

ASPECTS CONCERNING RESEARCH & DEVELOPMENT ACTIVITIES IN ROMANIA AND EU COUNTRIES

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In today's world the research and development are essential for society. In this paper we have analyzed three indicators reflecting this aspect: research and development expenditure by sectors of performance, total researchers by sectors of performance, and share of women researchers.

Key words: *R&D, sectors of performance, researchers, digital society*

1. INTRODUCTION

With the help of the data provided by the Eurostat Database we have graphically analyzed the research and development indicators in Romania and the rest of the European Union countries.

The database tree comprises under the label of Research and development (R&D) the following items [1]: Research and development expenditure, by sectors of performance, Intramural R&D expenditure (GERD) by source of funds, Total researches by sectors of performance – head count, Total researches by sectors of performance – full time equivalent, Research and development personnel, by sectors of performance, Share of women

researchers, all sectors, Share of women researchers by sectors of performance, Intramural R&D expenditure (GERD) by NUTS 2 regions, Researchers, all sectors by NUTS 2 regions.

2. RESEARCH AND DEVELOPMENT

Research and experimental development [2] (R&D) “comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications. R&D expenditures include all expenditures for R&D performed within the business

enterprise sector (BERD) on the national territory during a given period, regardless of the source of funds. R&D expenditure in BERD are shown as a percentage of GDP (R&D intensity).”

The first indicator that we have taken into consideration is the Research and development (R&D) expenditure as percentage of the GDP (Gross Domestic Product).

In Figure 1 we can observe

and in Sweden between 2015 and 2021 (3.22%, 3.25%, 3.36%, 3.32%, 3.39%, 3.49%, and 3.36%).

In Figure 2 we can observe the evolution of the second indicator – the R&D expenditure by business enterprise sector in Romania and EU-27. Also, from our data, we see that the minimum values were registered in Cyprus from 2010 to 2015 (0.08%, 0.07%, 0.07%, 0.09%, 0.11%, 0.11%) and in Latvia

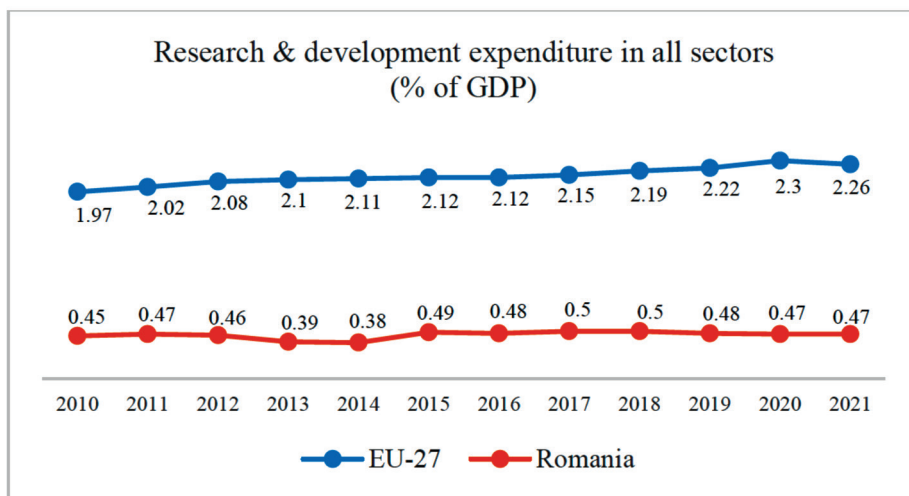


Fig.1 Research & development expenditure in all sectors

the evolution of this indicator in all sectors between 2010 and 2021 in Romania and EU-27 composite average. Romania has the lowest value among all the EU countries in 2013, 2014, and 2017-2021. The highest values are in Finland between 2010 and 2014 (3.71%, 3.62%, 3.4%, 3.27%, and 3.15%)

from 2016 to 2021 (0.11%, 0.14%, 0.16%, 0.17%, 0.21%, 0.23%). The maximum values were in Finland from 2010 to 2013 (2.58%, 2.55%, 2.34%, 2.25%), in Austria in 2014 (2.22%), in Sweden from 2015 to 2020 (2.24%, 2.26%, 2.4%, 2.36%, 2.43%, 2.52%), and in Belgium in 2021 (2.42%).

