Analysis of the impact of the demographics trends on the economic growth in four of the Nordic countries

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Abstract

The purpose of this article is to find out the impact of the demographics on the economic growth of four Nordic countries: Denmark, Finland, Norway, and Sweden. These countries were chosen because they have relatively similar economic, social, and cultural models. They have similar patterns in terms of economic growth and population growth in the 40 years considered period (1961-2021). In order to find out other authors' opinion on this theme, a literature review was conducted.

A linear regression using EViews 8 software was conducted, where the dependent variable is GDP and the independent variables are young age dependency ratio, old age dependency ratio, total dependency ratio, fertility rate, birth rate, mortality rate, life expectancy, net migration rate and population 20-64. The following tests were performed in EViews 8 and SPSS: Descriptive Statistics, correlations of the dependent variables with the independent variables, Unit Root Tests, linear regression using Ordinary Least Squares Method and collinearity test.

The results are the following: life expectancy, net migration rate and the population 20 to 64 have a positive influence on GDP, while fertility rate and mortality rate have a negative influence. The only result which is contradictory with the previous studies is the negative influence of total dependency ratio. It could be explained by the fact that, in contrast with the other models, the Nordic model combines efficiency with equity.

According to the authors' knowledge, this is the first study on the impact of the demographics on the economic growth in the Nordic countries.

The main practical implication is studying the Nordic model, which is the most performing model, the only model which combines the efficiency with the social equality, to study which indicators influence the economic growth of the Nordic countries, so the authorities could apply these lessons on their own countries.

Keywords

Demographics, economic growth, nordic countries, GDP, dependency ratio, life expectancy, net migration rate

Introduction

There is an ongoing debate for more than a century on the impact of the demographics on the economics and this debate divide the researchers in optimists, pessimists, and neutrals. Those considered as optimists stress that maintain or increase of population is benefit to economic development because it increases the size of labor force and positively influences markets equilibrium, it promotes productivity, innovation and make possible the effects of economy of scale. Pessimists consider that increasing the number of populations could be detrimental to economic development because it puts more pressure on the exploitation of natural resources, on public expenditure and on pension systems. Neutrals believe that

when consider other explanatory variables of the economic development like country size or technological development, the demographic influence on economic growth is diminished.

Several theories had been developed to explain the impact of the demographics on the economics: the life cycle theory (Franco Modigliani and Richard Brumberg) in the 1950's, the human capital theory (Gary Becker and Theodore Schultz) in the 1960's, the structural change theory (Simon Kuznets and Luigi Pasinetti) in the 1980's. The life cycle theory states that people will borrow when their income is low and save when their income is high, thus paying previous debs from their initial education and saving for their future retirement. The human capital theory states that investment in personal education is a premise for better skills, higher income, and later better pension. The structural change theory states that labor productivity does not depend only on the age, education, and skills of the workers, but on the stage of the economy as well, in some stages of the economy younger workers can be more productive, while in other stages the more experienced workers prove to be more productive.

The aim of the authors was to evaluate the impact of the demographics on the economic development of four Nordic countries: Denmark, Finland, Norway, and Sweden. These countries were chosen due to their similarities in terms of economics (they are among the richest and competitive countries), economic model (their economies follow the Nordic model), social (they have similar HDI and GINI indexes), cultural (they share a Scandinavian culture).

