Demographic Dividend Economic Development in Arab Countries

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Abstract

The demographic dividend is the window of opportunity provided by changes in the age structure of a population. It occurs because of the decline of both fertility and mortality rates. Data from the World Bank are used for descriptive statistics, regression analyzes with and without robust standard-errors, in addition to performing Granger-Causality tests. The results indicate that estimated time trends for fertility and mortality are significantly decreasing for Arab countries. Findings also indicate that the demographic dividend has occurred in the recent decade in most of Arab countries except for Egypt. This paper shows also the causal links between the dependency ratio (change in the population age structure) and the working age population, unemployment, economic development, government and private expenditures on health and education, education, and female participation in education variables.

Keywords: Demographic Dividend, Arab Countries, Granger Causality.

JEL: J11-J13-O11.

Introduction:

Economies today are more globalized and open to migration in addition to technological and institutional innovation. While most economies have been benefiting from low fertility and mortality rates, others are still seeking to benefit from the shifts that allow demographic dividends with their likely impact on economic development.

Recent studies on the demographic dividend analyzed groups of countries with different income levels, and indicate that low and upper middle income countries are still facing the beginning of this window of opportunity, which is not the case of high income economies (Lee and Mason, 2012). Contributions also indicate that the demographic transition in emerging countries benefited only Russia, India, and China,

but not Brazil (Berlin Institute, 2012; Stampe, Porsse, and Portugal, 2011; Brito and Carvalho, 2013) while in developed countries, gains and economic growths account for values that ranges from 5 to 45% (Mason, 2005; Lee & Mason, 2006; 2010; Mason & Lee, 2007; 2011). But for countries in Sub-Saharan Africa, they did not take advantage from the demographic dividend, as they need reforms to enhance the human capital (Drummond, Thakoor, and Yu, 2014; Loewe, 2007).

During these recent decades, Arab countries have been through a demographic transition. This latter is characterized by the shift from higher rates of fertility as well as higher rates of mortality to lower values, and resulted in a switch from population with large base pyramids, or expansive pyramids, to either constructive or stationary base.

The population size of Arab countries has been growing over the past decades. This is mainly because of the combined effects of the less rapidly declining fertility rates and the rapidly decreasing mortality rates. This is likely to continue in the near future according to population forecasts of the World Bank (2016).

These demographic changes are referred to as demographic dividend or demographic window of opportunity, as more resources are allocated for younger generations in education and health besides higher labor supply. This population transition can achieve rapid economic growth when the dependency ratio, which is the ratio of the non-active population divided by the active population, reaches lower values.

Recent research has been debating the influence of the age structure of a given population on a macroeconomic level. For this, Bloom and Canning (2004) demonstrates through a cross-country analysis that a promising age structures impact the increase of income per capita as well as income growth.

The current research focuses on providing the potential magnitude of the occurrence of the demographic dividend in Arab economies besides analyzing the effect of the population change on educational and macroeconomic variables.

The questions that could be raised at this stage of the research are:

- Are the trends of fertility rates and mortality rates significantly decreasing in Arab economies?

- Do Arab population dynamics result in the occurrence of demographic dividend?
- Do the demographic transitions in these countries impact economic growth, educational, and social variables?

This paper introduces a literature review of the demographic dividend. This is followed by the selected theoretical framework that is used for the empirical methods applied to the data mobilized. The results of the fertility and mortality trends, the estimation of the demographic dividend, and the causalities by the population change in Arab countries are introduced. The last part of the paper focuses on an overall discussion and conclusion.

I. Literature Review:

Kirk (1996) discusses the change of population structure in its theory of demographic transition that occurs when countries have decreasing rates of fertility and decreasing rates of mortality. This change in the population composition generates an economic opportunity of growth, as there will be fewer needs for investments to meet the youngest segment and thus the remaining resources will be targeting family welfare and economic development (Ross, 2004).

Galor and Weil (2000) indicate that within each country, the demographic transition has many stages. The first stage is noticeable when the population growth becomes negatively correlated with the economic development. This is followed by a decline in child mortality besides the decrease of fertility rate. At this latter stage, the children are perceived as “consumption” rather than “investment”, and greater emphasis targets the quality of health and education, which increase the productivity on the longer run (Rosenzweig, 1990; Soares, 2005).

The contributions of Bloom, Williamson (1998) and Bloom, Canning, and Sevilla (2003) indicate that any change in the age composition of a population within a country can have an impact on its economic performance (Williamson and Higgins, 2001; Bloom, Canning, and Sevilla, 2003). Findings also indicate that if the growth rate of the active population is higher than the growth rate of the overall population, it impacts the economic development positively due to a higher labor supply (Bloom et al, 2013; Bloom and Canning, 2003).

The contributions of Lee (2003) and Galor (2005) show that the increase in the active population results in a decrease of the number of dependents –the populations of the age groups between 0-15 and 60 years or more- within economies. This leads to an enhancement in the economic outputs, savings, and investments. Bloom et al. (2009), Soares and Falcao (2008) indicate that this demographic transition also supports female participation in the labor market besides savings.

Some authors indicate that the demographic transition is the key driver of the success of some Asian countries (Bloom et al., 2000; Mason, 2001) while others expect that this is yet to take place in Africa (Bloom and Sachs, 1998; Bloom et al., 2003).

The demographic transition leads to achieving the demographic dividend (Carvalho and Wong, 1999; Pool, 2007). But in order to achieve this window of opportunity, proper policies are of prime importance, as without monitoring and adapting these policies on the population change, social risks and unemployment may occur (Bloom and Canning, 2000; Bloom et al., 2003, 2007; Lorentzen et al., 2008).

Contributions have been done to test for the occurrence of the demographic dividends in many economies. In the case of India, the change in the population composition has occurred, but it is not homogeneous among all of its states (Thakur, 2012; Drummond, Thakur, Yu, 2014). Findings also indicate the impact between the change in the age structure and economic development is conditioned by the presence of good policies and how the BIMARU states are willing to reform their economy. But Majumder (2013) assesses the link between the demographic transition and youth unemployment. Results indicate that if the Indian policy makers do not relook at the human capital development, education, and skill formation, the demographic opportunity will turn into a threat.

Ven and Smits (2011) assess the demographic dividend in 39 developing countries. Findings indicate that the demographic transition is currently occurring in developing countries with higher rates than developed countries. In addition to that, a high ratio of working age population relative to total population positively affects the economic growth while it is the opposite of a high ratio of youth or elderly dependency ratio.

The contribution of Medina and Chager (2015) uses panels data model to analyze the elements to be prioritized in the African political agendas to take advantage from the

demographic dividend as well as to reduce poverty. Results indicate that the Sub-Saharan Africa needs to enhance the employability and human capital throughout education, foster women participation in the job market, besides enhancing health conditions. Drummond, Thakoor, and Yu (2014) support these latter findings.

In the case of Arab countries, some contributions (United Nations, 2003; El-Khouri, 2016; Crane et al., 2011; Englelhardt and Schulz, 2017) indicate a descriptive analysis of the patterns of the demographic change in Arab economies. They also indicate the patterns of the death rates, birth rates, population growth, international migration, fertility rates, and life expectancy besides the trends of the share of the young population.

The United Nations (2016) introduces the occurrence of the demographic dividend in Arab regions. This contribution estimates the time span, or the opening and closing year, of this window of opportunity. For Morocco, Libya, Algeria, and Tunisia the opening year of the demographic dividend is 1981, while the closing year is 2019 for Tunisia, 2021 for Algeria, and 2025 for Morocco and Libya.

Still, there is a lack of contributions that are directly linked to the demographic dividends in Arab economies besides the lack of contributions that analyze the impact of the demographic transitions on economic, social, and educational variables.

II. Theoretical Framework:

The theoretical framework introduces the demographic transition theory, followed by the definition of the demographic dividend. The last part of this section introduces the theoretical model of the relationship between the income per capita and economic growth, which is the basis of the demographic dividend simulation.

The demographic transition theory was first introduced by Kirk (1996) and defines the evolution or modernization of societies from the pre-modern regime to a post-modern. This is explained by the transition from higher rates of fertility and mortality rates to lower ones besides the increase in life expectancy in a given country. Every country experiences this phenomenon at different time periods. It first started in North Western Europe followed by the Eastern and Southern Europe. But for low-income countries, or developing countries, this demographic transition did not take place until the beginning of the twentieth century (Lee, 2003).

The contributions of Kirk (1996), Lee (2003), and Davis (1963) divide the demographic transition into three main stages. The most important characteristics of the first stage are the high fertility rate and high mortality rate. This is followed by the decline of mortality, as a result of health enhancement besides the improvements of agriculture and transports. The final phase is characterized by a decrease in fertility rates.

The population pyramid has different forms in each of these stages. At the beginning, it has a long base, as the median population age is very young. At the second stage, it becomes flatter at its top and the number of young dependents increase. But when fertility rate decreases, the population growth is kept at check, and the median age population becomes higher.

The demographic shift or demographic transition due to the decreasing rates of mortality and fertility can lead to the demographic dividend, which is benefiting from the change of the population composition to reach an accelerated economic growth due to the larger share of the active population and decreasing trends of the number of total dependents within the country (Gribble & Bremner, 2012).

In addition to that, the demographic dividend can also be explained by the reallocation of governments' expenditures and savings.

The population in a given country is divided into many age-group categories. If we assume that there are only three main sub-groups that are S_1, S_2 and S_3 at the time period t_1, these sub-populations size are going to be subject to a change in a different period of time to be S_1', S_2', and S_3' at t_2.

The shift of each group size is defined by a change that is represented by the given formula:

$$\Delta_n = \frac{S_n' - S_n}{S_n}$$

This change suggests that in the case of Δ_1 and Δ_2 are negative, the younger population at t_1 has more education, more health expenditure, and more consumption. This also indicates that the decrease of the population size of these groups will result

in more government savings for that country, which will enhance the education and the health for the younger generations at t_2.

The demographic dividend is a phenomenon that has a limited period of time, because as the large active or adult population will move to the oldest segment, there will be less cohort that were born during the period of the declining fertility, and concern will relate to taking care of the elderly (Ross, 2004).

Some contributions indicate that the demographic dividend needs to be accompanied by good policy choices so that economies can take advantage from it rather than being subject to economic and social threats such as unemployment. Bloom et al. (2002) indicates that in order to translate the demographic into a gift for any economy, there should be a prioritization of some variables such as health, education, and family planning. This depends only on the institutional environment and the established policies.

The estimation of the relationship between the per capita income and economic growth is borrowed from the model of Barro and Sala-i-Martin (1995, 2004). This model is used in several other contributions (Mody & Aiyar, 2011; Bloom and Canning, 2004).

The model uses a conditional convergence equation to derive this relationship by the use of the following formula:

$$g_z = \lambda(z^* - z_0)$$

Where:

z^*: is the steady state of the income per worker;

z_0: is the initial income per worker;

g_z: is the growth of income per capita;

and λ: is the speed in which the country converges to its steady state level.

As the steady state of income per worker is defined by the use of many variables that impact the productivity, the formula is rearranged to be:

(1) $$g_z = \lambda(x\beta - z_0)$$

x represents all the variables that affect the workers' productivity and β represents its corresponding coefficients.

