

The longevity improvements and low fertility rates experienced in Italy in the last decades are a largely acknowledged phenomenon. As a consequence, the Italian population experiences, and will experience in the long term, cohorts of elderly that are increasing in size and younger cohorts of active people that are declining. Hence, the population ageing, featured by a low time progression but persistent, considerably threatens, and will threaten over the next decades, the viability of the Italian public pension system that is pay-as-you-go financed. This paper aims to assess the implications of the population ageing on the sustainability of the Italian public pension scheme in the light of the demographic and economic projections provided by the 2018 Ageing Report for years 2016-2070, published by the European Commission in May 2018. Specifically, the level of the pension expenditure, measured as the ratio between the pension expenditure to the GDP, and its decomposition in the product of some specific factors - first of all the old-age dependency ratio or the benefit ratio - are analyzed.

Keywords: population ageing; pension schemes; pension expenditure; old-age dependency ratio; sustainability indicators.

JEL Classification: H55; J11.

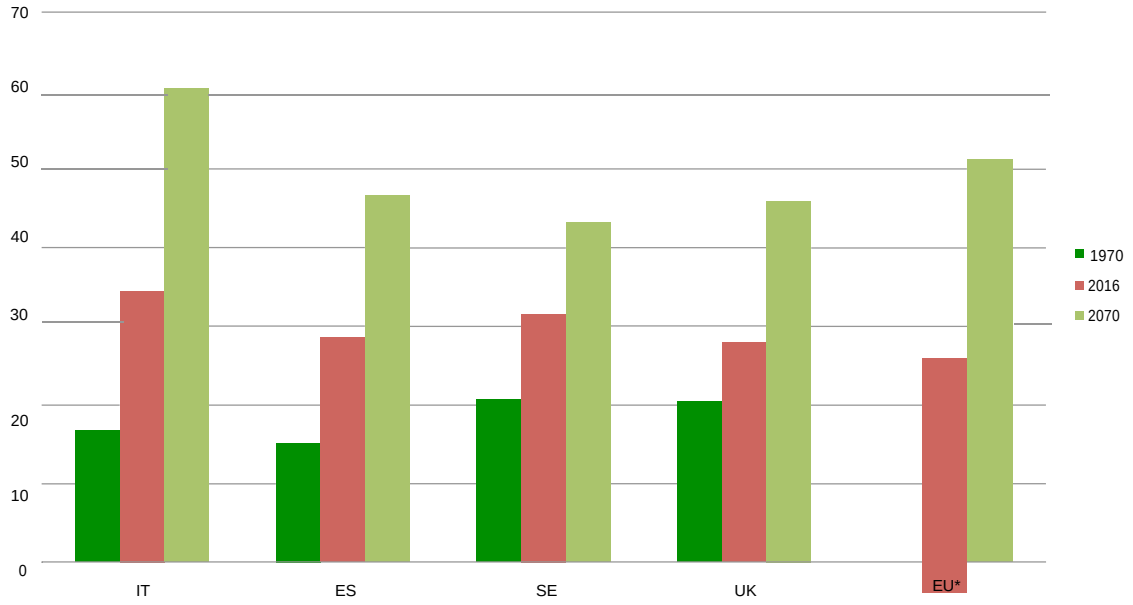
Introduction

In many industrialized worldwide countries, the phenomenon of the population ageing, resulting from specific combinations of declining fertility and increasing life expectancies, has undoubtedly clear evidence. Such a phenomenon seems to be a historical *unicum*: no evidence of precedents can be found in history. Projections suggest that ageing will continue throughout the century, with a speed that is likely to increase in the decades to come and to decelerate by mid-century (Lutz, Sanderson, and Scherbov, 2008).

The evidence can be provided by using, as a conventional measure, the old-age dependency ratio, defined as the ratio of the number of individuals aged over 65 over the number of individuals aged between 15 and 64, whose values are shown in Figure 1 for Europe as a whole for years 2016 and 2070, and for some selected countries, among which Italy, for years 1970, 2016 and 2070. The increase in the values of the old-age dependency ratio is very noticeable for all the displayed countries. The growth is particularly marked in Italy, where the ratio doubled from 16.7% in 1970 to 34.5% in 2016, that is the maximum level in Europe. According to projections, it will grow up to 60.3% by 2070 (European Commission, 2018a). Not by chance, Italy is labelled as one of the countries with the fastest population ageing. The consequent increase in the cohorts of elderly, jointly with the shrinking of the working population, has a negative effect on the financing of social security schemes. Therefore, the critical challenge that ageing poses to the financial sustainability of such schemes is manifest.

Such considerations are fundamental for pay-as-you-go (PAYG) pension systems, where current pension expenditures are financed by current contributions. Clearly, the system is not sustainable, that is becomes unable to pay the owing benefits to its participants, if the ratio of current pensioners over active contributors is too large. The baby boomers' retirement over the next decade is going to amplify such issue because of their retirement will not be supported by working generations of the same size. Thus, intergenerational equity would crumble down: disproportional economical burdens would be laid on the shoulders of future workers.

Figure 1. Old-age dependency ratios (%) – the number of people aged 65 and over as % of people aged 15-64 - in 1970, 2016 and 2070



Source: Our illustration from data provided by European Commission (2018a).

Therefore, though European pension systems widely vary in their structure and their relations among the different pillars, nonetheless their mandatory pension systems, PAYG financed, are strongly affected by ageing, whose effect is worsened by the global economic crisis. Such issues demand for the updating and adjustments due to economic or demographic alterations, but also require a change in the logical basics to evaluate the financial sustainability of pensionsystems.

This paper aims at illustrating how the population ageing affects the Italian pension expenditure using two basic indicators: the ratio of pensioners to working people, and the degree of PAYG covering of the pension disbursements. The demographic projections provided in European Commission (2018a, 2018b) are the basis for this analysis. Throughout the paper, a comparison among Italy, Europe as a whole and other European countries is exploited. In particular, reference is made to the following three countries: 1) Spain, which is one of the most populous European countries and had the largest increase in the pension expenditure-to-GDP costs between 2003 and 2016, just ahead Italy; 2) the United Kingdom, which is one of the major economies in Europe and underwent a strong increase in the pension expenditure during in the shorter period 2007-16; and 3) Sweden, which, as Italy, implemented the so-called Notional Defined Contribution (NDC) scheme and had the largest decrease in the pension expenditure between 2003 and 2016.