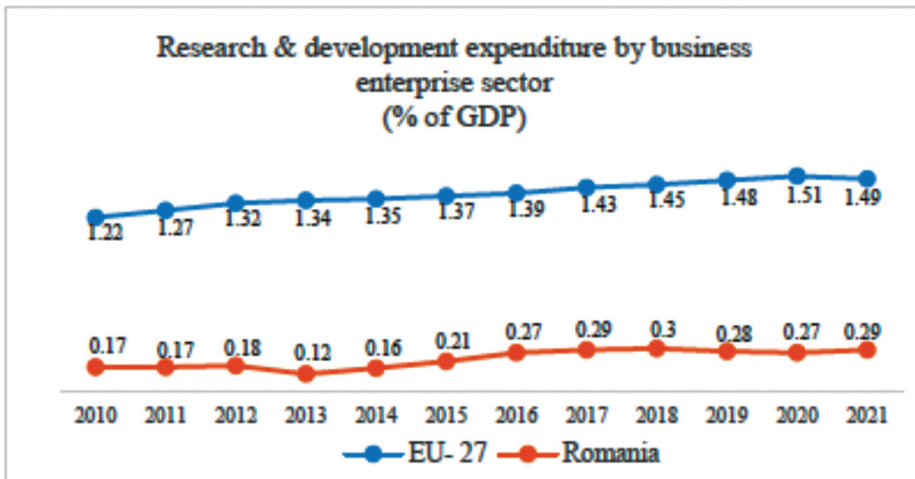


Fig. 2 Research & development expenditure by business enterprise sector

In Figure 3 we have the evolution of the third indicator – the R&D expenditure by government sector in Romania and EU-27. From the rest of the data we see that the minimum values were in Malta between 2010 and 2014 (0.02%, 0.03%, 0.06%,

0.07%, 0.07%) and from 2016 to 2021 (a constant 0.01%). In 2015 the lowest value was in Ireland (0.05%). The highest values of this indicator were in Germany for all the analyzed period (from 0.4% to 0.47%).

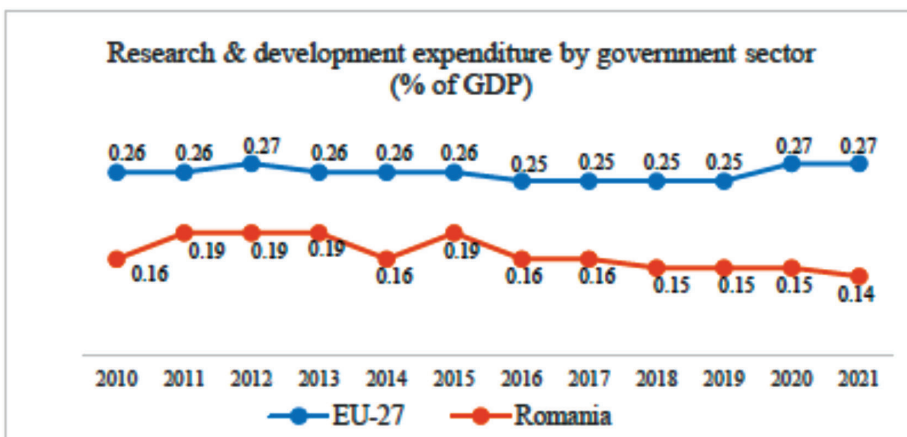


Fig. 3 Research & development expenditure by government sector

The fourth indicator analyzed (Figure 4) is the R&D expenditure by higher education sector in Romania and EU-27, as we can observe in Figure 4. Romania has the minimum values in 2014 (0.06%), and from 2019 to 2021 (0.05%, 0.04%, 0.04%). For the rest of the years analyzed Bulgaria has the lowest values (0.04% - 0.07%). The highest values were in Denmark (0.88% - 1.04%).