Bloom and Canning (2004) theorized the relationship between the working age population or active population and the economic growth using variables of interest. This latter model is given in the following formula:

(2) $$\frac{Y}{N} = \frac{Y}{L}\frac{L}{WA}\frac{WA}{N}$$

where the GDP per capita is written in terms of total income (Y) divided by the total population (N). This formula is further expanded in terms of labor force (L) and working age population (WA).

When substituting for:

$$\log(\frac{Y}{N}) = y;\ \log\left(\frac{Y}{L}\right) = z;\ \log\left(\frac{L}{WA}\right) = p;\ \log(\frac{WA}{N}) = w$$

Formula (2) becomes:

$$y = z + p + w$$

Assuming the labor force absorption rate, or the labor force divided by the working age, is constant, the formula in terms of growth is:

(3) $$g(y) = g(z) + g(w)$$

When substituting formula 1 and 2 into 3, the resulted formula explains the per capita income in terms of initial and growth rate of the working age share, initial and growth rate of the per capita income besides many human productivity factors. Thus the formula will be:

$$g(y) = \lambda(x\beta - z_0) + g(w)$$

(4) $$g(y) = \lambda(x\beta + p + w_0 - z_0) + g(w)$$

Equation 4 is the basis of the empirical estimation. The assumptions to be made, relate to savings and health. This means that the working population has positive savings while the dependents, either young or old, spend more than they earn. In addition to that, the working population is considered to be healthier than the other

remaining segments. For this, these variables will not be captured. Aiyar and Mody (2013) estimate the specification forms using the following formula:

(5) $$g(y_t) = \rho \ln(y_t) + \beta_1 \ln(w_t) + \beta_2 \ln(g(w_t)) + \gamma' x_t + f_t + \eta_t + \varepsilon_t$$

$g(y_{i,t})$ is the dependent variable, which is the growth rate of per capita income, f_t is the time invariant fixed effect, η_t is a time dummy that captures the effects unique to the decade beginning in year t.

Considering the counterfactual where there is no change in the working age ratio between the base period t=0 and t+n, $w_t = w_0$, and $g(w_t) = 0$. This can be written such as:

(6) $$g(y_t) = \rho \ln(y_t) + \beta_1 \ln(w_0) + \gamma' x_t + f_t + \eta_t + \varepsilon_t$$

This model defines the demographic dividend as the difference between equation 5 and equation 6, that is:

$$DD_t = \beta_1(\ln(w_t) - \ln(w_0)) + \beta_2(g(w_t))$$

This demographic dividend (DD_t) represents the increment of per capita income that is attributed to the change in the age structure.

III. Empirical Investigation

1. Data and methods:

This paper aims at identifying the demographic dividend in Arab countries with comparison to ECE countries. For this, this contribution is divided into three parts. The first part relates to the analysis of the trends of both fertility and mortality per 1000 infant rates. This is through two regression models that are given such as:

$$Y_i = \alpha + \beta_1 F_i + \varepsilon$$

$$Y_i = \alpha + \beta_1 M_i + \varepsilon$$

Where:

Y: is the independent variable, which represents years,
α: the intercept,
β: the coefficient that corresponds to each variable,
F_i: fertility rate at year i,

M_i: mortality rate at year i,
ε: standard error.

The second part summarizes the estimations of the demographic dividend for Arab and ECE countries. Regressions of the theoretical model explained under the demographic dividend simulation section in this part are estimated with heteroskedasticity-robust standard errors.

The data used for the simulation of the demographic dividend are GDP growth per year, log of the GDP per capita, log of the initial working age ratio, and the yearly growth of the working age ratio.

The third part gives the results of the Granger causality test that enables the prediction of the causality between two variables in a sense where a variable enhance the accurateness of the forecast of the other variable. This section tests different sets of hypotheses and analyzes the causal links between the change in the population age structure that is represented by the dependency ratio, and social, educational, and macroeconomic variables.

The data used are extracted from the World Bank and are of the period between 1960 and 2016. The selected Arab countries are: Algeria, Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Mauritania, Morocco, Oman, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, United Arab Emirates, Palestine, and Yemen, and the selected ECE countries are: Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and Slovakia

2. Hypotheses to be tested

a. Granger causality between dependency ratio and employment variables:

- H_0: Total labor force does not Granger cause dependency ratio.
  H_A: Dependency ratio does not Granger cause total labor force.
- H_0: Female labor force does not Granger cause dependency ratio.
  H_A: Dependency ratio does not Granger cause female labor force.
- H_0: Total unemployment does not Granger cause dependency ratio.
  H_A: Dependency ratio does not Granger cause total unemployment.
- H_0: Young female unemployment does not Granger cause dependency ratio.
  H_A: Dependency ratio does not Granger cause young female unemployment.
- H_0: Young male unemployment does not Granger cause dependency ratio.

H_A: Dependency ratio does not Granger cause young male unemployment.

- H_0: Youth labor force participation does not Granger cause dependency ratio.
  H_A: Dependency ratio does not Granger cause youth labor force participation.

b. Granger causality between dependency ratio and economic development variables:

- H_0: GDP per capita does not Granger cause dependency ratio.
  H_A: Dependency ratio does not Granger cause GDP per capita.
- H0: GDP per capita growth does not Granger cause dependency ratio.
  H_A: Dependency ratio does not Granger cause GDP per capita growth.
- H_0: Gross savings does not Granger cause dependency ratio.
  H_A: Dependency ratio does not Granger cause gross savings.
- H_0: Agriculture value added does not Granger cause dependency ratio.
  H_A: Dependency ratio does not Granger cause agriculture value added.
- H_0: Industry value added does not Granger cause dependency ratio.
  H_A: Dependency ratio does not Granger cause industry value added.

c. Granger causality between dependency ratio and expenditure variables:

- H_0: Education expenditure does not Granger cause dependency ratio.
  H_A: Dependency ratio does not Granger cause education expenditure.
- H0: Health expenditure per capita does not Granger cause dependency ratio.
  H_A: Dependency ratio does not Granger cause health expenditure per capita.
- H_0: Private health expenditure per capita does not Granger cause dependency ratio.
  H_A: Dependency ratio does not Granger cause private health expenditure per capita.
- H_0: Public health expenditure per capita does not Granger cause dependency ratio.
  H_A: Dependency ratio does not Granger cause public health expenditure per capita.
- H_0: Total health expenditure does not Granger cause dependency ratio.
  H_A: Dependency ratio does not Granger cause total health expenditure.

d. Granger causality between dependency ratio and educational variables:

- H_0: Enrolment in primary education does not Granger cause dependency ratio.
  H_A: Dependency ratio does not Granger cause enrolment in primary education.

- H0: Enrolment in secondary education does not Granger cause enrolment in secondary education.
  H_A: Dependency ratio does not Granger cause enrolment in secondary education.
- H_0: Enrolment in secondary vocational education does not Granger cause dependency ratio.
  H_A: Dependency ratio does not Granger cause enrolment in secondary vocational education.
- H_0: Enrolment in secondary general education does not Granger cause dependency ratio.
  H_A: Dependency ratio does not Granger cause enrolment in secondary general education.

e. Granger causality between dependency ratio and female participation in education variables:

- H_0: Female enrolment in primary education does not Granger cause dependency ratio.
  H_A: Dependency ratio does not Granger cause female enrolment in primary education.
- H0: Female enrolment in secondary education does not Granger cause enrolment in secondary education.
  H_A: Dependency ratio does not Granger cause female enrolment in secondary education.
- H_0: Female enrolment in secondary vocational education does not Granger cause dependency ratio.
  H_A: Dependency ratio does not Granger cause female enrolment in secondary vocational education.
- H_0: Female enrolment in secondary general education does not Granger cause dependency ratio.
  H_A: Dependency ratio does not Granger cause female enrolment in secondary general education.

IV. Results

Two major sets of results are respectively introduced. The first set focuses on the estimation of time trends in variables. The second set of results introduces the links between demographic, economic and social variables.

I. Results for Time Trends in Variables

The variables analyzed are fertility, mortality and demographic dividends.

1. Fertility rates in Arab countries

Table 1 shows the results of the trends of fertility rate in Arab countries. Findings indicate that all the resulted model for Arab countries are explained by an R-square 0.713 and 0.982 and are significant. The trends of the fertility rate are significantly decreasing in all Arab countries with the lowest coefficients for Libya, Algeria, and Kuwait and the highest ones for Mauritania, Iraq, and Egypt.

Table 1: Trend of fertility rate in Arab countries

Country	R-squared	Intercept	Fertility Rate
Algeria	0.905	8.565 (48.926)	-0.124 (-22.625)
Bahrain	0.972	7.269 (92.159)	-0.108 (-43.619)
Egypt	0.930	6.789 (75.246)	-0.076 (-26.803)
Iraq	0.869	7.467 (78.218)	-0.057 (-18.949)
Jordan	0.946	8.793 (79.169)	-0.107 (-30.622)
Kuwait	0.884	7.684 (40.945)	-0.119 (-20.265)
Lebanon	0.982	5.722 (115.125)	-0.085 (-54.245)
Libya	0.893	8.900 (45.821)	-0.129 (-21.247)
Mauritania	0.962	7.186 (187.074)	-0045 (-37.090)
Morocco	0.959	7.534 (77.885)	-0.107 (-35.331)
Oman	0.713	9.004 (29.708)	-0.110 (-11.589)
Qatar	0.974	7.701 (98.067)	-0.111 (-45.138)
Saudi Arabia	0.896	8.414 (55.838)	-0.102 (-21.536)
Sudan	0.883	7.412 (93.777)	-0.049 (-20.176)
Syria	0.941	8.528 (73.162)	-0.107 (-29.266)
Tunisia	0.939	7.422 (57.933)	-0.117 (-29.041)
UAE	0.979	7.545 (104.154)	-0.113 (-49.895)

Palestine	0.965	10.065 (51.798)	-0.113 (-25.363)
Yemen	0.508	8.984 (32.526)	-0.065 (-7.474)

2. Mortality rates in Arab countries

With regard to the trend of mortality per 1000 infants in Arab economies, they all have negative significant trends. Highest values of the coefficients of the trends are for Mauritania, Iraq and Yemen, meaning that these countries have lower decreasing rates than the remaining countries (Table 2).

Table 2: Trend of mortality of infants (per 1000 infants) in Arab countries

Country	R-squared	Intercept	Mortality per 1000 live births
Algeria	0.892	156.607 (35.138)	-2.947 (-21.089)
Bahrain	0.737	80.824 (18.035)	-1.727 (-12.290)
Egypt	0.953	190.941 (54.834)	-3.630 (-33.253)
Iraq	0.842	98.893 (33.518)	-1.569 (-16.963)
Jordan	0.872	81.351 (34.089)	-1.432 (-19.143)
Kuwait	0.801	68.964 (22.563)	-1.413 (-14.748)
Lebanon	0.991	57.864 (141.467)	-0.989 (-77.093)
Libya	0.867	122.037 (29.698)	-2.417 (-18.762)
Mauritania	0.915	121.577 (80.737)	-1.139 (-24.126)
Morocco	0.983	142.001 (102.911)	-2.385 (-55.139)
Oman	0.844	170.209 (23.056)	-3.665 (-16.430)
Qatar	0.897	48.631 (30.584)	-0.886 (-19.568)
Saudi Arabia	0.866	108.484 (23.876)	-2.041 (-16.259)

Sudan	0.980	107.269 (171.325)	-1.021 (-52.038)
Syria	0.889	94.044 (33.954)	-1.807 (-20.814)
Tunisia	0.893	141.904 (32.039)	-2.794 (-20.681)
UAE	0.755	91.572 (18.326)	-2.021 (-12.900)
Palestine	0.875	79.883 (27.419)	-1.274 (-16.319)
Yemen	0.913	247.359 (38.741)	-4.432 (-22.977)

3. Demographic Dividend

Table 3 shows the coefficients of each of the variables from the model resulted from the robust standard error regression process. The log initial working age ratio and the growth rate of working age ratio coefficients are to be used in the estimation of the demographic dividend.