Figure no. 1. GDP growth rate in the 1961-2021 period
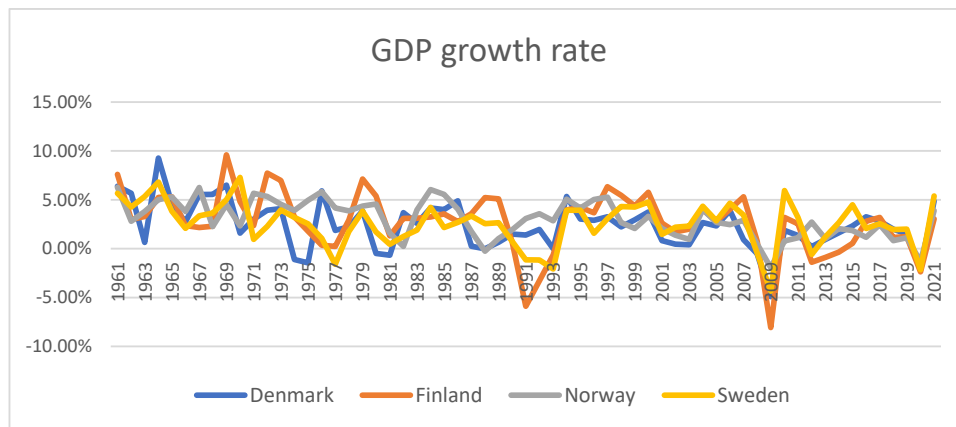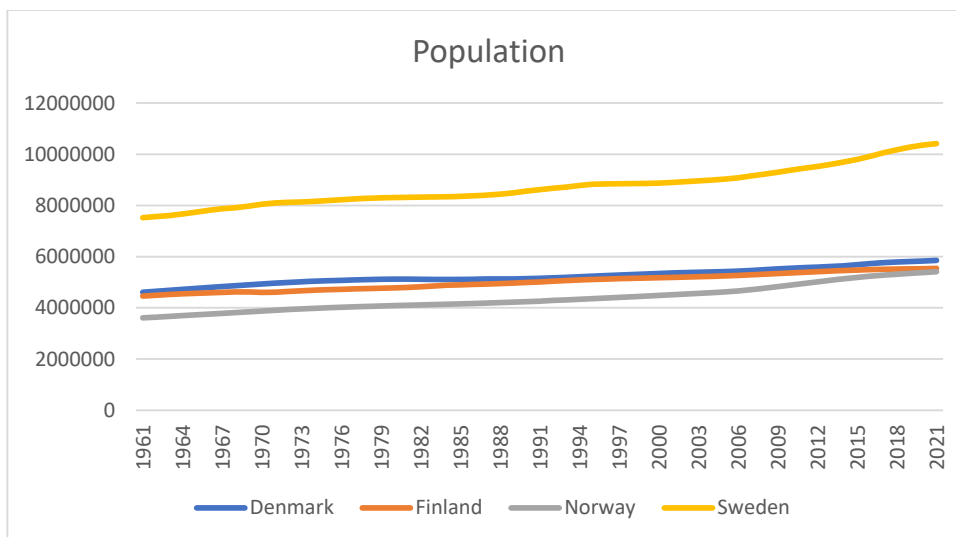*Source: Authors' figure based on World Bank data, https://data.worldbank.org/*

Figure no. 2. Population growth in the 1961-2021 period
Source: Authors' figure based on World Bank data, https://data.worldbank.org/

Figure 1 and Figure 2 display similar patterns in terms of economic growth, as well as in terms of population growth in the considered period.

1. Review of the scientific literature

Malthus (1872) showed that population and living standards are negatively correlated, if the population is increasing, the available resources for each person are decreasing. Simon (1977) concluded that better educated workers will be more productive and determine a greater economic development.

Simon (1981) proved that the scarcity of the available resources would led to higher incentives for humans to discover substitutes or alternative resources and to adapt their behaviors accordingly and stressing the human capital is one of the most valuable resources.

Bloom and Williamson (1998) found that the economically active population (aged 15-64) exert a strong positive impact on GDP per capita growth rate. Their findings were later confirmed by Beaudry and Collard (2003) for the most developed countries.

Mason (1988) reported that the age distribution pattern is influencing the savings and therefore the economic growth. Kelly and Schmidt (1995) concluded that population size have a transitional impact on economic growth.

Bloom et al. (2003) showed that another demographic factor, the fertility rate, could influence the economic growth, the decreasing of the fertility rate determine a larger working population and a smaller dependent population. Bloom et al. (2003) founded that population growth has no significant influence on economic growth.

Batini et al. (2006) proved that the impact of the structured age population on the economic growth depends on how developed the country is. Dyson (2013) has identified demographic factors such as fertility, life expectancy and age composition, which affect economic growth, life expectancy being positively correlated with economic growth and in 2014 proved that the lower the mortality rate, the higher the GDP per capita is.

2. Data and findings

The following independent variables were considered:

YDR - young age dependency ratio: population aged under 20 / population aged 20-64

ODR - old age dependency ratio: population 65+ / population aged 20-64

TDR - total dependency ratio: population under 20 and over 65 / population aged 20-64

Data for dependencies ratio are from: https://stats.oecd.org/Index.aspx?DataSetCode=HISTPOP#.

Fertility rate represents the number of children that would be born by a woman if she was to live to the end of her childbearing years and bear children in accordance with age-specific fertility rates of the specified year.

Birth rate is the ratio between the number of live-born births and the average population in a year.

Mortality rate is the ratio between deaths and individuals in a specified population and during a year.

Life expectancy refers to *the number of years a person can expect to live.*

The net migration rate is the difference between the number of immigrants and the number of emigrants divided by the population.

The data for these variables are from https://www.macrotrends.net/global-metrics.

Population 20-64 means the population aged 20 to 64.

The dependent variable is GDP.

The data for population and GDP are from https://data.worldbank.org/indicator.

3. Research methodology and results

EViews 8 was used to perform the statistics, the tests, the correlations, and the regression.