In this category of R&D expenditure we have also the

3. TOTAL RESEARCHERS

Researchers [3] are “professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems, and in the management of the projects concerned. Head count (HC) data measure the total number of researchers who are mainly or partly employed on R&D.”

The next category of indicators refers to the total researchers by

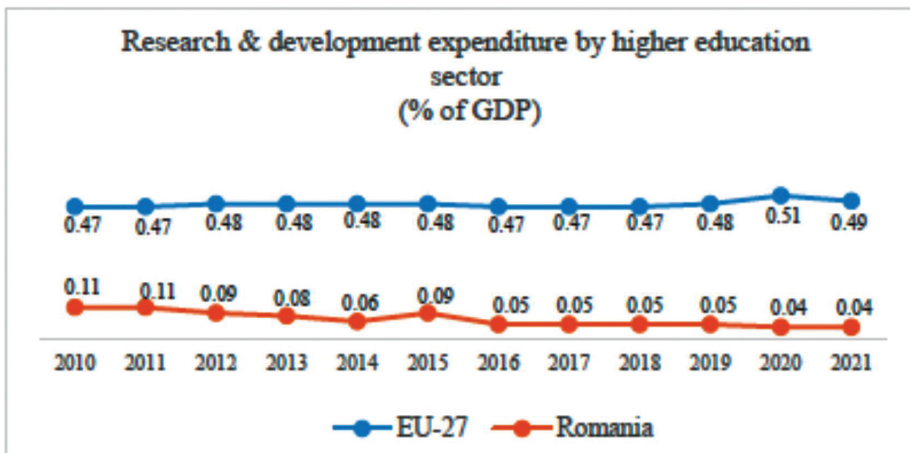


Fig. 4 Research & development expenditure by higher education sector

one from the private non-profit sector. Several countries, including Romania have the value of this indicator 0% (Poland, Luxembourg, Slovakia, Netherlands). The highest values were in Portugal from 2010 to 2012 (0.16%, 0.13%, 0.12%) and in Cyprus from 2013 to 2021 (0.06% - 0.12%).

sector of performance in Romania. We begin with the values from all sectors (Figure 5). For the period analyzed the highest value was in 2009 (30,645 persons) and the lowest value was in 2011 (25,489 persons). The average was 27,914 persons.

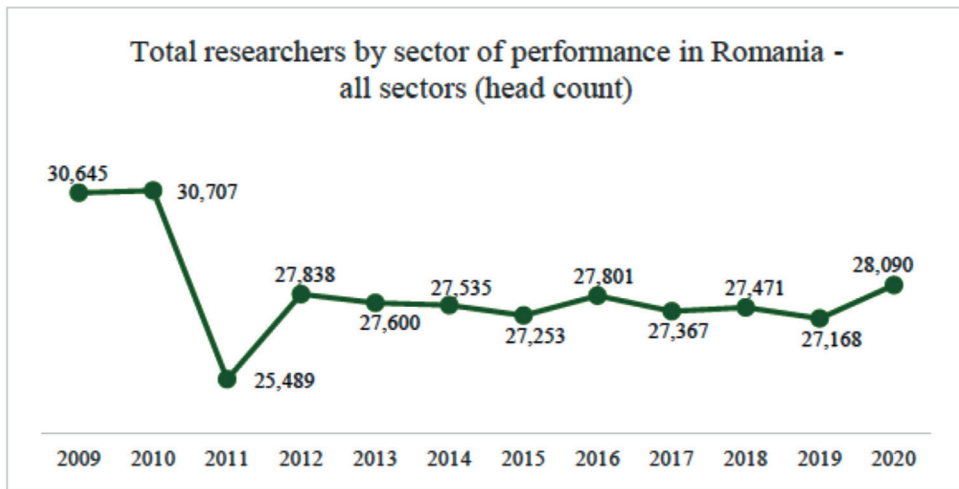


Fig. 5 Total researchers by sector of performance – all sectors

Concerning the number of total researchers in business enterprise sector in Romania (Figure 6) the maximum value for the period analyzed was 6,389 persons in 2009 and minimum value was 4,122 persons in 2011. The average was 5,363 persons.