The paper is organized as follows. In the next section, the basic assumptions underlying the economic and budgetary projections provided in European Commission (2018a, 2018b) are presented. In addition, the basic features of the Italian pension system, as well as the main last reforms and their effects on the system, are briefly reviewed. Section 3 focuses on the Italian pension expenditure by analyzing the pension expenditure-to-GDP ratio and its decomposition in four specific ratios. Hence, the issue of the Italian pension system sustainability is assessed in Section 5. The final section presents some concluding remarks.

2. Research Background

2.1. Evolution of the population age structure in Italy

Assumptions about demographic developments are the starting point of every projection of pension expenditures. Any change in the assumptions determines a different demographic scenario and, consequently, a different projection. Three main variables determine the demographic scenario, they are fertility rates, life expectancy, and migration flows (Jimeno, Rojas, and Puente 2008).

During the last decades, Italy experienced a significative drop in fertility rates. This, together with the increase in life expectancy and the growing size of immigration inflows, led to a strong change in the Italian demographicscenario.Consequently,analterationoftheagestructureofItalianpopulationoccurred.

In the following, the general trends of the above-mentioned key variables with reference to Italy are outlined. Data are acquired from the 2018 Ageing Report, Underlying Assumptions and Projection Methodologies prepared by the European Commission's Directorate-General for Economic and Financial Affairs, (European Commission (2018b)).

Fertility rate. The Total Fertility Rate (TFR) is defined as the average number of births per woman. This indicator suffered a sharp reduction in all the European countries after the post-war 'baby boom' phenomenon. In fact, the peak value, larger than 2.5, was registered in the second half of the 1960s. Then, TFR settled at values lower than the natural replacement level of 2.1.

In Italy, the post-war peak TFR value was slightly lower in comparison with other European countries (2.37 against the average value of 2.67 for Europe). The Italian TFR dropped down below the replacement level in 1975. In year 2016, this value was 1.33 that is lower than the European average of 1.58.

According to the projections in the time interval 2016-2070, the European countries TFR is expected to grow up from 1.58 in 2016 to 1.69 in 2030. The increase should continue up to 2070 to the value of 1.81, for a total change of 0.23 between 2016 and 2070. In Italy, an agreeing yet higher increase in the fertility rate is expected in the same projection period. The indicator should move from 1.33 in 2016 to 1.42 in 2030, up to 1.66 in 2070, for a total increase of 0.33 (higher than the European average value). Nonetheless, the Italian TFR values remain lower than the European average values, which are, however, expected to remain below the natural replacement rate of 2.1 in the period considered.

Life expectancy. Starting from 1960, the life expectancy at birth significantly grew up in all the Member States. In particular, an increase of around 10 years was observed for both males and females from 1960 to 2015. In Italy, life expectancy increased by about 13 years between 1960 and 2015 (13.1 for men and 12.6 for females). These values are higher than the average ones in Europe as a whole (9.9 and 10.3 for respectively males and females).

The prosecution of this growing trend is not given for granted. Actually, this is an open issue among demographers: there is no agreement on saying if such trend goes on over the next decades or if there is a natural biological limit to longevity (Oeppen, Vaupel, *et al.* (2002)). However, past population projections have generally underestimated the gains in life expectancy. This because the mortality rate was always assumed to reduce at a lower rate in the long run. Current projections still forecast a reduced pace of the increase in life expectancy with respect to past years. The reason is that mortality rates at younger ages are already very low and future gains in life expectancy would require improvements in mortality rates at older ages that have a smaller impact on life expectancy at birth. Projections for the European States expect an increase of life expectancy at birth from 78.3 years in 2016 to 86.1 in 2070 for males (total growth of 7.8 years). For females, life expectancy at birth shifts from 83.7 to 90.3 in the same time interval (total growth of 6.6 years). In Italy, the projected increase in life expectancy at birth is less marked (6.2 years and 5.6 years for males and females, respectively). However, Italy is expected to have one of the highest life expectancies in 2070 among the European States (86.9 years for males and 90.9 years for females).

Similar remarks can be made for life expectancy at 65 years. In Europe as a whole, the expected value grows up of 5.3 years for males and 5.1 years for females in the time interval 2016-2070. Again, a smaller increase and a higher final value of life expectancy at 65 are forecast in Italy (respectively, 4.6 years and 23.7 years for males, 4.5 years and 27 years for females).

Net migration. Net migration flows are the most difficult key-variable to be estimated, being them characterized by high variability over time and countries. Starting from 1965, net flows in the Euro area were substantially positive, increasing from around 78,000 (on average) before 1985 to 1.58 million (on average) in years 2013-15. A significative drop, from 1.27 million to 774,000 (average values) was registered in years 2009-12 due to the global economic and financial crisis, but recovery and overtaking of the pre-crisis level happened in the subsequent years. In time interval 1961-2015, Italy is recognized to have recorded, together with Germany, France, and UK, the largest number of net inflows in Europe. Thus, the Italian country shifted from being traditionally an emigration country to being an immigration destination. In interval 2001-15, the average annual net migration flow was of 287,192. However, in 2015, Italy saw a large decline in the net flow (down to 31,730) with respect to 2001-15.