Table 3: Coefficients obtained from the robust standard error regression analysis for Arab countries

Country	Intercept	Log GDP per capita	Log initial working age ratio	Growth rate of working age ratio
Algeria	1.894	-0.813	1.169	0.231
Bahrain	-141.601	-21.141	124.564	-0.969
Egypt	23.491	0.424	-12.774	1.049
Iraq	-2.250	8.091	-10.932	-3.905
Jordan	36.030	-12.205	4.406	-3.498
Kuwait	-134.186	-17.204	112.448	1.841
Lebanon	134.287	4.306	-84.373	7.852
Mauritania	-256.248	-4.886	156.992	-3.716
Morocco	-56.241	-7.437	46.523	-0.314
Oman	-29.080	-13.211	47.900	-2.826
Qatar	-72.814	-5.422	51.162	1.495
Saudi Arabia	-153.787	-24.695	144.530	-3.847
Sudan	-160.092	5.540	86.003	-4.606
Syria	-15.450	-1.189	12.909	-1.468
Tunisia	-24.238	-4.103	21.718	2.389
United Arab Emirates	-32.815	20.413	-32.779	0.373
Palestine	307.447	40.298	-255.883	5.261
Yemen	401.306	21.248	-275.244	7.927

The resulted demographic dividends are summarized in table 4. The selected basis year to compute the demographic dividend is the year 1960, and results are summarized to show the values of each 5 years. A negative value of the demographic dividend is interpreted such as there is no increment in the income per capita that is caused or attributed to the change of the working age population. But a positive value indicates the opposite.

Findings divide Arab countries into two main categories that illustrate economies that still have the demographic dividend and countries that don't. For Algeria, Egypt, Iraq, Jordan, Lebanon, Sudan, United Arab Emirates, Palestine, and Yemen, results indicate that the windows of opportunities that is caused by the population change no longer exist, as the latest years indicate a negative energy. But for Bahrain, Kuwait, Mauritania, Morocco, Oman, Qatar, Saudi Arabia, Syria, and Tunisia, the demographic dividend started in the years, 1975, 1978, 2005, 1980, 2008, 1960, 1986, 2011, and 1969, respectively. For countries that are still experiencing the demographic dividend, there are countries that have increasing trends of its corresponding values while others face the opposite. This gives incentives about the countries that will either have longer periods to benefit from the demographic change or not.

Findings indicate that all these economies have increasing trends except for Qatar, and Tunisia.

Table 4: The demographic dividend in Arab countries

Country	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015
Algeria	-0.17	0.05	0.02	0.06	0.13	0.24	0.39	0.46	0.38	0.12	-0.06
Bahrain	-3.10	-3.34	0.70	5.67	7.35	7.86	9.49	10.56	12.94	17.00	17.65
Egypt	0.23	0.25	0.32	0.10	-0.11	0.08	0.57	0.77	0.26	-0.85	-1.08
Iraq	3.12	1.92	2.79	-0.44	-1.31	-0.76	-2.17	-1.97	-1.22	-0.79	-1.49
Jordan	1.88	-0.95	-0.16	0.29	-2.83	-2.06	-6.43	-1.43	-0.97	-0.11	-1.35
Kuwait	-2.19	-7.59	-5.33	1.79	2.96	5.83	8.54	8.89	9.76	12.42	13.47
Lebanon	2.13	6.81	5.01	-1.10	2.45	-0.75	-0.24	-2.29	-3.00	-4.04	-8.84
Mauritania	-0.62	-2.55	-3.28	-3.03	-2.58	-2.29	-2.09	-1.56	0.06	1.51	2.59
Morocco	-1.10	-1.46	-0.93	0.12	0.84	1.35	1.89	2.87	3.71	4.37	4.67
Oman		-0.19	-1.14	-1.04	-0.62	-2.00	-4.55	0.46	-0.42	2.92	5.80
Qatar	2.82	3.54	4.68	3.05	6.54	5.81	5.87	6.18	8.32	10.80	9.09
Saudi Arabia	-0.13	-0.46	-1.29	-0.45	-0.47	2.20	0.05	3.40	5.72	10.63	15.31
Sudan	-0.06	-0.27	-0.74	-1.90	-2.84	-2.39	-1.73	0.31	0.10	0.36	-0.34
Syria	0.00	-0.74	-0.13	0.00	-0.66	-1.22	-1.36	-0.88	0.08	-0.46	1.90

Tunisia	-3.52	0.92	1.56	1.80	2.09	2.47	3.71	4.38	4.46	3.32	1.70
United Arab Emirates	-0.99	-2.65	-4.29	-4.62	-4.02	-3.57	-4.22	-4.78	-5.85	-6.95	-7.12
Palestine						-0.31	0.23	1.53	-0.54	-6.61	-13.01
Yemen	0.28	-1.74	1.99	11.43	14.62	18.49	23.43	21.08	16.42	6.47	-0.80

II. Causalities of the dependency ratio and economic, educational, and social variables

1. Causality tests of the dependency ratio and unemployment variables in Arab:

Tables 5, 6, 7, 8, and 9 summarize the results of the Granger causality test of the dependency ratio and employment variables in Arab countries. Under a level of significance of 5%, Algeria indicates that the dependency ratio causes the females labor force, causes the total unemployment, and causes the participation of youth in the labor force. This latter variable also causes the dependency ratio. But for Bahrain, the total labor force, the female labor force, and the participation of youth in the total labor force cause the dependency ratio. Egypt does not show any causalities under a 5% significance level. But for Iraq, the dependency ratio causes the female labor force (Table 5).

Table 5: Granger causality of the dependency ratio and employment variables in Arab countries (set1):

Country	Algeria		Bahrain		Egypt		Iraq	
	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.
LABORFORCETOTAL does not Granger Cause DR	2.379	0.118	6.993	0.005	0.769	0.476	1.253	0.306
DR does not Granger Cause LABORFORCETOTAL	2.918	0.077	2.768	0.086	2.477	0.109	1.627	0.221
LABORFORCEFEMALE does not Granger Cause DR	3.423	0.052	3.591	0.046	0.270	0.765	3.139	0.065
DR does not Granger Cause LABORFORCEFEMALE	7.170	0.004	0.002	0.997	1.826	0.186	3.671	0.043
UNEMPLOYMENTTOTAL does not Granger Cause DR	3.509	0.050	1.271	0.303	0.808	0.460	1.253	0.308
DR does not Granger Cause UNEMPLOYMENTTOTAL	3.846	0.039	3.518	0.050	3.266	0.060	0.270	0.765
UNEMPLOYMENTYOUNGFEMALE does not Granger Cause DR	2.813	0.085	0.754	0.483	0.214	0.808	1.284	0.299
DR does not Granger Cause UNEMPLOYMENTYOUNGFEMALE	3.267	0.060	0.633	0.541	0.360	0.702	0.066	0.936
UNEMPLOYMENTYOUNGMALE does not Granger Cause DR	3.126	0.067	1.279	0.301	0.449	0.644	1.201	0.322
DR does not Granger Cause UNEMPLOYMENTYOUNGMALE	3.242	0.061	1.936	0.171	3.413	0.054	0.037	0.962
YOUTHLABORFORCEPARTICIPA does not Granger Cause DR	4.095	0.032	6.759	0.005	0.210	0.812	0.491	0.618

DR does not Granger Cause YOUTHLABORFORCEPARTICIPA	4.403	0.026	2.154	0.142	1.652	0.216	7.631	0.003

For Jordan, there is a double causality between the total unemployment and the dependency ratio while also the unemployment of young males causes the dependency ratio. For Kuwait, the total labor force and the female labor force cause the dependency ratio. In the case of Lebanon, there is a double causality between the total labor force and the dependency ratio besides this latter variable that causes the young female unemployment and the participation of youth in the labor force. In Libya, the dependency ratio causes the total labor force, the female labor force, the young female unemployment, the young male unemployment, and has a double causality with the youth participation in the labor force (Table 6).

Table 6: Granger causality of the dependency ratio and employment variables in Arab countries (set2):

Country	Jordan		Kuwait		Lebanon		Libya	
	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.
LABORFORCETOTAL does not Granger Cause DR	2.96400	0.0746	6.25119	0.0106	7.13377	0.0046	1.61930	0.2229
DR does not Granger Cause LABORFORCETOTAL	0.49310	0.6180	2.40592	0.1241	18.4160	3.E-05	4.78290	0.0201
LABORFORCEFEMALE does not Granger Cause DR	1.20810	0.3197	4.49748	0.0295	1.76985	0.1960	0.96268	0.3989
DR does not Granger Cause LABORFORCEFEMALE	0.47370	0.6295	0.46131	0.6391	2.66138	0.0944	8.97422	0.0017
UNEMPLOYMENTTOTAL does not Granger Cause DR	3.85972	0.0392	0.45272	0.6443	0.13923	0.8709	1.03286	0.3751
DR does not Granger Cause UNEMPLOYMENTTOTAL	4.92437	0.0189	0.99004	0.3946	1.91509	0.1747	0.85468	0.4411
UNEMPLOYMENTYOUNGFEMALE does not Granger Cause DR	3.29803	0.0590	0.51890	0.6055	1.57644	0.2326	1.11905	0.3472
DR does not Granger Cause UNEMPLOYMENTYOUNGFEMALE	1.71739	0.2063	0.92082	0.4196	4.81503	0.0203	4.44686	0.0261
UNEMPLOYMENTYOUNGMALE does not Granger Cause DR	4.11192	0.0328	0.69499	0.5145	0.26928	0.7668	1.31748	0.2912
DR does not Granger Cause UNEMPLOYMENTYOUNGMALE	1.49753	0.2489	0.64545	0.5384	0.97478	0.3954	4.35622	0.0277
YOUTHLABORFORCEPARTICIPA does not Granger Cause DR	0.07240	0.9304	1.49521	0.2558	1.02530	0.3768	3.95941	0.0356
DR does not Granger Cause YOUTHLABORFORCEPARTICIPA	0.25305	0.7789	0.30145	0.7441	3.70837	0.0427	6.64354	0.0061

For Mauritania, no causalities are found, but for Morocco, the dependency ratio causes the total unemployment, young females unemployment, young male unemployment, and youth participation in the labor force. In Oman, the dependency

ratio has a double causality with the total labor force, is caused by both the female labor force and the total unemployment, and causes the participation of youth in the labor force. For Qatar, the female labor force and the young males unemployment cause the dependency ratio, which causes the participation of youth in the labor force (Table 7).