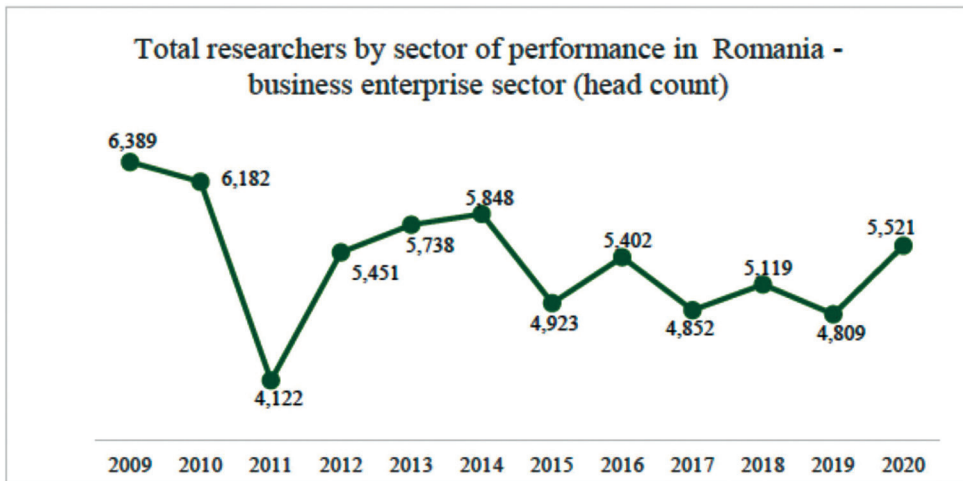


Fig. 6 Total researchers by sector of performance – business enterprise sector

The next indicator is total researchers in the government sector (Figure 7). Here the evolution is different, having a constant growth from 2010 to 2020, from 5,831 persons to 7,249 persons. The average was 6,733 persons.

persons and then small decreases and increases with 15,069 persons in 2020. The average was 15,639 persons.

Even if we don't have any R&D expenditure in the private non-profit sector from the part of the state, we do have a number of researchers

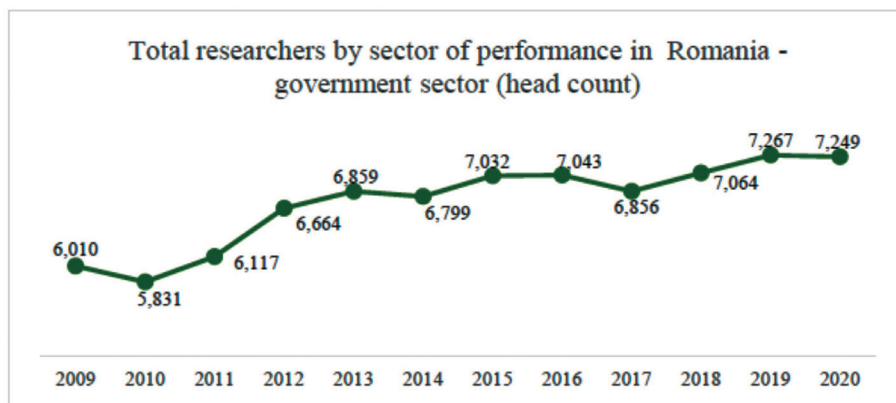


Fig. 7 Total researchers by sector of performance – government sector

The situation is different for the total researchers in the higher education sector (Figure 8). We have an abrupt decrease from 2010 to 2011, from 18,540 persons to 15,086

with values from 109 persons in 2009 to 251 persons in 2020, with a maximum value of 273 persons in 2016 (Figure 9). The average was 179 persons.

