

English Title Will Be Analysis of the Effects of Birth-Rate and Fertility on Romania's Labour Market

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Abstract

Romania in the past decades traversed a multitude of social and economic changes reflected in the increasing efficiency of its labour market in utilising and integrating young employees between the ages of 15 and 24 years old. This age group represents, in a broad economic view the future generations that will populate the labour market in the coming decades. Due to the effect of declining birth rates and lower fertility numbers this group is projected to shrink gradually. Thus, weakening over time, the total mass of adults that comprise the effective core of employees active on the labour market at one time or another. This decline is a direct result of population ageing through a decline in birth rates and fertility rates.

Aim The aim of this paper is to explore the correlation and influences through a linear regression model between birth rates, employment rate and unemployment rate on the current status of Romania's labour market.

Method: The method used to present the links and influences is a linear regression model coupled with correlation analysis.

Findings: The expected results are that with the decline in birth rates and fertility a decline in the share of employees between the ages of 15 and 25 years old will occur.

Keywords: Population Aging (PA); Employment Rate (ER); Crude Birth Rate (CBR); Fertility Rate; Unemployment Rate (UR).

1. Introduction

One of the most important segments of the population is the segment comprised of people between the ages of 15 and 24. This group will go on to be educated and take an active role in society and the labour market replacing older generations that are approaching retirement age. This segment is also one of the most vulnerable, requiring financial assistance and guidance from guardians. Also, an early involvement on behalf of this group in the labour market is crucial since Romania, is suffering from a decline in labour resources.

This paper analyses the relationship between fertility and birth-rate on the share of the population age 15 to 24 years of age, using a Multiple Regression analysis model, and also takes a look at the correlation between this age group and the employment and unemployment. The primary focus is to determine the degree to which fertility and birth rate influence the evolution of the population share 15 and 24 years old and also to see the correlation between this age group and the leading indicators that track labour market participation.

This is significant for two reasons, first, an understanding of the importance that birth rate and fertility have at a national level over the labour market and secondly the degree to which the decline in individuals between 15 and 24 years old is reflected through the main indicators of labour market participation.

The expected results are the existence of a strong influence of fertility and birth rate on the population and a strong correlation between a shrinking population and declining participation in the workforce. A decline in the number of young participants in the labour market is crucial since it signals a possible disruption in labour supply in the near future.

2. Literature review

The composition of Romania's population has seen two types of demographic transformations defined by rapid ageing and a decline of individuals that comprise younger generations. The improvements in hygiene and medical services have helped to boost life expectancy from 65.9 years to 71.7 years for men and from 70.4 years to 79.1 years for women (INS, 2018).

The average age of Romania's labour force is locked in an upward trend. This process began in the early 1990s and continued to accelerate in the coming decades. Between 1991 and 2018, the median age of employees that have an active role in the labour market rose by approximately 0.2 years for men and women per year resulting in an overall increase of six years for men and five years for women (INS, 2018).

An increasing share of women in Romania is mirroring global tendencies of investing more time and resources in furthering education in the detriment of reproductive behaviour. This investment in human capital tends to delay stability in couples and procreation tendencies.

Declining fertility rates and lower birth-rates are presented in the literature as one of the main factors of demographic ageing and population decline (Easterlin, 1968). Economic development models incorporate the influence of fertility on future labour supply, proving for the most part that a decline in fertility rate over a more extended period of time will decrease the number of active participants in the labour market while also affecting production (Borjas, 2000; Cramer, 1980; Cain, 1966; Fisher & Rhodes, 1979).

Parents see younger generations as alternative saving vehicles since they hey transfer savings as social and financial aid to parents as they grow older (Qiao & Wang, 2016).

3. Demographic Changes in Romania

The past two decades have witnessed an accelerated demographic transition that saw a decline in new-borns and fluctuating birth rates that moved gradually lower reflecting a shift in the structure and size of Romania's population. In the same time, a rise in living standards correlated with an increase in the quality of social and medical services drove up the median age of the population causing a rise in population of 65 years and older.

The figure below presents the trade-off in the structure of Romania's population between young generations and elderly generations that left active life and have a decreased involvement in societal wellbeing. The share of the population between 0 and 19 years old has been declining in an alarming manner beginning shortly after the fall of the Socialist regime in Romania. In 1990 the share of the population between 0 and 19 years started declining from 31.9% to a level of 26% in 2000, this decline started to slow down reaching in 2006 a share of 23.9%. Beginning with 2008 the share of the population between 0 and 19 years saw a sharp decrease to 22.7% of the total population and 21.4 % in 2009. This trend was continued until the end of the period in question, reaching a low of 21% in 2016.