Table 7: Granger causality of the dependency ratio and employment variables in Arab countries (set3):

Country	Mauritania		Morocco		Oman		Qatar	
	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.
LABORFORCETOTAL does not Granger Cause DR	0.98393	0.3912	0.44644	0.6461	5.96886	0.0093	1.92615	0.1718
DR does not Granger Cause LABORFORCETOTAL	0.10597	0.9000	1.44192	0.2600	17.7143	4.E-05	1.42331	0.2643
LABORFORCEFEMALE does not Granger Cause DR	0.17602	0.8399	1.35317	0.2811	5.67963	0.0111	4.48438	0.0246
DR does not Granger Cause LABORFORCEFEMALE	0.45293	0.6421	2.68464	0.0927	0.38931	0.6825	3.01959	0.0715
UNEMPLOYMENTTOTAL does not Granger Cause DR	1.57329	0.2332	0.06300	0.9391	3.78098	0.0415	0.08371	0.9200
DR does not Granger Cause UNEMPLOYMENTTOTAL	2.32695	0.1248	8.80318	0.0020	2.26933	0.1307	0.93356	0.4105
UNEMPLOYMENTYOUNGFEMALE does not Granger Cause DR	1.65983	0.2166	0.00602	0.9940	3.40634	0.0544	0.09578	0.9091
DR does not Granger Cause UNEMPLOYMENTYOUNGFEMALE	2.14345	0.1447	5.82335	0.0107	2.94677	0.0768	0.98548	0.3915
UNEMPLOYMENTYOUNGMALE does not Granger Cause DR	1.48008	0.2527	0.01276	0.9873	3.15631	0.0655	4.58471	0.0237
DR does not Granger Cause UNEMPLOYMENTYOUNGMALE	2.03345	0.1584	7.30144	0.0044	3.09002	0.0689	1.68774	0.2115
YOUTHLABORFORCEPARTICIPA does not Granger Cause DR	1.02688	0.3762	1.10853	0.3495	0.91016	0.4185	0.37082	0.6948
DR does not Granger Cause YOUTHLABORFORCEPARTICIPA	0.47509	0.6287	12.3103	0.0003	8.22951	0.0025	3.94972	0.0358

In Saudi Arabia, Sudan, and Syria, the dependency ratio causes the total labor force and the female labor force. In addition to that, the dependency ratio also causes the participation of youth in the labor force in Sudan and Syria. The dependency ratio causes the total labor force and the participation of youth in the labor force in Tunisia (Table 8).

Table 8: Granger causality of the dependency ratio and employment variables in Arab countries (set4):

Country	Saudi Arabia		Sudan		Syria		Tunisia	
	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.
LABORFORCETOTAL does not Granger Cause DR	0.02964	0.9708	0.01572	0.9844	0.18939	0.8289	2.65079	0.0952
DR does not Granger Cause LABORFORCETOTAL	4.16537	0.0307	6.37552	0.0072	7.10353	0.0047	4.24435	0.0291
LABORFORCEFEMALE does not Granger Cause DR	0.02984	0.9706	0.98655	0.3903	0.42632	0.6587	0.29755	0.7459
DR does not Granger Cause LABORFORCEFEMALE	6.72088	0.0059	6.89538	0.0053	8.50632	0.0021	1.84297	0.1842
UNEMPLOYMENTTOTAL does not Granger Cause DR	2.16616	0.1421	0.09940	0.9058	0.57682	0.5712	1.56413	0.2350
DR does not Granger Cause UNEMPLOYMENTTOTAL	0.21156	0.8112	2.96099	0.0760	1.84393	0.1854	1.18098	0.3285
UNEMPLOYMENTYOUNGFEMALE does not Granger Cause DR	2.14109	0.1450	0.01248	0.9876	0.76796	0.4778	1.07267	0.3619
DR does not Granger Cause UNEMPLOYMENTYOUNGFEMALE	1.52980	0.2421	2.44738	0.1133	2.36057	0.1214	2.10180	0.1498
UNEMPLOYMENTYOUNGMALE does not Granger Cause DR	0.32108	0.7292	0.02503	0.9753	1.09756	0.3539	1.63608	0.2210
DR does not Granger Cause UNEMPLOYMENTYOUNGMALE	1.43554	0.2627	2.49204	0.1094	2.99886	0.0738	2.13943	0.1452
YOUTHLABORFORCEPARTICIPA does not Granger Cause DR	0.25958	0.7739	1.49193	0.2489	0.23755	0.7908	0.87151	0.4336
DR does not Granger Cause YOUTHLABORFORCEPARTICIPA	1.20406	0.3208	6.36873	0.0072	5.22670	0.0149	4.12901	0.0315

In the United Arab Emirates, the dependency ratio causes all unemployment and labor force variables except the female labor force. But in Palestine, the dependency ratio causes total labor force, has a double causality with the female labor force, and is caused by the participation of youth in the labor market. In the case of Yemen, the dependency ratio has a double causality with the total labor force and the young females unemployment and is caused by the female labor force, the total unemployment, and the participation of youth in the labor market (Table 9).

Table 9: Granger causality of the dependency ratio and employment variables in Arab countries (set5):

Country	United Arab Emirates		Palestine		Yemen	
	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.
LABORFORCETOTAL does not Granger Cause DR	0.60452	0.5560	4.98884	0.0175	3.67455	0.0437
DR does not Granger Cause LABORFORCETOTAL	8.13669	0.0026	1.46612	0.2546	6.87337	0.0053
LABORFORCEFEMALE does not Granger Cause DR	1.97080	0.1655	5.89189	0.0097	3.53901	0.0483
DR does not Granger Cause LABORFORCEFEMALE	2.38456	0.1178	4.84021	0.0193	2.12714	0.1454
UNEMPLOYMENTTOTAL does not Granger Cause DR	1.02806	0.3768	0.43938	0.6508	6.83202	0.0058
DR does not Granger Cause UNEMPLOYMENTTOTAL	6.05255	0.0093	0.86914	0.4353	6.14295	0.0088
UNEMPLOYMENTYOUNGFEMALE does not Granger Cause DR	1.22771	0.3152	1.75505	0.1998	8.01779	0.0030
DR does not Granger Cause UNEMPLOYMENTYOUNGFEMALE	3.75634	0.0422	2.75257	0.0892	5.18518	0.0160
UNEMPLOYMENTYOUNGMALE does not Granger Cause DR	1.27242	0.3030	0.82733	0.4524	2.46454	0.1118
DR does not Granger Cause UNEMPLOYMENTYOUNGMALE	6.00354	0.0095	1.40564	0.2696	0.29724	0.7463
YOUTHLABORFORCEPARTICIPA does not Granger Cause DR	0.51061	0.6077	2.09788	0.1489	4.01742	0.0341
DR does not Granger Cause YOUTHLABORFORCEPARTICIPA	7.91117	0.0029	6.77374	0.0057	1.30675	0.2928

2. Granger causality between the dependency ratio and economic development variables in Arab countries:

Table 10, 11, 12, 13, and 14 summarizes the causal links between the dependency ratio and economic development variables in Arab economies.

The dependency ratio causes the GDP per capita growth and is caused by gross savings and agriculture value added. In Bahrain, the dependency ratio causes the agriculture value added, and is caused by the gross savings and the industry value added. In Egypt the dependency ratio only cause the industry value added. In the case of Jordan, the dependency ratio is caused by both the GDP per capita growth and the agriculture value added (Table 10).

Table 10: Granger causality of the dependency ratio and economic development variables in Arab countries (set1):

Country	Algeria		Bahrain		Egypt		Jordan	
	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.

GDPPERCAPITA does not Granger Cause DR	0.55054	0.5801	1.05173	0.3623	1.46725	0.2403	0.27127	0.764
DR does not Granger Cause GDPPERCAPITA	0.92571	0.4029	0.42452	0.6581	1.0503	0.3574	0.45856	0.6359
GDPPERCAPITAGROWTH does not Granger Cause DR	0.08416	0.9194	0.47491	0.6269	2.94406	0.062	5.67245	0.0075
DR does not Granger Cause GDPPERCAPITAGROWTH	4.11829	0.0222	0.65934	0.525	0.18199	0.8342	0.04271	0.9582
GROSSSAVINGS does not Granger Cause DR	5.85945	0.0116	5.96396	0.007	0.48339	0.6211	0.0652	0.937
DR does not Granger Cause GROSSSAVINGS	0.98483	0.3938	0.91666	0.4115	1.7339	0.1928	1.03705	0.3658
AGRICULTUREVALUEADDED does not Granger Cause DR	4.97861	0.0111	1.07429	0.37	2.54721	0.0895	6.13388	0.0044
DR does not Granger Cause AGRICULTUREVALUEADDED	0.2134	0.8086	5.37314	0.0199	0.55086	0.5803	1.78469	0.1795
INDUSTRYVALUEADDED does not Granger Cause DR	1.74643	0.186	17.0558	0.0002	1.4984	0.2344	1.64624	0.2042
DR does not Granger Cause INDUSTRYVALUEADDED	2.00606	0.1464	0.03836	0.9625	3.7075	0.0323	0.49738	0.6114

In Kuwait, no causal links are found, Mauritania, the dependency ratio is caused by the GDP per capita growth, and in Morocco, the dependency ratio is caused by the industry value added. For Lebanon, the dependency ratio causes the GDP per capita, the GDP per capita growth, and has a double causality with the gross savings (Table 11).

Table 11: Granger causality of the dependency ratio and economic development variables in Arab countries (set2):

Country	Kuwait		Lebanon		Mauritania		Morocco	
	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.
GDPPERCAPITA does not Granger Cause DR	1.27617	0.2911	2.59204	0.0975	1.2242	0.3027	1.44551	0.2466
DR does not Granger Cause GDPPERCAPITA	0.84452	0.4379	12.3885	0.0002	1.27529	0.2883	0.64548	0.5293
GDPPERCAPITAGROWTH does not Granger Cause DR	0.91029	0.4117	0.53193	0.5952	5.03742	0.0102	0.81834	0.4479
DR does not Granger Cause GDPPERCAPITAGROWTH	0.92071	0.4077	6.50199	0.0063	2.0534	0.1392	0.03644	0.9642
GROSSSAVINGS does not Granger Cause DR	1.21401	0.3117	32.007	0.0003	0.70396	0.5071	1.03572	0.3656
DR does not Granger Cause GROSSSAVINGS	0.67911	0.5149	22.0782	0.0009	1.31684	0.2914	1.15294	0.3274
AGRICULTUREVALUEADDED does not Granger Cause DR	NA	NA	1.06613	0.3676	2.43247	0.0981	3.20328	0.0548
DR does not Granger Cause AGRICULTUREVALUEADDED	NA	NA	0.74223	0.4917	1.06229	0.3533	1.55592	0.2275
INDUSTRYVALUEADDED does not Granger Cause DR	NA	NA	1.31498	0.296	1.31063	0.2788	4.34856	0.022
DR does not Granger Cause INDUSTRYVALUEADDED	NA	NA	0.3358	0.7197	0.61426	0.5451	1.11104	0.3424

Oman and Saudi Arabia do not show significant causal relationships under a level of significance of 5%, and in Qatar only the industry value added causes the dependency ratio (Table 12).