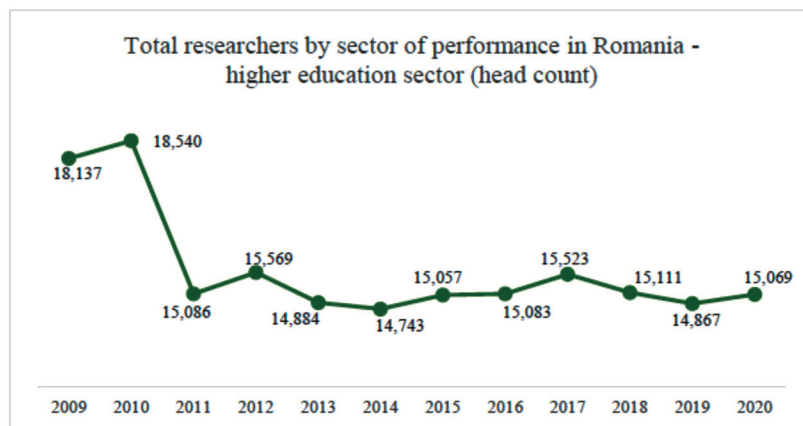


Fig. 8 Total researchers by sector of performance – higher education sector

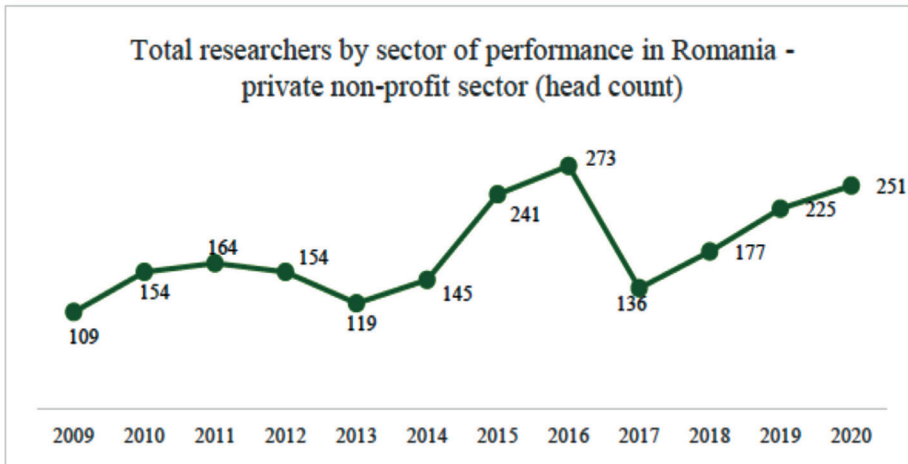


Fig. 9 Total researchers by sector of performance – private non-profit sector

4. SHARE OF WOMEN RESEARCHERS

Researchers are [3] “professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems, and in the management of the projects concerned. The share of women researchers among total researchers

in head count in all institutional sectors is shown.”

Based on previous head count of the total researchers by sector of performance from 2009 to 2020 we also made an analysis of the share of women researchers in Romania. The general evolution in all sectors (Figure 10) was one of increase from 44% in 2010 to 47.3% in 2020.