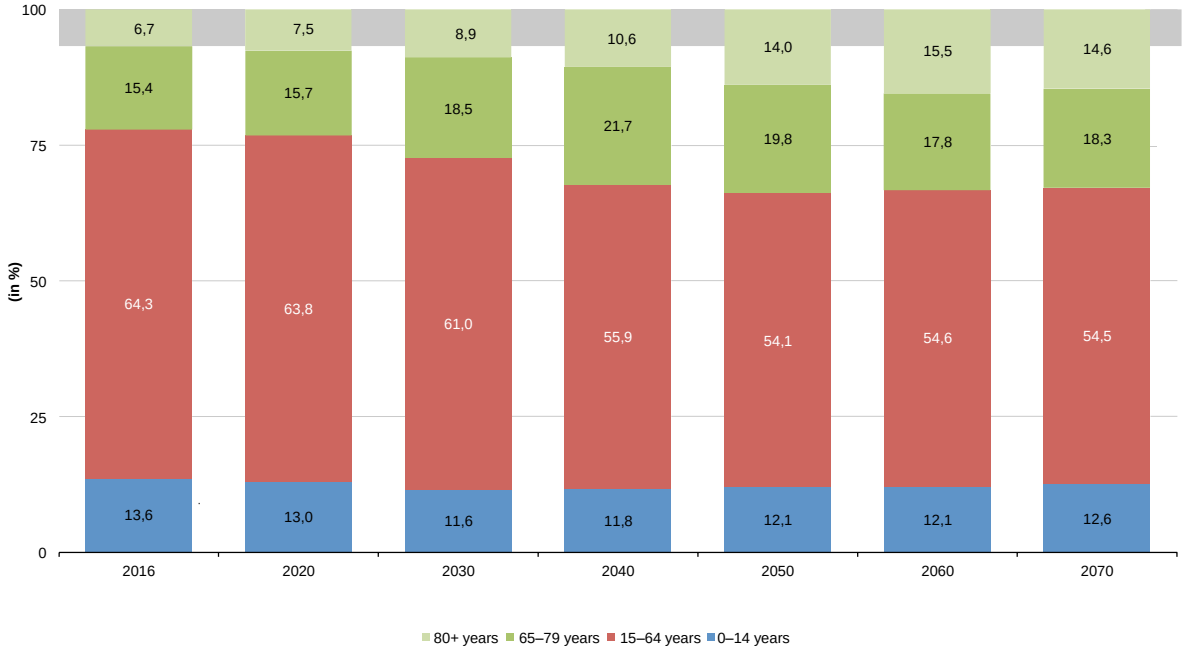
Projection of net migration flows in the time period 2016-70 expects that inflows towards Europe from the rest of the world will go on. However, a significant decrease of the annual net inflows with respect to the values registered in 2016 should occur. For Europe as a whole, annual net inflows are expected to decrease from about 1.5 million people in 2016 to 805,000 people in 2070 (that is, from 0.3% to 0.2% of the European population).

Italy is expected to be one of the countries with the highest cumulative net migration flows as a share of population, that should be at least 50% higher than the European average.

The simultaneous evolution over time of the three key-variables (fertility rate, life expectancy and net migration flows) determines the age structure of populations. The total population in Europe is expected to increase from 511 million in 2016 to 528.5 million in 2040, and then to reduce to 520 million in 2070, that is higher than the starting value in 2016. Differently, the Italian population is projected to continuously decrease from 60.8 million in 2016 to 54.9 million in 2070, with a total population loss of 9.7 million.

The outstanding aspect of this evolution is the severe ageing occurring in the same (2016-70) time period. In Europe as a whole, the age-group of people between 15 and 64 years is expected to fall (from the 65% of the total population in 2016 to the 56% in 2070), whereas a strong increase in the age-group 65+ is expected (from 19% to 29% of the total population between 2016-2070), with a particular growth of the group 80+ that is expected over to double. A very similar trend is expected in Italy, see Figure 2, where the population structure by major age groups is shown 2016-2070, manifesting the ageing evidence on the Italian population structure. The illustrated trends can be justified with different reasons. The increase in the elder population is due to the joint effect of the larger cohorts born in 1950's and 1960's and the projected gains in life expectancy. On the other hand, the shrinking of the age-group 15-64 derives from the fertility rates below natural replacement level, and from the cutback of cohorts of woman in childbearing ages. Net migration flows are not projected to act against the above-mentioned trends.

Figure 2. Population structure by major age groups for Italy in 2016-70 (% of total population)



Source: Our illustration from data provided by European Commission (2018a).

2.2. Overview of the Italian pension system

During the 90's, the Italian public pension system underwent an important season of reforms, which radically changed its nature. These reforms did not change the general PAYG financing scheme, but they did alter the mechanism for calculating pension benefits (Ferrera and Gualmini, 2000). The fundamental modification was put in act firstly in 1992 with the Amato reform (law 503/1992) that basically eliminated the indexation of benefits to real wages, and tightened the eligibility requirements for old age, early, and social assistance pensions. A year later, the process of pension reforms introduced a new regime to regulate private, supplementary, funded schemes (legislative decree 507/1993, which was followed by law 335/1995 two years later).

However, despite the cuts and measures made with the goal to put an end to a too generous mechanism of pension benefits, the persistent crisis in public finances and the growth in social expenditure moved the Italian government to approve in 1995 the so-called Dini reform. This actually represented a substantial innovation for the Italian pension system as it provided with the introduction of the NDC scheme, though with a very gradual phase in. With this provision, the NDC pension scheme was introduced. As a result, Italy changed the rules for

the determination of the benefits, moving from the defined benefit (DB) method (that is, pensions are linked to earnings) to the defined contribution (DC) method that establishes a tight link between contributions made and benefits received. Indeed, in agreement with the actuarial equity principle, the individual pension is calculated at the retirement on the basis of real paid contributions. In addition, for the NDC scheme the term 'Notional' means that individual contributions are only virtually accumulated into individual accounts, but they are actually exploited to pay the current pension benefits. For an exhaustive review of NDC pension systems and their features, along with details about their implementations in other countries, like Sweden, Latvia and Poland, reference can be made to Holzmann and Palmer (2006), whereas for a detailed analysis of the experience relative to the implementation of NDC schemes in the old or new pilot countries, see Holzmann, Palmer, and Robalino (2012, 2013).

The Italian Dini reform provided an extended transition period, which should have to come into effect gradually starting from 2013. During this time, the old DB scheme worked in parallel with the new DC one. This resulted in a significative delay of the reform effects. In fact, the NDC reform would be fully applied only for generations after the baby boom, that is, for individuals that stepped inside the labor market after 1996. Workers who accumulated at least 18 years of contributions at the end of 1995 kept the old DB regime. On the other side, workers with less than 18 years of contributions on the same date had their pension calculated partially with DB and partially with NDC.