Table 12: Granger causality of the dependency ratio and economic development variables in Arab countries (set3):

Country	Oman		Qatar		Saudi Arabia	
	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.
GDPPERCAPITA does not Granger Cause DR	1.88423	0.164	2.3019	0.1505	0.02259	0.9777
DR does not Granger Cause GDPPERCAPITA	0.49156	0.615	1.90869	0.1986	2.94071	0.0638
GDPPERCAPITAGROWTH does not Granger Cause DR	0.16862	0.8454	2.56534	0.1313	0.06235	0.9396
DR does not Granger Cause GDPPERCAPITAGROWTH	0.98988	0.3799	0.93368	0.4281	0.43353	0.6512
GROSSSAVINGS does not Granger Cause DR	0.68712	0.5103	NA	NA	1.78787	0.1808
DR does not Granger Cause GROSSSAVINGS	0.09448	0.9101	NA	NA	0.02138	0.9789
AGRICULTUREVALUEADDED does not Granger Cause DR	0.06478	0.9375	3.84843	0.0576	0.90099	0.4139
DR does not Granger Cause AGRICULTUREVALUEADDED	0.05106	0.9504	0.31167	0.7391	1.15765	0.324
INDUSTRYVALUEADDED does not Granger Cause DR	0.81034	0.4603	5.00046	0.0312	0.51552	0.6009
DR does not Granger Cause INDUSTRYVALUEADDED	0.67732	0.5205	0.10423	0.902	0.68406	0.5101

In Syria, the dependency ratio causes both the agriculture value added and the industry value added, and is caused by both the GDP per capita growth and the gross savings. In Tunisia, the dependency ratio has a double causality with the GDP per capita, and causes the gross savings besides the agriculture value added. No significant causal relationship is found for Sudan (Table 13).

Table 13: Granger causality of the dependency ratio and economic development variables in Arab countries (set4):

Country	Sudan		Syria		Tunisia	
	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.
GDPPERCAPITA does not Granger Cause DR	1.1331	0.3302	0.90029	0.4143	23.0598	0.0000001

DR does not Granger Cause GDPPERCAPITA	3.01097	0.0582	1.13115	0.3325	3.6992	0.0326
GDPPERCAPITAGROWTH does not Granger Cause DR	1.86361	0.1659	3.57893	0.0372	2.47182	0.0961
DR does not Granger Cause GDPPERCAPITAGROWTH	2.29794	0.1112	0.16293	0.8502	2.24945	0.1175
GROSSSAVINGS does not Granger Cause DR	0.19891	0.8206	4.02624	0.0311	0.53702	0.5895
DR does not Granger Cause GROSSSAVINGS	1.4785	0.2431	0.54828	0.585	5.92516	0.0063
AGRICULTUREVALUEADDED does not Granger Cause DR	0.85778	0.4302	0.97513	0.3985	1.43786	0.2484
DR does not Granger Cause AGRICULTUREVALUEADDED	0.06328	0.9388	4.68875	0.025	4.46925	0.0171
INDUSTRYVALUEADDED does not Granger Cause DR	0.26226	0.7705	1.20181	0.3264	0.41351	0.6639
DR does not Granger Cause INDUSTRYVALUEADDED	0.25451	0.7764	5.54307	0.0148	0.63449	0.535

For the United Arab Emirates, the GDP per capita causes the dependency ratio. This latter variable causes the GDP per capita in Palestine and Yemen. In addition to that, the dependency ratio causes the GDP per capita growth and the industry value added, and has a double causality with the agriculture value added in Yemen (Table 14).

Table 14: Granger causality of the dependency ratio and economic development variables in Arab countries (set5):

Country	United Arab Emirates		Palestine		Yemen	
	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.
GDPPERCAPITA does not Granger Cause DR	5.10512	0.0113	0.21595	0.8081	0.12	0.8876
DR does not Granger Cause GDPPERCAPITA	0.22194	0.8021	6.08716	0.0108	4.67979	0.0215
GDPPERCAPITAGROWTH does not Granger Cause DR	0.18327	0.8334	0.69199	0.5159	0.00907	0.991
DR does not Granger Cause GDPPERCAPITAGROWTH	0.03889	0.9619	0.03395	0.9667	6.5281	0.007
GROSSSAVINGS does not Granger Cause DR	1.34034	0.2752	3.27025	0.0683	1.79739	0.2774
DR does not Granger Cause GROSSSAVINGS	2.21346	0.1248	0.017	0.9832	1.69065	0.2937
AGRICULTUREVALUEADDED does not Granger Cause DR	NA	NA	0.6511	0.5356	8.8344	0.0018
DR does not Granger Cause AGRICULTUREVALUEADDED	NA	NA	0.19359	0.826	4.7801	0.0201
INDUSTRYVALUEADDED does not Granger Cause DR	NA	NA	1.42699	0.2708	1.59553	0.2276
DR does not Granger Cause INDUSTRYVALUEADDED	NA	NA	1.3612	0.2863	16.5513	0.00006

3. Granger causality between the dependency ratio and expenditure variables in Arab countries:

Tables 15, 16, 17, 18, and 19 summarizes the Granger causality tests between the dependency ratio and expenditure variables for Arab countries.

In Algeria, the dependency ratio causes all expenditure variables. In Bahrain, the dependency ratio causes the expenditure on education and expenditure on public health and is caused by both expenditure on health and expenditure on private health. In Egypt, expenditure on education causes the dependency ratio that in return causes the per capita health expenditure. But for Iraq, the dependency ratio causes both expenditure on health and expenditure on public health (Table 15).

Table 15: Granger causality of the dependency ratio and expenditure variables in Arab countries (set1):

Country	Algeria		Bahrain		Egypt		Iraq	
	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.
EDUCATIONEXPENDITURE does not Granger Cause DR	2.88865	0.0676	1.56466	0.2263	4.58607	0.0163	3.33573	0.0654
DR does not Granger Cause EDUCATIONEXPENDITURE	4.82626	0.0134	7.48523	0.0024	1.57063	0.2208	0.28721	0.7547
HEALTHEXPENDITUREPERCAPI does not Granger Cause DR	1.35466	0.2922	0.04075	0.9602	1.89165	0.1901	0.54825	0.6091
DR does not Granger Cause HEALTHEXPENDITUREPERCAPI	9.98162	0.0024	1.69704	0.2214	4.37011	0.0354	1.20347	0.3744
HEALTHEXPENDITUREPRIVATE does not Granger Cause DR	0.57262	0.5776	1.40392	0.2805	3.77459	0.0510	1.02486	0.4236
DR does not Granger Cause HEALTHEXPENDITUREPRIVATE	9.23765	0.0032	4.68898	0.0293	2.77309	0.0993	5.47027	0.0551
HEALTHEXPENDITUREPUBLIC does not Granger Cause DR	1.02009	0.3877	10.4611	0.0020	3.39403	0.0652	0.19601	0.8280
DR does not Granger Cause HEALTHEXPENDITUREPUBLIC	5.24425	0.0214	1.85744	0.1952	0.50235	0.6164	7.33882	0.0325
HEALTHEXPENDITURETOTAL does not Granger Cause DR	0.68923	0.5194	5.94642	0.0147	3.00773	0.0844	0.01834	0.9819
DR does not Granger Cause HEALTHEXPENDITURETOTAL	6.06894	0.0138	3.24259	0.0720	2.92841	0.0891	7.12945	0.0343

No causal links are found for Kuwait. But for Jordan, the dependency ratio causes the expenditure on private health and is caused by both the expenditure on health per capita, and the expenditure on public health. For Lebanon, the dependency ratio has double causality with expenditure on education and is caused by expenditure on private health. In Libya, only the health expenditure per capita is caused by the dependency ratio (Table 16).

Table 16: Granger causality of the dependency ratio and expenditure variables in Arab countries (set2):

Country	Jordan		Kuwait		Lebanon		Libya	
	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.
EDUCATIONEXPENDITURE does not Granger Cause DR	0.43633	0.6495	0.21821	0.8051	7.42668	0.0039	0.46374	0.6676
DR does not Granger Cause EDUCATIONEXPENDITURE	0.53617	0.5892	1.49037	0.2396	5.30389	0.0142	0.47123	0.6638
HEALTHEXPENDITUREPERCAPI does not Granger Cause DR	10.4369	0.0020	0.94462	0.4140	3.32509	0.0682	0.02506	0.9753
DR does not Granger Cause HEALTHEXPENDITUREPERCAPI	3.47893	0.0616	1.41493	0.2780	1.74546	0.2131	15.8335	0.0003
HEALTHEXPENDITUREPRIVATE does not Granger Cause DR	2.58954	0.1131	0.36883	0.6986	7.47056	0.0069	2.69700	0.1048
DR does not Granger Cause HEALTHEXPENDITUREPRIVATE	7.63402	0.0064	1.15969	0.3440	2.21442	0.1487	2.64530	0.1087
HEALTHEXPENDITUREPUBLIC does not Granger Cause DR	4.24118	0.0382	1.75740	0.2111	2.25420	0.1444	1.39212	0.2833
DR does not Granger Cause HEALTHEXPENDITUREPUBLIC	2.61648	0.1109	2.80004	0.0975	3.13231	0.0776	1.25908	0.3164
HEALTHEXPENDITURETOTAL does not Granger Cause DR	0.81247	0.4651	1.33682	0.2965	1.81395	0.2019	1.83006	0.1994
DR does not Granger Cause HEALTHEXPENDITURETOTAL	2.21685	0.1485	1.92690	0.1850	1.57171	0.2447	1.47504	0.2647

No causalities are found in Morocco and Qatar. But in Mauritania and Oman, the dependency ratio causes expenditure on education and per capita expenditure on health (Table 17).

Table 17: Granger causality of the dependency ratio and expenditure variables in Arab countries (set3):

Country	Mauritania		Morocco		Oman		Qatar	
	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.
EDUCATIONEXPENDITURE does not Granger Cause DR	0.86742	0.4282	0.09560	0.9090	0.68282	0.5111	0.07159	0.9311
DR does not Granger Cause EDUCATIONEXPENDITURE	4.26359	0.0214	2.11403	0.1344	4.07823	0.0246	3.18897	0.0550
HEALTHEXPENDITUREPERCAPI does not Granger Cause DR	0.43575	0.6559	0.38249	0.6896	0.41435	0.6692	3.39823	0.0650
DR does not Granger Cause HEALTHEXPENDITUREPERCAPI	4.55309	0.0317	3.77891	0.0508	6.82595	0.0094	0.75136	0.4911
HEALTHEXPENDITUREPRIVATE does not Granger Cause DR	1.09115	0.3647	1.13624	0.3509	1.04606	0.3791	1.97107	0.1788
DR does not Granger Cause HEALTHEXPENDITUREPRIVATE	3.17892	0.0752	1.17163	0.3405	2.61864	0.1108	0.14703	0.8647
HEALTHEXPENDITUREPUBLIC does not Granger Cause DR	1.01488	0.3894	2.20050	0.1503	2.14166	0.1571	1.26849	0.3139
DR does not Granger Cause HEALTHEXPENDITUREPUBLIC	1.74222	0.2136	2.81075	0.0967	0.99547	0.3960	0.58006	0.5737

HEALTHEXPENDITURETOTAL does not Granger Cause DR	1.47329	0.2650	0.50097	0.6172	2.25823	0.1440	0.56674	0.5808
DR does not Granger Cause HEALTHEXPENDITURETOTAL	2.55084	0.1163	3.66561	0.0546	0.60299	0.5618	1.86661	0.1938

In Saudi Arabia, the dependency ratio causes per capita expenditure on health, and has a double causality with both the total expenditure on health and the expenditure on public health. In Sudan, the dependency ratio is caused by the per capita health expenditure, the total expenditure on health and the private expenditure on health. In the case of Syria, the dependency ratio only causes the per capita health expenditure (Table 18).