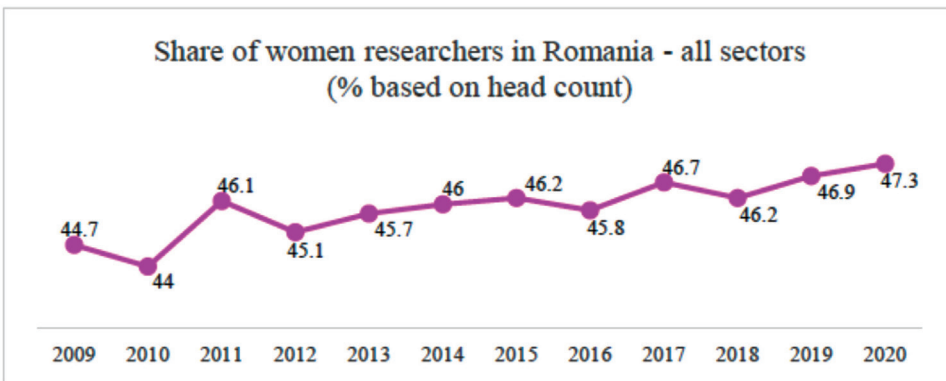


Fig. 10 Share of woman researchers – all sectors

In the business enterprise sector we have the maximum value of 40.1% in 2014 and the minimum value in 2018 – 32.5%. The evolution is a combination of increases and decreases (Figure 11) with more than 0.5% from a year to another.

In the government sector (Figure 12) we have a maximum value for the share of woman researchers in 2010 (49.9%) and a minimum value in 2011 (46.3%).

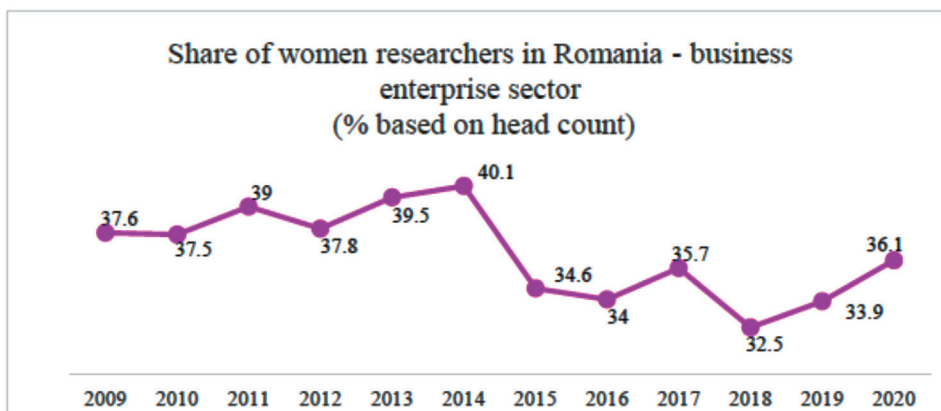


Fig. 11 Share of woman researchers – business enterprise sector

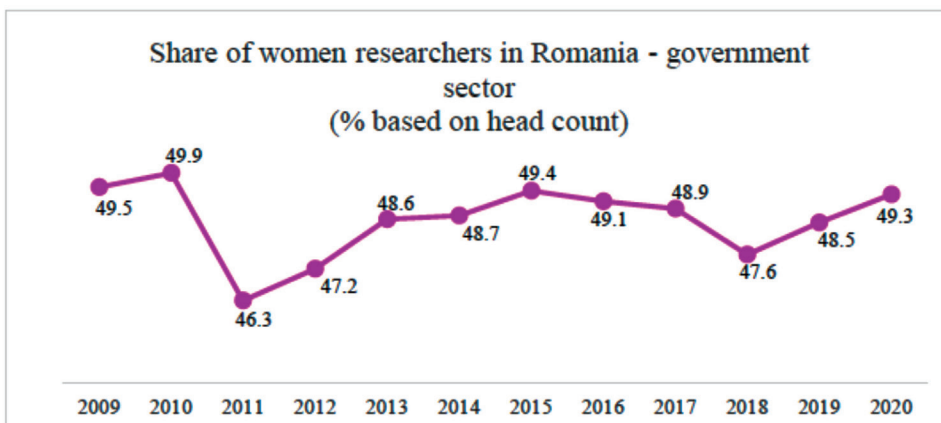


Fig. 12 Share of woman researchers – government sector

In the higher education sector (Figure 13) we have almost a constant increase of the share of women researchers in Romania, from a minimum value of 44.3% in 2010 to a value of 50.4% in 2020.