The Dini reform also introduced a flexible retirement age, standardly allowed from 57 to 65 years. Over the last 25 years, a series of reforms subsequently increased the standard retirement age both for old-age pensions and for early retirements. Currently, the Italian pension system provides two ways for retirement: the old-age retirement, at the Statutory Retirement Age (SRA) together with at least 20 years of contribution, and the early retirement, at an age below the SRA and with higher contribution periods (MEF, 2018b). In 2016, the SRA is set at 66 years and 7 months for men (all sectors) and female employees in the public sector. For self-employed or private sector female employees the SRA was initially lower in 2016 (respectively, 66 years and 1 month, and, 65 years and 7 months), but it caught up the SRA of other workers at the beginning of 2018. The SRA is planned to be at least 67 in 2021, even if projections hint that this target may be achieved in advance. The early pension retirement, namely before the SRA, may be obtained by all workers on the basis of a minimum contribution requirement. Moreover, workers enrolled after 1995 may catch retirement no more than three years before the SRA, depending on a minimum amount of years of contributions and a minimum benefit value. Further details can be found in MEF (2018b).

In addition, since 2013 an indexation mechanism has been introduced to adjust the eligibility requirements to changes in the life expectancy at 65. The modifications are applied every three years until 2019 and every two years thereafter. Life expectancy at 65 is measured by the Italian National Institute of Statistics (ISTAT) over the three (two years from 2021) years previous to the time of application of the mechanism. The indexation is applied to the SRA, to the minimum contribution requirements for early pensions, and to the minimum age requirement for early pension.

In agreement with the NDC scheme, the pension is calculated as the total lifelong contributions multiplied by the transformation coefficient. Lifelong contributions are capitalized by the nominal GDP growth rate (measured on the previous five years by a geometric mobile average). The transformation coefficients are calculated using a specific actuarial formula, and depends on specific demographic and normative parameters. Among these, two elements are particularly relevant: the survival probabilities and the interest rate returned on pension benefits during the retirement phase. In the computation of the transformation coefficients, the survival probabilities are evaluated according to the current life tables. Hence, possible future imbalances could stem from attributing to the retired individual survival probabilities that are lower than the actual ones because they do not reflect the current improvements in longevity. Frequent revisions of the transformation coefficients can cope with this risk, because in this way they can include the effects of the increasing survival probabilities. In order to maintain transformation coefficients related to the actual demographic dynamics, as provided by law 247/2007, they are subjected to periodic revisions (every two years starting from 2019) according to changes in mortality rates. However, as during the retirement phase no revision of coefficients is provided, the progressive improvements in survival probabilities could be financially compensated through reduction of the rate of return on the pension liability to retirees (Angrisani and Di Palo, 2006; Di Palo, 2016). During the retirement phase, pensions are indexed only to prices, unlike the rule applied before 1992 (that provided the indexation of pensions to real wages). Note that in the transformation coefficients a real interest rate, equal to 1.5%, is recognized, and hence ensured in advance, to the retiree pension liability, in order to have more generous pensions in the initial

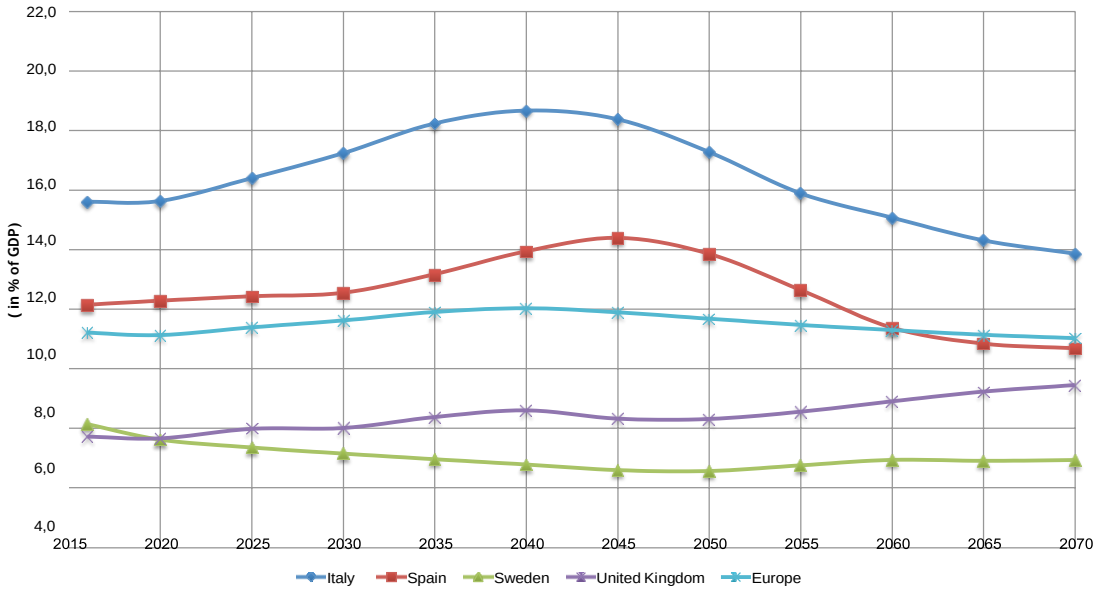
pay-out phase. However, systematic imbalances in the pension system could be caused if the rate of return on the pension liability should result different from that included in the coefficient.

To conclude, it is true that, in spite of the reforms, at the end of the 1990s Italy still displayed one of the highest ratios of pension expenditure/GDP in the whole OECD area and that the situation was likely to worsen. However, the significance of the 1992/95/97 reforms must be appreciated by contrast with the status quo ante. In the absence of reforms, the pension expenditure would have reached the impressive peak of 23.2% of GDP in the year 2040, before beginning to decline. After the reforms, the peak is expected to be 'only' 15.8% of GDP in the year 2032. The virtual stabilization of the pension expenditure may not have been enough to cure fully the long-standing disease of Italy's unbalanced welfare state, but it has certainly contained its fatal aggravation.