Table no. 1. The descriptive statistics for the variables

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Pop20-64	244	2000377	5890160	3396278.67	1030388.347
YDR	244	37.1154237341429	70.7136344446720	46.162472377994554	7.748955204609378
ODR	244	13.6993558037577	40.6670170325295	25.939680873874362	4.991740437089232
TDR	244	62.5819579056311	84.9961606101376	72.101748481946970	5.514065115211279
GDP	244	587251643246.011000000000000	4815899000000.0000000000000000	1867282311165.406500000000000	921639537188.893700000000000
Fertilityrate	244	1.35	2.98	1.8713	.32902
Birthsrate	244	8.3	18.4	12.793	2.1483
Mortalityrate	244	7.5	12.1	9.945	.8377
NeiMigRate	244	-4.267	8.797	2.01475	2.084738
PopGrowRate	244	-0.38%	1.32%	0.4987%	0.27228%
Life Expectancy	244	68.72	83.03	76.7298	3.40282
Valid N (listwise)	244				

Source: Authors' table based on EViews output

Table no. 2. Correlations of the dependent variable with the independent variables

Independent variable	Correlation coefficient with GDP
Population	0.675
Population 20-64	0.688
YDR	-0.657
ODR	0.717
TDR	-0.217
Fertility rate	-0.386
Births rate	-0.576
Mortality rate	-0.265
Net Migration	0.776
Life expectancy	0.868

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

Source: Authors' table based on EViews output

According to the theory, fertility rate, mortality rate, TDR, YDR, ODR are expected to have negative signs and all the other coefficients should have positive signs.

First, a Unit Root Test was conducted to make sure that time series are stationary, and the regression will return robust results.

Table no. 3. The results of the Unit Root Test

Has no unit root	Test for Unit Root in	Probability	Test for Unit Root in	Probability
BIRTHSRATE	Level	0.0065		
FERTILITYRATE	Level	0.0002		
GDP	Level	0.6444	1st. Difference	0.0000
Life_expectancy	Level	0.1386	1st. Difference	0.0000
Mortalityrate	Level	0.5456	1st. Difference	0.0000
Neimigrate	Level	0.0326		
ODR	Level	0.0344		
POP20_64	Level	0.9760	1st. Difference	0.0000

POPGROWRATE	Level	0.0479		
TDR	Level	0.1878	1st. Difference	0.0000
YDR	Level	0.1167	1st. Difference	0.0000

Source: Authors' table based on EViews output

A regression was performed for the above-mentioned variables. Then, the collinearity tests were run and after solving the multicollinearity issues, the results were as follows:

Table 4. Ordinary Least Squares Output

Dependent Variable: GDP
Method: Least Squares
Date: 04/07/24   Time: 17:43
Sample: 1 244
Included observations: 244

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-9.47E+12	9.94E+11	-9.521447	0.0000
FERTILITYRATE	-2.07E+11	7.65E+10	-2.706560	0.0073
LIFE_EXPECTANCY	1.40E+11	1.14E+10	12.29903	0.0000
MORTALITYRATE	-1.53E+11	2.63E+10	-5.817805	0.0000
NEIMIGRATE	6.52E+10	1.74E+10	3.742172	0.0002
POP20_64	385307.5	21586.14	17.84976	0.0000
TDR	1.45E+10	4.32E+09	3.361141	0.0009

R-squared	0.901675	Mean dependent var	1.87E+12
Adjusted R-squared	0.899186	S.D. dependent var	9.22E+11
S.E. of regression	2.93E+11	Akaike info criterion	55.67051
Sum squared resid	2.03E+25	Schwarz criterion	55.77084
Log likelihood	-6784.802	Hannan-Quinn criter.	55.71091
F-statistic	362.2305	Durbin-Watson stat	0.101313
Prob(F-statistic)	0.000000		

Source: Authors' table based on EViews output

Discussion and conclusions

Fertility rate is negatively correlated with the GDP, because fewer children in a family lead to a higher chance for a better education for children, better care services, better nutrition, therefore later on, these children will become more educated and more skilled adults, with higher income and higher social status, so they will be more productive, more innovative, therefore the GDP they contribute to will be greater. On the other hand, women with fewer children will be more involved in the labor market, will dedicate more time to professional development and will contribute more to GDP.

Mortality rate is negatively correlated with GDP, because the lower the mortality rate is, more people will be in the labor market, the health system offers proper solutions, the elderly carrying is functioning.

Life expectancy is positively correlated with GDP, because living a long and a prosper life, one have a better chance to bring an added value to the society and to the economy according to their abilities and interests.

Net migration rate is positively correlated with GDP, because there are more immigrants than emigrants, and these immigrants fill in the vacant positions in economy and contribute to the host country economy, so that their live will be better, and they can help their family to prosper.

Obviously, the population aged 20 to 64, being the working population, is actually making the GDP through their daily work.

All the above results are consistent with previous studies and theories, yet TDR result is contradictory. It could be explained by the specificity of the Nordic economic model, which successfully combines economic efficiency with social equality.

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