The highest values of share of women researchers in Romania is in the private non-profit sector (Figure 14), with values from 30.9% to 55.2%.

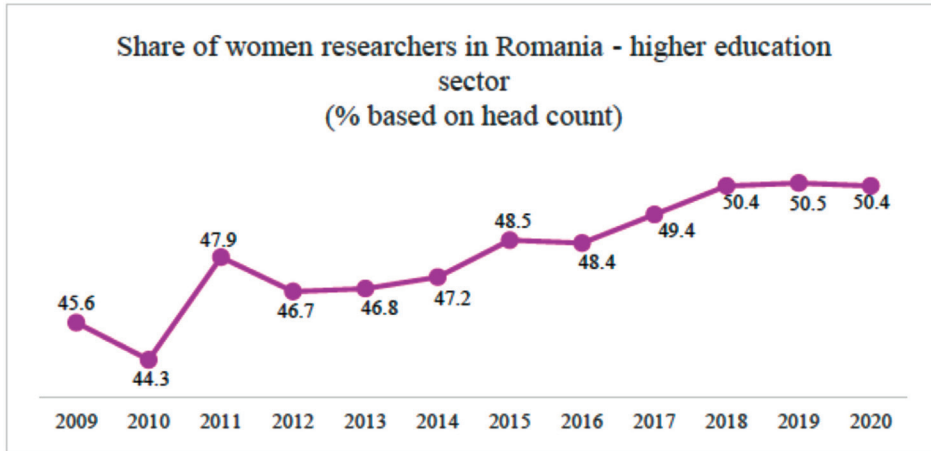


Fig. 13 Share of woman researchers – higher education sector

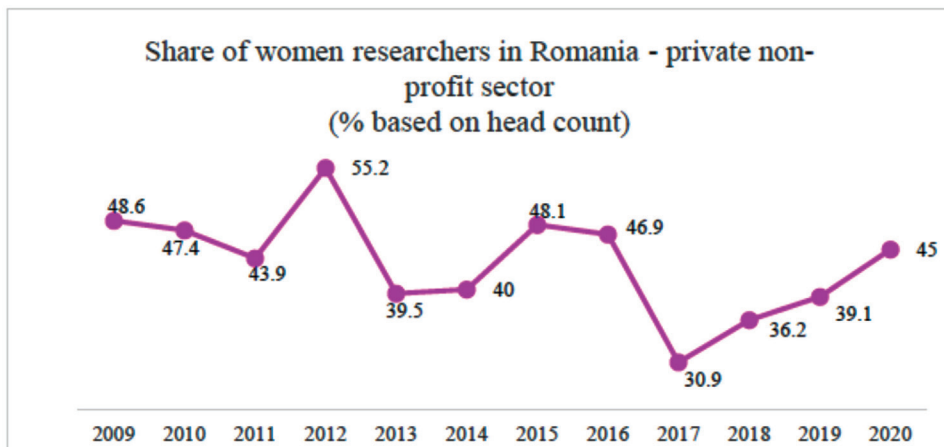


Fig. 14 Share of woman researchers – private non-profit sector

CONCLUSIONS

Research and development activities are essential to our society in its way to become a digital society. Business enterprise sector, government sector, higher education sector, and private non-profit sector are contributing by their employees to the creation of that society. Besides expenditure we need performant personnel in order to advance in the future and women researchers are very important in this process.

ACKNOWLEDGEMENT

This article is original research and has not been published elsewhere.

ENDNOTES

- [1]<https://ec.europa.eu/eurostat/web/main/data/database>, last retrieved 27 February 2023.
- [2]https://ec.europa.eu/eurostat/cache/metadata/en/rd_esms.htm, last retrieved 27 February 2023.
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