The share of the population with an age of 65 years old and more, between 1990 and 2018 saw an increase in total numbers, from 10.3% in 1990 to 14.1% in 2003. Between 2007 and 2009 a sharp increase can be observed from 14.7% to 16.1% and finally reaching a peak for the entire period of 18.2% in 2018 of the total population (Figure 1).

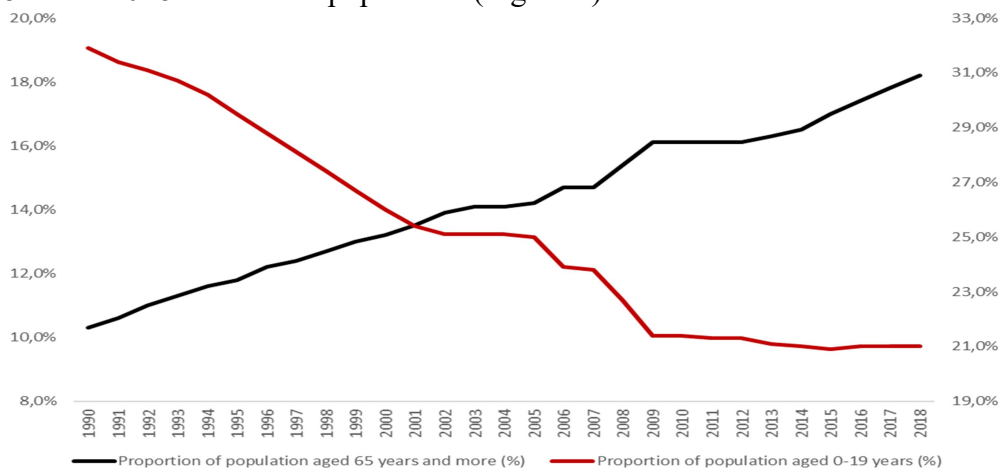


Figure 1. Share of population 0-19 years and 65 years and more of total population between 1990 and 2018
Source: Own creation based on EUROSTAT Data

Figure 2 presents how the median age of the population evolved between the period of 1990 and 2017, the general trend is an ascending one starting from a median age of 31.4 years for men and 33.7 years for women at the beginning of the '90.

Between 1991 and 1999, the median age rose steadily from 31.6 years for men and 34 years for females. In 2005 a sharp rise in median age can be observed to a level of 34.2 years for males and 37.4 for females this trend continued until the end of the period reaching peak values of 40.2 years for males and 43.5 years for females in 2017.

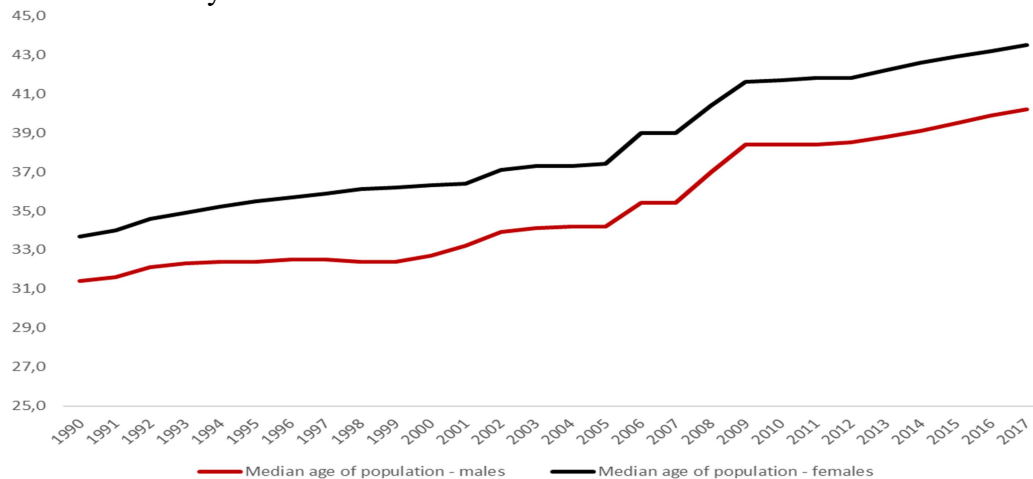


Figure 2. The median age for males and females in Romania

Source: Own creation based on the Romanian Institute of Statistics Data (INSSE).

4. Research methodology

The labour market in Romania is shrinking at a rapid pace mainly due to the decline in fertility and birth rate. This decline will have a stronger impact on young employees that will replace elderly employees who will retire in the near future.