Table 18: Granger causality of the dependency ratio and expenditure variables in Arab countries (set4):

Country	Saudi Arabia		Sudan		Syria	
	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.
EDUCATIONEXPENDITURE does not Granger Cause DR	0.24500	0.7839	0.84327	0.4380	1.41088	0.2592
DR does not Granger Cause EDUCATIONEXPENDITURE	5.33424	0.0090	2.30321	0.1134	2.26220	0.1210
HEALTHEXPENDITUREPERCAPI does not Granger Cause DR	0.76121	0.4868	4.22832	0.0385	1.70444	0.2201
DR does not Granger Cause HEALTHEXPENDITUREPERCAPI	0.36996	0.6978	1.24417	0.3203	3.97348	0.0450
HEALTHEXPENDITUREPRIVATE does not Granger Cause DR	1.34051	0.2956	4.76240	0.0281	2.16215	0.1547
DR does not Granger Cause HEALTHEXPENDITUREPRIVATE	0.19431	0.8257	2.15839	0.1551	1.03892	0.3814
HEALTHEXPENDITUREPUBLIC does not Granger Cause DR	5.31039	0.0206	0.98504	0.3996	0.92385	0.4215
DR does not Granger Cause HEALTHEXPENDITUREPUBLIC	4.92199	0.0256	0.26709	0.7697	1.59012	0.2411
HEALTHEXPENDITURETOTAL does not Granger Cause DR	4.71238	0.0289	3.93343	0.0461	0.15328	0.8594
DR does not Granger Cause HEALTHEXPENDITURETOTAL	5.05776	0.0237	1.76783	0.2094	2.00099	0.1747

In Tunisia, the dependency ratio has a double causal relationship with expenditure on education and per capita health expenditure and causes expenditure on public health and total expenditure on health. For United Arab Emirates, the dependency ratio causes the per capita health expenditure. In Yemen, the dependency ratio causes all expenditure variables (Table 19).

Table 19: Granger causality of the dependency ratio and expenditure variables in Arab countries (set5):

Country	Tunisia		United Arab Emirates		Yemen	
	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.
EDUCATIONEXPENDITURE does not Granger Cause DR	5.76938	0.0064	0.06896	0.9337	0.81749	0.4565
DR does not Granger Cause EDUCATIONEXPENDITURE	4.14529	0.0233	2.16705	0.1541	9.25487	0.0016
HEALTHEXPENDITUREPERCAPI does not Granger Cause DR	8.07525	0.0053	1.16059	0.3437	1.04771	0.3786
DR does not Granger Cause HEALTHEXPENDITUREPERCAPI	5.51114	0.0185	12.8139	0.0008	3.91078	0.0468
HEALTHEXPENDITUREPRIVATE does not Granger Cause DR	3.28721	0.0699	1.07288	0.3705	0.76031	0.4872
DR does not Granger Cause HEALTHEXPENDITUREPRIVATE	2.73177	0.1022	2.52930	0.1181	5.10654	0.0231
HEALTHEXPENDITUREPUBLIC does not Granger Cause DR	0.28628	0.7557	1.03484	0.3828	0.16312	0.8512
DR does not Granger Cause HEALTHEXPENDITUREPUBLIC	4.48444	0.0330	2.52347	0.1186	5.51677	0.0184
HEALTHEXPENDITURETOTAL does not Granger Cause DR	0.42179	0.6645	0.12028	0.8876	0.38966	0.6849
DR does not Granger Cause HEALTHEXPENDITURETOTAL	4.64165	0.0301	0.29262	0.7511	9.84634	0.0025

4. Granger causality between the dependency ratio and education variables in Arab countries

Table 20, 21, 22, 23, and 24 summarizes the results of Granger causality between the dependency ratio and education variables for Arab countries.

For Algeria, the dependency ratio causes the secondary vocational and is caused by the primary education. In Bahrain, the dependency ratio is caused by both the secondary education and the secondary vocational. But for Egypt, the dependency ratio causes the secondary vocational and is caused by primary, secondary, and secondary general education. Iraq does not show and causalities (Table 20).

Table 20: Granger causality of the dependency ratio and education variables in Arab countries (set1):

Country	Algeria		Bahrain		Egypt		Iraq	
	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.
PRIMARY does not Granger Cause DR	5.57743	0.0075	3.00105	0.0639	5.22754	0.0111	2.16097	0.1548
DR does not Granger Cause PRIMARY	0.89342	0.4177	0.15426	0.8577	0.47934	0.6237	0.54762	0.5911
SECONDARY does not Granger Cause DR	0.54395	0.5859	4.18530	0.0235	12.3135	0.0001	1.84914	0.1965

DR does not Granger Cause SECONDARY	0.90408	0.4153	0.97202	0.3883	0.18105	0.8354	1.09896	0.3623
SECONDARYVOCATIONAL does not Granger Cause DR	0.81351	0.4525	4.14544	0.0242	2.51430	0.1050	1.42630	0.2754
DR does not Granger Cause SECONDARYVOCATIONAL	5.54240	0.0088	1.70060	0.1973	4.08165	0.0318	1.67428	0.2254
SECONDARYGENERAL does not Granger Cause DR	3.22863	0.0517	1.34411	0.2739	11.5306	0.0003	2.94305	0.0882
DR does not Granger Cause SECONDARYGENERAL	1.73050	0.1920	1.78406	0.1829	0.16900	0.8455	0.79321	0.4731

The dependency ratio is caused by primary education in Jordan, causes the secondary vocational in Kuwait and does not show any significant causal relationship in Lebanon and Libya (Table 21).

Table 21: Granger causality of the dependency ratio and education variables in Arab countries (set2):

Country	Jordan		Kuwait		Lebanon		Libya	
	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.
PRIMARY does not Granger Cause DR	3.55994	0.0419	0.18357	0.8331	1.32612	0.2890	1.77685	0.2299
DR does not Granger Cause PRIMARY	0.70894	0.5008	0.51137	0.6043	2.86224	0.0819	0.60062	0.5714
SECONDARY does not Granger Cause DR	1.75193	0.1941	1.07582	0.3542	0.21761	0.8068	2.74609	0.1776
DR does not Granger Cause SECONDARY	0.57779	0.5685	0.61244	0.5489	1.50197	0.2525	4.63039	0.0910
SECONDARYVOCATIONAL does not Granger Cause DR	1.83844	0.1799	0.80907	0.4562	0.44588	0.6475	4.05713	0.0768
DR does not Granger Cause SECONDARYVOCATIONAL	1.98753	0.1581	10.4614	0.0005	1.00338	0.3873	1.20509	0.3631
SECONDARYGENERAL does not Granger Cause DR	1.71389	0.2034	0.18996	0.8279	0.34601	0.7124	4.25965	0.1021
DR does not Granger Cause SECONDARYGENERAL	0.59793	0.5586	1.64415	0.2086	1.68211	0.2155	2.69772	0.1813

In Mauritania, primary and secondary education cause the dependency ratio. But for Morocco, the dependency ratio causes the primary education and has a double causality with the secondary vocational. In Oman, the dependency ratio causes secondary education. And For Qatar, the dependency ratio is caused by secondary and secondary general education (Table 22).

Table 22: Granger causality of the dependency ratio and education variables in Arab countries (set3):

Country	Mauritania		Morocco		Oman		Qatar	
	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.

PRIMARY does not Granger Cause DR	5.96614	0.0056	0.33912	0.7145	3.10945	0.0583	1.06827	0.3537
DR does not Granger Cause PRIMARY	0.64860	0.5285	7.08147	0.0024	1.93867	0.1604	0.48437	0.6198
SECONDARY does not Granger Cause DR	1.42121	0.2648	0.12342	0.8843	2.94276	0.0681	3.39305	0.0450
DR does not Granger Cause SECONDARY	4.15104	0.0311	2.55851	0.0918	6.51711	0.0045	0.71658	0.4954
SECONDARYVOCATIONAL does not Granger Cause DR	3.15042	0.0766	4.69658	0.0156	2.19212	0.1345	0.92616	0.4056
DR does not Granger Cause SECONDARYVOCATIONAL	3.70385	0.0533	4.06499	0.0259	0.97350	0.3928	0.08994	0.9142
SECONDARYGENERAL does not Granger Cause DR	0.01057	0.9895	0.83498	0.4417	2.82356	0.0752	3.46503	0.0424
DR does not Granger Cause SECONDARYGENERAL	1.27312	0.2916	2.35437	0.1087	2.53769	0.0959	0.82884	0.4449

The dependency ratio causes the secondary education in Saudi Arabia and Sudan. It also causes the general secondary in Sudan. But for Syria, the dependency ratio causes the primary education and has a double causality with the secondary vocational (Table 23).

Table 23: Granger causality of the dependency ratio and education variables in Arab countries (set4):

Country	Saudi Arabia		Sudan		Syria	
	F-statistic	**Prob.**	**F-statistic**	**Prob.**	**F-statistic**	**Prob.**
PRIMARY does not Granger Cause DR	5.11616	0.1635	4.92458	0.0543	2.56326	0.0910
DR does not Granger Cause PRIMARY	1.49030	0.4016	0.08123	0.9230	7.47732	0.0019
SECONDARY does not Granger Cause DR	0.27606	0.7837	0.14376	0.8690	0.01011	0.9899
DR does not Granger Cause SECONDARY	24.4012	0.0394	9.45981	0.0140	2.99724	0.0625
SECONDARYVOCATIONAL does not Granger Cause DR	2.42762	0.2917	0.99438	0.4237	5.00656	0.0121
DR does not Granger Cause SECONDARYVOCATIONAL	2.97214	0.2518	1.10996	0.3889	5.86441	0.0062
SECONDARYGENERAL does not Granger Cause DR	NA	NA	0.19811	0.8254	0.03006	0.9704
DR does not Granger Cause SECONDARYGENERAL	NA	NA	9.56880	0.0136	2.79518	0.0744

In Tunisia, the dependency ratio causes the secondary education and is caused by all the remaining educational variables. But in the United Arab Emirates, only primary education that causes the dependency ratio. In the case of Palestine, the dependency ratio causes primary education and is caused by secondary and secondary general education (Table 24).