3. Methodology

According to the European Commission (2018a), in Italy the level of the gross public pension expenditure, measured as the ratio of the pension expenditure to GDP, is expected to increase by 3.1 pps. of GDP between 2016 and 2040, whereas it would decline by 4.8 pps. of GDP in the period 2040-2070, moving to a lower level (13.9 in 2070) than the initial one (15.6 in 2016). Note that the level of pension spending for Italy in 2016 is the second maximum level in all Europe (just after Greece), but it is projected to be the maximum one in 2040. In the period 2040-2070 Italy is the country that is projected to register the maximum reduction in the spending level. In Europe, dynamics follow a comparable pattern, though with a lower amplitude: public pension expenditure is projected to increase by 0.8 pps. of GDP between 2016 and 2040, and to decline thereafter by 1 pps. of GDP. Refer to Figure 3, where the projected dynamics in the level of the pension expenditure are graphically illustrated for Italy, for Europe and for the other countries considered. Although with a different degree of variation, either Italy or Spain will see a pension expenditure decline in the second part of the time period considered.

Figure 3. Projections of the gross public pension expenditure in Europe as a whole and in some selected countries, including Italy: time profile 2016-2070



Source: Our illustration from data provided in European Commission (2018a).

Such a decline will exceed the initial increase (the peak for Italy is projected in 2040, for Spain in 2045), with a fall in the 2070 value compared with that in 2016. Differently, according to projections, Sweden will experience a global decline of 1.2 pps. of the GDP, in particular in the first four years, whereas the United Kingdom appears to expect a total increase of 1.7 pps. of GDP. In any case, Sweden and the United Kingdom are both classified as countries with a stable time profile in the level of the pension expenditure-to-GDP, although the peak years vary notably: it is projected to be in 2016 for Sweden and in 2070 for the United Kingdom. As highlighted in Figure 3, the bell-shaped curve of the pension expenditure for Spain and Italy leads to classify them as up/down time-profile countries.

3.1. The four factors driving the change in the public pension expenditure

EuropeanCommission(2018a)usesadecompositionofthepensionexpenditure-to-GDPintofourspecificratios inordertoassesstheirimpactonthepensionexpenditure.Thisdecompositionconsidersthefollowingequality

$$\frac{\text{pension expenditure}}{\text{GDP}} = \frac{\text{pension expenditure}}{\text{number of pensioners}} \cdot \frac{\text{number of pensioners}}{\text{population aged 20-74}} \cdot \frac{\text{population aged 20-74}}{\text{hours worked by population aged 20-74}} \cdot \frac{\text{hours worked by population aged 20-74}}{\text{GDP}} \quad (1)$$

where term GDP per hours worked has to be considered as a proxy of the average wage. The first ratio in equality (1) can be further decomposed as

$$\frac{\text{pension expenditure}}{\text{number of pensioners}} = \frac{\text{population aged 65+}}{\text{number of pensioners}} \cdot \frac{\text{population aged 20-64}}{\text{population aged 65+}} \cdot \frac{\text{hours worked by population aged 20-74}}{\text{population aged 20-64}} \quad (2)$$

where we consider the following ratios:

- the dependency ratio, denoted by $_J$, is the ratio between the population over 65 years to the population aged 20-64 years, that is: $_J = \frac{\text{KLKMNOPQLR STU}}{\text{KLKMNOPQLR VWXTY}}$;
- the coverage ratio, denoted by $_V$, is the ratio of pensioners of all ages to the population over 65 years, that is: $_V = \frac{\text{RM[\]^ L_ K]R`QLR]^`}}{\text{KLKMNOPQLR STU}}$;
- the labor market effect, denoted by $_a$, is the population aged 20-64 years to the hours worked by the population 20-74, that is: $_a = \frac{\text{KLKMNOPQLR VWXTY}}{\text{bLM^` cL^d]e VWXfY}}$.

The second ratio in equality (1) is the benefit ratio; it is denoted by $_Y$, and is equal to the average pension (the public pension spending divided by the number of pensioners) to the average wage, which is approximated by the GDP per hours worked, a measure of labor productivity, OECD (2019), namely it is:

$$_Y = \frac{\text{Og]^Oh] K]R`QLR QRiL[]}}{\text{mnopq rnpstu vwxyz}}.$$

By means of the decomposition, as in (1) and (2), it follows that the pension expenditure-to-GDP ratio, indicated by y, can be expressed into the product of above-mentioned four ratios, $_J$, $_V$, $_a$, and $_Y$, that is = $_J \cdot _V \cdot _a \cdot _Y$. In addition, through this decomposition, it follows that the change in the public pension expenditure-to-GDP ratio is given by the sum of the contributions produced by each of the four ratios above-mentioned[1].

In following Table 1 the contribution of each of the four factors is reported for Italy and for the other selected European countries, as in European Commission (2018a).

Dependency ratio. This indicator provides the measure of the demographic burden for working generations. As shown in Table 1, it produces the main contribution to the change in the levels of the pension expenditure. Its impact is positive for all European countries, and hence for the considered ones. This means that the demographic component leads to a significant increase in the pension expenditure, whose effect is counterbalanced from the other ratio contributions. This contribution amounts to 6.5 pps. of GDP for Europe on average. It ranges from 2.4 pps. of GDP in Sweden, see Table 1, to 11.7 pps. of GDP in Poland.