The data sets used in the analysis are time series collected between 1990 and 2017 from Eurostat and are comprised of fertility levels, total birth rate and share of population age 15 to 24 as a percentage of the total population.

Regression analysis “is probably one of the oldest topics in mathematical statistics dating back to about two hundred years ago. The earliest form of the linear regression was the least squares method” (Xin 2009, p.2).

The statistical technique of regression analysis is generally used to reveal the link among variables that present a cause and effect pattern. A regression analysis can present the relationship between two variables, a dependent and independent variable, this is also known as a univariate analysis, or the relationship between a dependent variable and at least two independent variables, also known as multilinear regression (Freedman, 2009).

The multivariate regression analysis model utilised in this paper is as follows (1.1) (Xin, 2009):

$$y = \beta_0 + \beta_1 x_1 + \dots + \beta_n x_n + \varepsilon \quad (1.1)$$

where:

y - dependent variable;

x_n - independent variable;

β_n - parameter;

ε - error.

When running a multiple regression analysis, the main intent is to determine the level of variation of the independent variables on the dependent variable (Lindley, 1987). In the process of running a regression analysis, a series of statistical tests will be employed to verify the validity and relative fit of the model (Lindley, 1987).

The test will be run through SPSS and will verify the assumptions that “there should be homoscedasticity of residuals (equal error variances); there should be no multicollinearity; there should be no significant outliers, high leverage points or highly influential points; and the errors (residuals) should be approximately normally distributed” (Laerd, 2019).

5. Results and discussion

For a more clear view of the the effects that a declining birth rate and fertility rate might have on the overall size of a young cohort between the ages of 15 and 24 that comprise the labour market we will observe firstly the change in time of the the share of population of individuals of 15 to 24 years as a percentage of the total population.

Between 1990 and 2018 as can be observed in the figure below, the share of individuals between the ages of 15 and 24 years old that continue to replace and cover the requirements for labour resources is gradually shrinking from a high value of 17.4% in 1992 to a level of 10.6% in 2018. This trend is likely to continue unless there is a correction in birth rates and fertility rates.

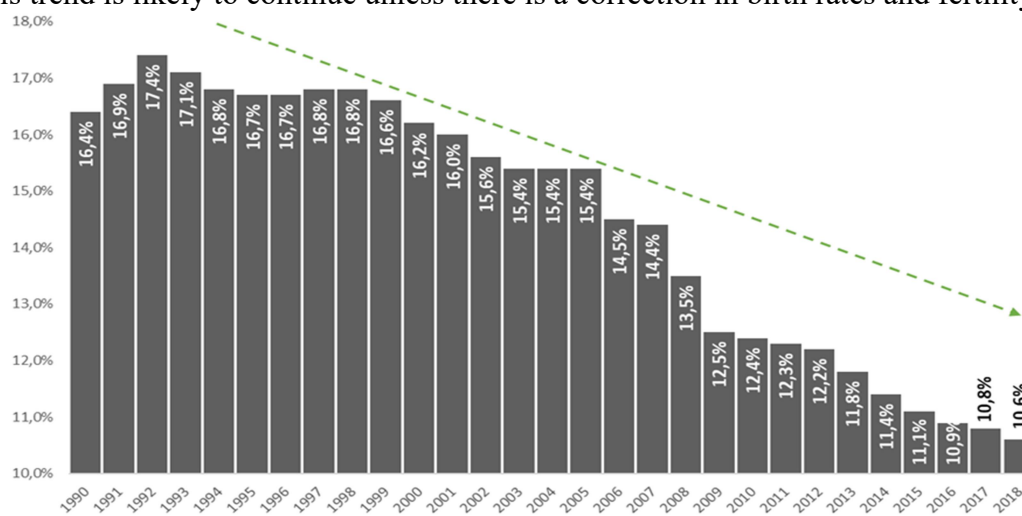


Figure 3. Share of population 15-24 years as % of the total population between 1990 and 2018

Source: Own creation based on EUROSTAT Data

A multiple regression was run to determine the variation that fertility and the total birth rate have on the proportion of population age 15-24 years as % of the total population.

The first step was to determine the existence of linearity, this was achieved with the help of partial regression plots and by calculating and plotting the studentized residuals against the predicted values (Draper & Smith, 1998). The second step was to determine the independence of residuals, this was done by performing the Durbin-Watson test, that offered a result of 1.823 as per the guidelines the resulting value indicates that there is a slight autocorrelation (Durbin & Watson, 1981).