Table 24: Granger causality of the dependency ratio and education variables in Arab countries (set5):

Country	Tunisia		United Arab Emirates		Palestine	
	F-statistic	**Prob.**	**F-statistic**	**Prob.**	**F-statistic**	**Prob.**
PRIMARY does not Granger Cause DR	9.11918	0.0006	5.09156	0.0115	2.90826	0.0969
DR does not Granger Cause PRIMARY	1.41609	0.2552	3.15830	0.0548	6.19143	0.0158
SECONDARY does not Granger Cause DR	1.30625	0.2837	3.07039	0.0712	10.8915	0.0025
DR does not Granger Cause SECONDARY	6.87628	0.0030	1.65597	0.2187	0.77085	0.4861
SECONDARYVOCATIONAL does not Granger Cause DR	4.96511	0.0143	1.49651	0.2505	2.95657	0.0938
DR does not Granger Cause SECONDARYVOCATIONAL	0.38975	0.6808	2.35474	0.1235	3.66338	0.0604
SECONDARYGENERAL does not Granger Cause DR	3.89478	0.0300	3.09218	0.0701	14.5026	0.0008
DR does not Granger Cause SECONDARYGENERAL	2.91579	0.0678	1.49486	0.2508	0.47237	0.6356

5. Granger causality between the dependency ratio and female participation in education in Arab countries:

Tables 25, 26, 27, 28, and 29 summarizes the Granger causality results between the dependency ratio for Arab countries.

The dependency ratio is caused by the percentage of females in primary education and causes the percentage of females in secondary general education in Algeria. In Bahrain, the dependency ratio causes the percentage of females in both primary and secondary general education. For Egypt, the dependency ratio has a double causal relationship with the percentage of females in secondary education, and is caused by the percentage of females in primary and secondary general education. No causal links are found for Iraq (Table 25).

Table 25: Granger causality of the dependency ratio and female participation in education variables in Arab countries (set1):

Country	Algeria		Bahrain		Egypt		Iraq	
	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.
PRIMARY does not Granger Cause DR	3.96006	0.0274	0.28352	0.7550	4.56060	0.0184	2.63332	0.1096
DR does not Granger Cause PRIMARY	2.93851	0.0651	3.56039	0.0402	1.61658	0.2149	1.65610	0.2287
SECONDARYGENERAL does not Granger Cause DR	1.68922	0.1994	1.03381	0.3663	6.09246	0.0075	0.49632	0.6198
DR does not Granger Cause SECONDARYGENERAL	3.29784	0.0487	3.61855	0.0373	3.21543	0.0587	3.74875	0.0518

SECONDARYVOCATIONAL does not Granger Cause DR	1.66584	0.2072	1.08914	0.3476	1.31426	0.2920	0.95179	0.4114
DR does not Granger Cause SECONDARYVOCATIONAL	2.76043	0.0805	1.32656	0.2784	2.33530	0.1239	2.36677	0.1329
SECONDARY does not Granger Cause DR	0.81811	0.4515	1.01115	0.3742	4.57172	0.0203	0.63833	0.5440
DR does not Granger Cause SECONDARY	2.99210	0.0664	2.37677	0.1077	5.28546	0.0122	2.72972	0.1024

In Kuwait, no causal links are found between the dependency ratio and female participation in education variables. But the dependency ratio causes the percentage of females in the secondary general education in Jordan, and causes the percentage of females in secondary education in Jordan, Lebanon, and Libya (Table 26).

Table 26: Granger causality of the dependency ratio and female participation in education variables in Arab countries (set2):

Country	Jordan		Kuwait		Lebanon		Libya	
	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.
PRIMARY does not Granger Cause DR	1.62296	0.2153	1.11155	0.3411	0.96603	0.4031	3.26127	0.0921
DR does not Granger Cause PRIMARY	0.97866	0.3883	1.39613	0.2618	1.16036	0.3400	0.03534	0.9654
SECONDARYGENERAL does not Granger Cause DR	1.85869	0.1818	3.20459	0.0535	1.32881	0.2942	2.34587	0.2118
DR does not Granger Cause SECONDARYGENERAL	5.34900	0.0138	1.67165	0.2035	1.86587	0.1890	4.87740	0.0846
SECONDARYVOCATIONAL does not Granger Cause DR	0.96227	0.3969	0.30349	0.7408	0.24242	0.7876	0.43180	0.6764
DR does not Granger Cause SECONDARYVOCATIONAL	2.32015	0.1208	1.22573	0.3100	1.98703	0.1695	3.06178	0.1561
SECONDARY does not Granger Cause DR	2.09036	0.1447	0.78141	0.4672	0.22777	0.7990	4.74584	0.0879
DR does not Granger Cause SECONDARY	6.12852	0.0068	1.13578	0.3350	5.40380	0.0171	12.5176	0.0190

Mauritania does not show significant causalities between the dependency ratio and female participation in education variables. But in Morocco, the dependency ratio has a double causality with percentage of females in primary education, and causes both the percentage of females in secondary and secondary general. In Oman, only the percentage of females causes the dependency ratio. This latter variable causes the percentage of females in primary education, and has a double causality with the percentage of females in secondary vocational (Table 27).

Table 27: Granger causality of the dependency ratio and female participation in education variables in Arab countries (set3):

Country	Mauritania		Morocco		Oman		Qatar	
	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.
PRIMARY does not Granger Cause DR	0.37669	0.6893	3.78248	0.0318	1.98600	0.1538	0.96357	0.3907
DR does not Granger Cause PRIMARY	0.66796	0.5202	3.84139	0.0302	0.07600	0.9270	3.60965	0.0367
SECONDARYGENERAL does not Granger Cause DR	3.11224	0.0591	0.01298	0.9871	3.42793	0.0466	0.20774	0.8134
DR does not Granger Cause SECONDARYGENERAL	0.45225	0.6405	10.1575	0.0003	0.94002	0.4026	1.85086	0.1722
SECONDARYVOCATIONAL does not Granger Cause DR	0.66523	0.5308	0.86818	0.4286	1.27920	0.2991	9.66246	0.0013
DR does not Granger Cause SECONDARYVOCATIONAL	3.59482	0.0572	0.18187	0.8345	0.19887	0.8212	3.84122	0.0397
SECONDARY does not Granger Cause DR	0.26868	0.7672	0.74671	0.4820	3.12499	0.0596	0.19069	0.8272
DR does not Granger Cause SECONDARY	3.47682	0.0517	4.80950	0.0149	2.38358	0.1107	0.71202	0.4976

The dependency ratio causes the percentage of females in primary education in Sudan. No causal relationships are found in Saudi Arabia and Syria (Table 28).

Table 28: Granger causality of the dependency ratio and female participation in education variables in Arab countries (set4):

Country	Saudi Arabia		Sudan		Syria	
	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.
PRIMARY does not Granger Cause DR	6.07706	0.1413	1.13470	0.3820	2.29104	0.1157
DR does not Granger Cause PRIMARY	0.59347	0.6276	6.55827	0.0309	0.76871	0.4711
SECONDARYGENERAL does not Granger Cause DR	1.75865	0.3625	0.76179	0.5072	1.99212	0.1512
DR does not Granger Cause SECONDARYGENERAL	1.23384	0.4477	0.60864	0.5746	0.09008	0.9141
SECONDARYVOCATIONAL does not Granger Cause DR	0.51808	0.6587	0.03675	0.9641	1.92840	0.1601
DR does not Granger Cause SECONDARYVOCATIONAL	1.32677	0.4298	0.25673	0.7817	2.64393	0.0848
SECONDARY does not Granger Cause DR	NA	NA	0.71312	0.5274	2.13724	0.1327
DR does not Granger Cause SECONDARY	NA	NA	0.35022	0.7180	0.68012	0.5129

In Tunisia, the dependency ratio is caused by the percentage of females in primary education, and causes the percentage of females in secondary general. In the United Arab Emirates, the dependency ratio is caused by both the percentage of females in

primary and secondary general education while in Palestine, the dependency ratio causes both the percentage of females in secondary and secondary vocational (Table 29).

Table 29: Granger causality of the dependency ratio and female participation in education variables in Arab countries (set5):

Country	Tunisia		United Arab Emirates		Palestine	
	F-statistic	Prob.	F-statistic	Prob.	F-statistic	Prob.
PRIMARY does not Granger Cause DR	3.30936	0.0473	3.87622	0.0302	0.17635	0.8406
DR does not Granger Cause PRIMARY	0.03706	0.9637	2.21462	0.1243	1.47413	0.2709
SECONDARYGENERAL does not Granger Cause DR	2.36767	0.1090	3.73340	0.0440	1.41833	0.2831
DR does not Granger Cause SECONDARYGENERAL	4.12311	0.0249	1.64996	0.2198	2.92036	0.0961
SECONDARYVOCATIONAL does not Granger Cause DR	2.20345	0.1342	0.26547	0.7698	1.60488	0.2446
DR does not Granger Cause SECONDARYVOCATIONAL	0.90974	0.4172	3.13499	0.0679	6.07943	0.0167
SECONDARY does not Granger Cause DR	3.20154	0.0578	0.93059	0.4146	1.13284	0.3570
DR does not Granger Cause SECONDARY	1.74131	0.1959	0.10437	0.9015	2.82324	0.1024

V. Implied Policies and Discussion

Arab countries have decreasing trends of fertility rate and mortality rate that have resulted in the most recent decades in an increase of the working age population, or the population of the age group 15-65. The dependency ratio, that explains the working age population in terms of the dependent population, also has decreasing trends. Still, if the dependency ratio is divided into the young dependent ratio and elder dependency ratio, the trends of the elder ratio is slightly increasing, as the number of the population over the age 65 is increasing because of the enhancement of healthcare in the Arab economies.

All of the following resulted in the occurrence of the demographic dividend in Arab countries. These economies are divided into two groups where the first set of groups is characterized by a positive value of the demographic dividend, which is not the case of the second group of countries.

In Algeria, the demographic dividend started in 1970 and ended in 2015. In this country, the change in the demographic composition led to the increase of the female

and youth labor force, but at the same time, it decreases the total unemployment. In addition to that, the dependency ratio causes the increase in the enrolment in vocational secondary education, with emphasis on females. With regard to the government expenditures, the dependency ratio also caused the increase of education expenditure besides the increase in both public and private health expenditure. And while the GDP per capita causes the GDP per capita growth, it is also caused by both the government gross savings and the agriculture value added.

These findings align with the contribution of Furceri (2012) that states that both the rigid labor market and the relative low-output employment elasticity are the main factors behind the high unemployment, mostly among the youngest segments. But for the contributions of Bardak (2014) and ETF (2012), they indicate that political violence and social instability in this country are mainly because of the discrimination of females in the job market besides the high rates of unemployment and low training and education systems.

Policy implications requires that policy makers should target specific groups of youth in Algeria such as early school leavers and the NEETs, increase job supply, enhance the general and vocational education quality, in addition to the increase of policies that allow self-employment (Bardak, 2014).

In the case of Bahrain, the demographic dividend started in 1975 and is still occurring. The dependency ratio seems to cause the agriculture value added, the expenditure on education and the expenditure on private health. Furthermore, the increase in the working age population led to the increase of female enrolment in primary and secondary general education.

The economy of Bahrain is heavily reliant on oil, but due to declining oil reserves, challenges remain in diversifying economic sectors within this country. Still, Bahrain was successful in developing tourism, banking, and agriculture sectors in these recent decades (ILO,2006).