[1] Specifically, the relative change in is given by $\frac{\Delta}{} = \frac{\Delta}{} + \frac{\Delta}{} + \frac{\Delta}{} + \frac{\Delta}{} +$, where measures the interaction effect of the explicative variables. Therefore, the change in function y can be decomposed as $\Delta = \left(\frac{\Delta}{} + \frac{\Delta}{} + \frac{\Delta}{} + \frac{\Delta}{} + \cdot\right)$, and the contribution of each one of the four ratios considered is given by $_Q = \left(\frac{\Delta}{}\right)$, where

Note that Italy is one of the European countries with the highest dependency ratio, by far higher than the European average, the highest compared to the other countries shown in Table 1. According to projections in European Commission (2018a), in Italy the dependency ratio, x_1 in Table 1, is projected to increase from 37.2% in 2016 to 65.5% in 2070. This reflects an ageing society: Italy would move from having 2.7 working-age persons for each person aged over 65 years in 2016 to 1.5 working-age persons in 2070. This means that the contribution base is going to reduce in comparison with the number of retired people. From this evidence, one can easily understand the spirit that inspired the latest measures adopted since 2004 (Law 243/2004) in order to contain the pension expenditure in Italy. Specifically, the measures adopted with the reform in 2011 (art. 24 of Law 214/2011) included, among others, short term cuts to pension indexation and a reduction in the number of pensions stemming from higher eligibility requirements. Note that the interventions adopted with the Budget Law in 2017 are in contrast with the previous ones. Indeed, for the first time in more than 20 years, the measures adopted on the Italian pension system have provided for an increase in the pension expenditure and for facilitating earlier access to pension lowering the eligibility requirements, MEF (2018b) and MEF (2018a).

Coverage ratio. It provides the number of retirees to the number of individuals aged 65 and over. Generally, the number of retirees exceeds the number of people aged 65+, because pensions may be available even at ages lower than 65, which is the standard age for the retirement eligibility. Hence, the higher is the age at retirement the lower is the share of pensioners below age 65, and the lower is the coverage ratio. As a consequence, reforms that restrain earlier access to pension, or increase the statutory retirement age, so that the effective retirement age could be postponed, aim to reduce the coverage ratio, and hence the pension expenditure.

In all the European countries, the coverage ratio is projected to decrease between 2016 and 2070, with the only exception of Malta and Sweden, see Table 1. This decrease is the highest one for Italy, where the coverage ratio is projected to reduce the pension expenditure by up to 4.5 pps. of GDP. This reflects the effect of the recent pension measures adopted in Italy, where an automatic link between the statutory retirement age and life expectancy is set: in this way, the number of pensioners should increase less of the number of people above the age 65 years.

Benefit ratio. This indicator is given by the ratio of the average individual pension to the average wage that is proxied by GDP per hours worked. Therefore, it provides a measure of the level of the public pension benefits, and is affected by the way in which pension benefits are adjusted for inflation and productivity gains, by the rules for the acquirement of pension rights or for enjoying full pension benefits, all features that imply the lower or higher level of generosity of pension systems. Thus, the lower is the generosity of the pension scheme, in the sense of lower benefits on average with respect to the productivity, the lower is the benefit ratio.

The contribution from the benefit ratio is expected to reduce the pension expenditure-to-GDP ratio with a magnitude, on average, larger than that of the coverage ratio. For all European countries, it is at least zero. Specifically, for Spain, Italy and Sweden the reduction in the benefit ratio is expected to decrease the pension expenditure by at least 4.0 pps. of GDP, a decrease larger than that expected for Europe as a whole (3.3 pps. of GDP), whereas for the United Kingdom the contribution of this ratio is expected to be a neutral factor for pension spending.

This reduction reflects the effects of the substantial pension reforms adopted in last decades. For Italy, it can be principally attributed to the introduction of the NDC scheme and the indexation of pension benefits to price inflation, MEF (2018b). Note that up to 2030 in Italy the pension benefits are expected to rise faster than wages: despite the fact that the quota of NDC pensions will increase, this does not enough to compensate for the low growth in productivity assumed in this period. This is expected to cause an increase in the benefit ratio, and hence in the pension expenditure-to-GDP ratio, equal to 1.7 pps. of GDP, which is the maximum increase in Europe in the period taken into account. Between 2030-2070, the benefit ratio effect will turn negative, because of the fact that the NDC scheme will be fully running, and the maximum decrease is expected in 2040-2050 (-2.7 pps. of GDP).

Labor market effect. This last indicator, which assesses the impact of the labor market behavior on the pension expenditure, can be further split in turn in three sub-drivers:

(a) the employment rate effect, i.e. the inverse of the employment rate, denoted by x_5, is the ratio of population aged 20-64 to the number of working people in the same age range 20-64: $= \frac{\text{KLKMNOPQLR VWXTY}}{\text{cL^d\Rh K]LKN] VWXTY}}$;

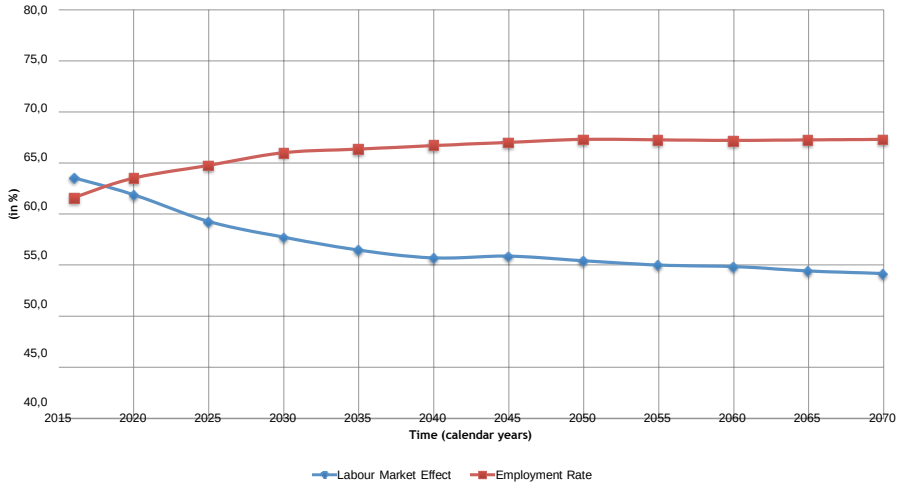
(b) the labor intensity effect, i.e. the inverse of the labor intensity, denoted by x_6, is the ratio of working people

aged 20-64 to the hours worked by the population 20-64: $= \frac{\text{cL^d[Rh K]LKN] VWXTY}}{\text{bLM^` cL^d]e VWXTY}}$;

(c) the career shift effect, i.e. the inverse of the career shift, denoted by x_7, is the ratio of the hours worked by the population 20-64 to the hours worked by the population 20-74: $= \frac{\text{bLM^` cL^d]e VWXTY}}{\text{bLM^` cL^d]e VWXfY}}$.