The next step was to assess the existence of homoscedasticity, this was done by plotting the studentized residuals against the unstandardized predicted values, confirming the existence of homoscedasticity. The tests for multicollinearity, proved negative as revealed by tolerance values higher than 0.1. Also, there were no studentized deleted residuals greater than ± 3 standard deviations, no leverage values greater than 0.2, and values for Cook's distance above 1. By plotting a Q-Q Plot, validation was met on the assumption of normality (Marno, 2012).

The results of the multiple regression model proved statistically significant predicting the Proportion of population age 15-24 years as % of the total population, $F(2, 24) = 806.250$, $p < .0005$, adj. $R^2 = .976$. The variables utilised in the model added statistical significance to the prediction, $p < .05$. Regression coefficients and standard errors can be observed in Table 1.

Table 1. Summary of Multiple Regression Analysis

Variable	B	SE _B	β
Intercept	13.832	0.806	
Fertility	-10.181	0.450	-0.685*
Birth rate total (thousands)	0.070	0.003	0.827*

Note. * $p < 0.05$; B = unstandardized regression coefficient; SE_B = Standard error of the coefficient; β = standardized coefficient

The decline in the size of the population is mostly reflected in younger age groups between the ages of 0 to 19 years old and also in the main group of 15 to 24 years old. This second group is important since it represents the main supply of labour that is destined to cover demand. Also, this group participates to a significant extent in the labour market in one form or another, this group also is pursuing increasing investments in human capital through the education system. To get a better view of the influence a decline in the primary age group of 15 to 24-year-olds might have on employment and unemployment, we will run a Pearson Correlation.

Table 2. Summary of Correlations

Variable		Proportion of population aged 15-24 years (%)	Employment 15-24 of total population (%)	Unemployment 15-24 of total population (%)
Proportion of population aged 15-24 years (%)	Pearson Correlation	1	0.820**	0.625**
	Sig. (2-tailed)		0.000	0.003
	N	21	20	20
Employment 15-24 of total population (%)	Pearson Correlation	0.820**	1	0.693**
	Sig. (2-tailed)	0.000		0.001
	N	20	20	19
Unemployment 15-24 of total population (%)	Pearson Correlation	0.625**	0.693**	1
	Sig. (2-tailed)	0.003	0.001	
	N	20	19	20

** . Correlation is significant at the 0.01 level (2-tailed).

The decline in the share of 15 to 24-year-old individuals, presents a strong link with the number of individuals that are employed, the analysis presenting a strong correlation of 0.8 and a significant correlation with unemployed of 0.6 (Table 2). To offer more perspective, Employment and Unemployment in regards to the share of Population between 15 and 24 years are both in decline due to the fact that a smaller number of individuals are seeking work, also this decline in the total number of individuals between the ages of 15 and 24 is causing less Unemployment.

6. Conclusion

The decline in fertility and birth rates are the main factors affecting the size and structure of the workforce in Romania in the present time and in times to come. One of the primary causes that result in declining birth rates and fertility can be linked as many authors suggest to the decision on behalf of women to postpone giving birth in favour of pursuing a higher level of education and also a greater degree of financial stability (Tao et al., 2018; Bell & Rutherford, 2013; Luiten, 2019).

The decision to pursue higher education on behalf of individuals is one of the principles of progress in social and economic areas, it has been proven that there is an active link between education, productivity and economic growth (Luiten, 2019). Also, with a higher standard of living the pursuit for greater social responsibility can be observed. The segment of the population between the ages of 15 and 24 years old represent the portion of the population that is preparing or engaged in active roles in the economy through production or transferred purchasing power.

As a consequence of a decline in reproductive choices, this segment of the population is shrinking from 17.4% in 1992 to 10.6% in 2018. This decline is determined mainly by the choices

of young couples to delay childbirth, in favour of utilising accumulated financial capital in altruistic proposes (Bell & Rutherford, 2013).

The Proportion of the population between the ages of 15 and 24 years old is also less productive than the older generation, thus there exist on part of employers a reluctance to hire since it is seen as a diminishing return on human capital investments (Luiten, 2019). Because of these factors, the Employment of individuals between the ages of 15 and 24 is in decline, this is an important aspect since it results in transfers from older generation causing an imbalance in spending patterns and a decline in accumulated savings. On a longer timeframe, the consequences of the declining share of 15 to 24-year-old individuals may result in a slow down of economic activity, and a fall in productivity since the number of active workers will shrink.

More active measures on behalf of Romania's government are necessary to encourage higher birth rates, this can be accomplished by way of financial and social incentives.

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