Note the contribution to the pension expenditure-to-GDP deriving from this factor still acts to counteract the projected increase in the dependency ratio, but its magnitude is lower than those deriving from the coverage and benefit ratios, see Table 1 for the considered countries. However, for Italy and Spain too, the assumed reduction of the unemployment rates leads the contribution due to this factor at the second largest value in Europe (-2.8 pps. of GDP). In addition, note that the employment rate and the career shift are the factors that, as a matter of fact, drive the labor market effect, whereas the contribution deriving from the labor intensity is almost neutral for all countries. In Figure 4, the labor market effect and the employment rate trend are illustrated for Italy. It has to be highlighted the increase assumed in the employment rate, mainly due to the postponement of the retirement age and its inverse impact on the projected trend on the labor market effect, hence on the pension expenditure- to GDP ratio. Therefore, reforms, aimed at strengthening the potential of economic growth, are particularly relevant, for example if they stimulate people to stay longer in the labor market.

Figure 4. Projected trend in the labor market effect and the employment rate for Italy between 2016-2070



Source: Our illustration from data provided in European Commission (2018b) and in European Commission (2018a).

4. Assessing the financial sustainability of the Italian pension system

The last economic and budgetary projections provided by the European Commission (2018a) confirm that Italy is going towards a society that is getting older and older, and show how the last pension reforms, implemented with the main aim at limiting the future increase in the pension expenditure (with the only exception of the measures adopted in 2017), impact on the pension expenditure-to-GDP ratio in an ageing context. Basically, the projected decrease in the Italian pension expenditure-to-GDP ratio, which should take place from 2040, comes mostly from the benefit ratio effect, which largely depends on the rules determining the coverage and the amount of pension benefits.

In the following, as in Di Palo (2011), we consider two other indicators.

4.1. The ratio of pensioners to working people

The ratio of pensioners to working people aged 20-64, denoted by Ü, is calculated as

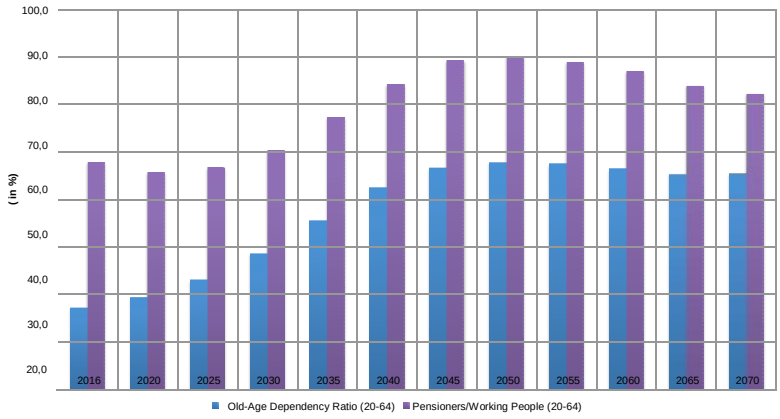
$$Ü = \frac{\text{20 -d}}{\text{+65}} = \frac{}{\text{20−64}} \quad (3)$$

$$= \frac{\cdot}{20-64} \qquad \frac{}{+65} \cdot \frac{}{20-64}$$

namely, it is calculated as the product of the three ratios indicated as J, V, and U in Section 4, and are the old-age dependency ratio, the coverage ratio, and the inverse of the employment rate, respectively. For easy of reading, in Figure 5 the old-age dependency ratio and the ratio of pensioners to working people aged 20-64, as calculated in (3), are compared. In particular, note that Italy presents very high values of ratio Ü, which starts from over 60% and rises to over 80% from 2040, with a projected peak in 2050. This means that between 2040 and 2060, according to the projections, one pensioner will be supported by about one active person. By means of decomposition (3), this indicator reflects the effects of:

- the population ageing, see the values of the old-age dependency ratio that for Italy gets the highest value, among the other European countries, in 2016 (37.2%), and reaches one of the highest values also in 2070 (65.5%, the fourth highest value);
- the implemented reforms, which basically have provided the increase in the standard age for the retirement and rules that automatically link the retirement age to life expectancy lengthening, see the significant decrease in the values of the coverage ratio: they start from a large value in 2016 (112.1%) to reach a level that is very lower than that for Europe as a whole;
- the labor market effect, mostly represented by the values of the employment rate. For the population aged 20-74, the employment rate for Italy is among the lowest ones in Europe (53.2%, the second lowest value) in 2016, and it is 9.0% below the average value for Europe as a whole. According to the projections, it will reach the 60.0% level in 2070, remaining still below the European average (66.0%). Thus the first of the five European headline target fixed by the "Europe 2020" strategy, that is to raise to 75% the employment rate for women and man aged 20-64, is well-far to have been reached (Marlier, 2010), with its consequent negative impact on the pension expenditure.

Figure 5. Old-age dependency ratio (20-64) and pensioners-contributors ratio between 2016-2070



Source: Our illustration from data provided in European Commission (2018a).

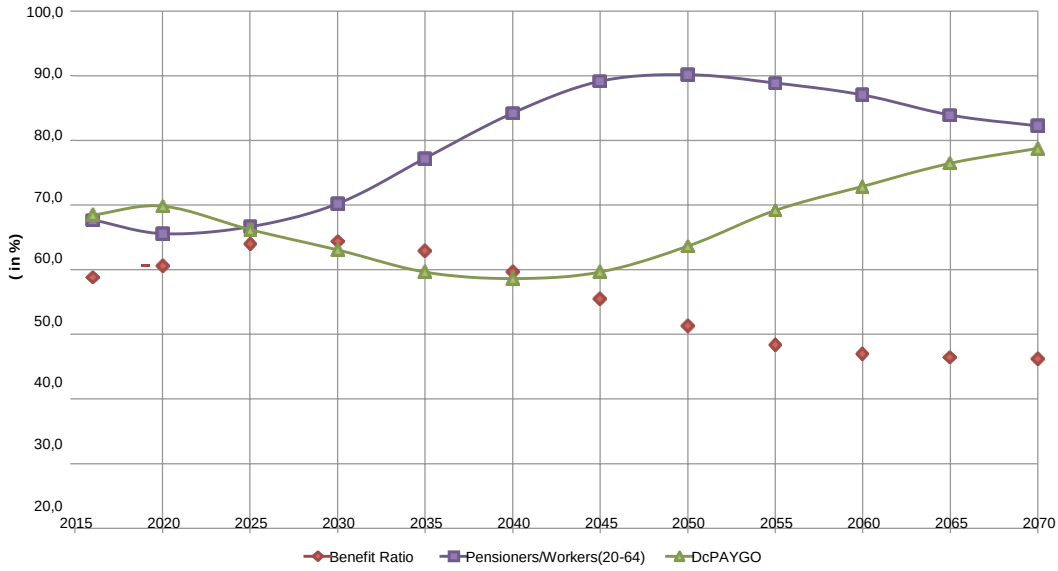
4.2. The degree of pay-as-you-go (PAYG) covering of the pension disbursements

The degree of PAYG covering of the pension disbursements, referred to as áàâi, see Angrisani and Di Palo (2019), hereinafter denoted by , is calculated as: = áàâi = iLRP^Q\MPQLR` O` % L_ ãçá / K]R`QLR O` % L_ ãçá, whose data are provided in Part III Statistical Annex - Cross-Country Tables, Table III.1.76: Public pensions, contributions as % of GDP and Table III.1.66: Public pensions, gross as % of GDP, in European Commission (2018a).

This indicator is inversely linked to the ratio of pensioners to working people and the benefit ratio; thus, to make the áàâi increasing, both ratios have to decrease. Figure 6 shows the expected trend of the three ratios considered, benefit ratio a, ratio of pensioners to working people aged 20-64 Ü, and degree of PAYG covering ã, for Italy between 2016 and 2070. Over the projection period the demographic dynamics of the Italian pension system is strongly affected by the consistent increasing in the ratio of pensioners to working people aged 20-64 expected between 2020 and 2050, where it reaches its maximum value (90.0%). This means that the support ratio will move from about 1.5 contributors for each pensioner in 2020 to just over one contributor for each pensioner in 2050. Note that although the adoption of the NDC scheme and the recent pension measures adopted, the benefit ratio shows an increasing trend up to 2030, where it achieves its maximum value, and thereafter it will decrease up to 2070. As a consequence, the decrease expected in áàâi in the decade 2020- 2030 is due to the increase of both ratios, whereas in the subsequent decade 2030-2040 the expected reduction in the

benefit is not able to counteract the consistent increase in the demographic factor that will strongly impact to expand the level of the pension expenditure. Thus, the degree of PAYG covering is projected to decrease from 69.9% in 2020 to 58.7% in 2040. The demographic trend is also worsened by the effects of the so-called 'demographic wave' (Angrisani and Di Palo, 2014, 2018) due to the baby boomers, namely the individuals born in the sixties (1960 is the year taken representative of the baby boom, Lanzieri (2011)), who approach to retirement starting from 2025, see the degree of PAYG covering graph between 2020 and 2050 in Figure 6.

Figure 6. Trends of the benefit ratio, the ratio of pensioners to working people aged 20-64, and the degree of PAYG covering between 2016-2070 for Italy



Source: Our illustration from data provided in European Commission (2018a).

Therefore, on the basis of the considered projections, the Italian pension system, under current rules for contributions and benefits, is and will be imbalanced. Note that the Italian pension system, although exclusively on PAYG financed, is actually supported by heavy additional contributions from the State, which covered about the third part of the pension expenditure in 2016, and is projected to cover 40% of the pension expenditure when the demographic wave will put under further pressure the system.

Conclusion

In this study, the time evolution of the Italian pension expenditure-to-GDP ratio is analyzed in the context of an ageing population. The analysis is carried out from the economic and budgetary projections as provided by the European Commission (2018a, 2018b).

These projections show that the time profile of the Italian pension expenditure-to-GDP ratio is of the so-called UP/DOWN type, because the initial upward trend in the level of the pension expenditure would be followed by a decline expected after the peak in 2040. The expected decline should exceed the initial growth so that the pension expenditure-to-GDP should move to a level lower than that in 2016. This predicted trend is mostly due to the expected demographic dynamics that confirm the ageing of the Italian population, a phenomenon that will be also worsened in the forthcoming decades as baby boomers will approach to retirement.

Hence, the issue of the pension system sustainability is still one of the major challenges for Italy that displays one of the highest level in the pension expenditure to GDP ratio in the whole Europe also in the long term. The sequence of pension reforms implemented over last decades have managed to control the future expansion in the level of the pension expenditure (although the last measures applied in 2017 goes in the opposite tendency), acting on the cuts of benefits and tightening the eligibility requirements. The effect of these measures makes the Italian benefit ratio reduced by 12.6 pps. between 2016 and 2070, while keeping a level above the European average.

Thus, projections, which prospect the pension expenditure to decline over time, could suggest that the pension system could be financially sustainable, namely able to face its commitments towards its current and future participants under substantial equity among generations. Actually, as the pension system is PAYG financed, the fulfilment of pension promises should have to be supported by projections of stabilization of contributions levels to ensure the intergenerational equity. In addition, any sustainability evaluation has to take into account the current, and not projected, quantification of the pension liability, namely the commitments

already taken up, as the future pension expenditure is depending on the current pension liability. From this point, it comes up the necessity to analyze the current pension system state by means of proper indicators of state and control, defined in a logical and mathematical framework, so that the sustainability should not be subjected to the 'goodness' of the adopted assumptions (Angrisani and Di Palo, 2019). Differently, sustainability evaluations based exclusively over the pension expenditure projections can be misleading because of the strong dependence on the underlying assumptions and the lack of objective indications to re-balance the system.

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