Even if this country has a strong economy, the Bahrain Center for Studies and Research indicates that almost 6% of the workforce that are unemployed are Bahraini nationals. The Ministry of Labor and Social Affairs tackles this latter issue besides

youth inclusion throughout the program “A Strategy for Employment and Integration of the National Workforce in the Labour Market in Bahrain”. (ILO, 2006)

The Bahraini Government also included an unemployment insurance that includes free healthcare in both private and public sectors.

In Bahrain, policy makers should also target specific groups in, mostly early school leavers that are a major concern in this country. In addition to that, both the quality of education and training should be enhanced and monitored throughout coordination between the provided educational and training programs, and the private sectors.

Finally, and even if females reached higher rates of participation in both the job market and education in Bahrain, more efforts are still needed. Policy makers should put strategies to include women more in the job market besides reducing the gap of the wage difference between males and females (ILO, 2006).

For Egypt, the demographic dividend ended in 2005. The dependency ratio in this economy causes the unemployment under a significant level of 10% and causes the industry value added and the expenditure on private health under a significance level of 5%. In addition to that, the dependency ratio led to an increase in the enrolment in secondary vocational education besides the increase in the female participation in secondary education.

According to Ghafar (2016), the problem of unemployment is of prime importance in Egypt. For this, there should be policies and programs that will increase the job supply. These policies should be targeting specific groups, mostly young graduates.

In the case of Iraq, the demographic dividend ended in 1980. The dependency ratio causes the female labor force, the public health expenditure, and the total health expenditure.

The economic situation of Iraq is a result of the political conflicts and war (Katzman, 2013; Katzman & Humud, 2016). But for this economy to be fast growing, Al Basri and Al Sebahi (2013) indicate that oil and gas legislation and regulatory reforms should be approved besides employment and educational reforms.

In Jordan, the demographic dividend ended in 1970, still the population change resulted in the increase of total unemployment. In addition to that, the dependency

ratio causes the expenditure on private health, female enrolment in both secondary education and secondary general education.

Even if the population change led to more female participation in both education and employment, the issue of unemployment still exists. This is why policy makers should put more programs to attain lower unemployment rates.

In Kuwait and Mauritania, the demographic dividend started in 1980, and 2005, respectively, but the demographic change indicates no causalities are found.

These two economies need to make reforms, strategies, and programs that will focus on the youth at this stage to make profit from the demographic dividend as this latter is in its early stage. Focus should be on human capital, education, health, and job supply.

For Lebanon, the demographic dividend ended in 1980. The dependency ratio in this economy causes the increase of the total labor force, unemployment of young females, GDP per capita, GDP per capita growth, gross savings, expenditure on education, and the female enrolment in secondary education.

In Lebanon, the issue of the females' marginalization still exists, mostly among the youth. For this, the Lebanese government should put policies that will enable the enhancement of female inclusion.

In Morocco, the demographic dividend started in 1980 and is still occurring with positive trends. The demographic transition causes the total unemployment, youth participation in the labor force, and the unemployment of both young males and young females. And with regard to education variables, the dependency ratio causes the enrolment in primary education, secondary vocational education, female participation in primary, secondary general, and secondary education.

The contribution of CITI foundation (2014) indicates that there is a lack of investment in the young Moroccans that resulted in the social and economic exclusion of this segment of the population. Even if there are projects for youth inclusion such as the partnership between the Moroccan government and the World Bank, efforts still need to be made. Policy makers should put strategies and programs of youth inclusion in addition to the creation of additional investment as well as the creation of microloans

to encourage innovative enterprises within this economy. Furthermore, there should be coordination between public and private sectors, in both the job market and educational institutions to reduce the gap of the skills learned in schools and the skills required by employers. Focus should also be on targeted groups such as the NEETs.

In Oman, the demographic dividend started in 2010 and is still occurring. In this country, the demographic transition causes the total labor force, youth participation in labor force, expenditure on education, and expenditure on health per capita. In addition to that, the dependency ratio also causes enrolment in secondary education.

Oman shows that the population change is having a positive economic impact. For this, policy makers should maintain the strategies in work and enhance the public sector in both education and health.

In the case of Qatar, the demographic dividend existed since 1960. But for the dependency ratio, it causes the youth participation in the labor force, and female participation in both primary and secondary vocational education.

In Saudi Arabia, the demographic dividend started in 1990 and is still occurring with a positive trend. The demographic transition causes the total labor force, female labor force, expenditure on education, and expenditure on total and public health. Furthermore, the dependency ratio causes the enrolment in secondary education.

In Sudan, the demographic dividend only happened in the period between 2000 and 2015. The dependency ratio in this economy causes total labor force, female labor force, and youth participation in labor force. Concerning education, the dependency ratio causes the increase in the enrolment in secondary and secondary general education as it causes the increase of female participation in primary education.

For Syria, no demographic dividend is found. But the demographic transition causes the total labor force, female labor force, and youth participation in labor force, agriculture value added, industry value added, and health expenditure per capita. The dependency ratio also causes the primary and secondary vocational education.

For Syria, strategies should relate to creating more job opportunities in the growing sectors with more inclusion of the youngest segment.

For Tunisia, the demographic dividend started in 1970 and had increasing trends until 2005. This demographic dividend is still occurring but with a negative pattern. In Tunisia, the demographic transition causes the total labor force, the youth participation in the labor force, the GDP per capita, the gross savings, the agriculture value added, expenditure on education, expenditure on health per capita, and expenditure on public health. For the education variable, the dependency ratio causes the increase in the secondary education enrolment and the increase in the female participation in general education.

In the United Arab Emirates, no demographic dividend is found starting the period of 1965. In this economy the demographic transition accounts for the causality of total labor force, total and young female unemployment, and health expenditure per capita.

This country has the same issue as Lebanon, which relates to the social exclusion of women. Thus, the United Arab Emirates policy makers should put strategies that will enable the inclusion of young females besides maintaining and enhancing the current strategies.

In Palestine, the demographic dividend is found only for the period between 1995 and 2005. But the dependency ratio causes the female labor force, and the youth labor force besides GDP per capita. With regard to education variables, the dependency ratio causes enrolment in primary education and female participation in secondary vocational education.

The economic situation and the poverty levels within this economy is mainly a result of its political situation (CITI foundation, 2014).

In Yemen, the demographic dividend was in the period between 1975 and 2010. The dependency ratio causes the total labor force, the total unemployment, the young female unemployment, GDP per capita, GDP per capita growth, industry value added, agriculture value added, expenditure on education, and expenditure on both public and private health.

As the population change has a direct impact on both industrial and agricultural sectors, Yemen should create more investment in these sectors to ensure job supply. In addition to that, policy makers should also put into work programs and strategies

that will enhance the human capital in this economy with focus on youth, mostly females.

Emphasis should be on countries in which the demographic dividend recently occurred or is still occurring to take advantages of the population change to achieve economic growth. These countries are Bahrain, Kuwait, Mauritania, Morocco, Oman, Qatar, Saudi Arabia, Syria, and Tunisia. Policies that must be standardized in order to achieve high economic growth among all of these economies should relate to health, human capital, education, and job supply.

For health policies, investment and government should be towards the public health sector to ensure medical care to the population and to strengthen health systems within these economies. But for educational policies, focus should not only be on increasing its access, but there should be coordination between education programs, training programs, and the job market, in order to ensure a better use of the human capital.

Other policies should target identifying economic sectors and industries that are among the growth phase, promote pro-growth policies, and expand both national and international investment. This is to ensure a supply of both skilled and unskilled labor.

VI. Conclusion

In the shorter and medium runs, demographic dividends can be still attractive for countries and economies and mostly for those sectors that are under quasi-autarky. But, the longer terms prospects appear to be playing in favor of economies that are open, interdependent and globalized. Migration and relocations of people, are also important factors that need to be considered when seeking new opportunities of change. In this context, Arab economies appear to be concerned with the global changes including demographic dividends, but the rate of shifts from traditional demographic structures seem to be very low in some economies. This implies that more research on demographic dividend is needed both globally and locally to better predict future demographic and economic trends. Collaboration with other scientists in other fields of knowledge is also highly needed to better understand the human impacts of series of future projects.

Cited References

Aiyar, S. & Mody, A. (2013). The demographic dividend: Evidence from the Indian States. India Policy Forum, National Council of Applied Economic Research, vol. 9(1), pages 105-148.

Al-Basri, K. F., & Al-Sebahi, M. (2013). The political economy of Iraq: Will oil burn out democracy? ISPI, 1-13. Retrieved from http://www.ispionline.it/sites/default/files/pubblicazioni/analysis_198_2013_0.pdf

Bardak, U. (2014). Labour market and education: Youth and unemployment in the spotlight. European Training Foundation, 1-7.

Barro, R., and Sala-I-Martin, X. (1995). Economic growth. New York: McGraw-Hill.

Berlin Institute. (2012). Demographic dividend in Brazil. 1-7.

Bloom, D. E., and Sachs, J. D. (1998). Geography, demography, and economic growth in Africa. Brookings Papers on Economic Activity, 2, 207–295.

Bloom D.E. and Williamson, J.G. (1998), Demographic transitions and economic miracles in emerging Asia. World Bank Economic Review, 12: 419-56.

Bloom, D. E., and Canning, Malaney, D. and P. N. (2000). Population dynamics and economic growth in Asia. Population and Development Review, 26, 257-290.

Bloom, D. E., Canning, D, and Sevilla, J. (2002). The demographic dividend: A new perspective on the economic consequences of population change. Santa Monica, California: RAND, MR– 1274, 2002.

Bloom, D. E., and Canning, D. (2003). Contraception and the Celtic tiger. The Economic and Social Review, 34, 229–247.

Bloom, D. E., Canning, D. and Sevilla, J. (2003). The demographic dividend: A new perspective on the economic consequences of population change. RAND.

Bloom, D. and Canning, D. (2004). Global demographic change: Dimensions and economic significance. NBER Working Paper 10817, NBER, 2004.

Bloom, D. E., Canning, D., Fink, G., and Finlay, J. (2007). Realizing the demographic dividend: Is Africa any different? PGDA Working Paper No. 23.

Bloom, David E., David Canning, Guenther Fink and Jocelyn E. Finlay (2009). Fertility, female labor force participation, and the demographic dividend. Journal of Economic Growth, 14(2), 79-101.

Bloom, D. E. & Alfonso, S. P. (2013). Ageing and productivity: Introduction. IZA Discussion Papers 7205, Institute for the Study of Labor (IZA).

Brito, R. D., & Carvalho, C. (n.d.). Macroeconomic effects of the demographic transition in Brazil. Asymmetric Demography and the Global Economy. doi:10.1057/9781137481436.0014

Carvalho, J. A. M. d. and Wong, L. (1999). Demographic and socioeconomic implications of rapid fertility decline in Brazil: A window of opportunity. Reproductive Change in Brazil and India. G. Martine, Oxford University Press.

CITI Foundation. (2014). Challenges and opportunities for youth employment in the Middle East and North Africa. Education For Employment, 1-64. Retrieved from https://efe.org/media/1274/challenges-and-opportunities-for-youth-employment-in-the-middle-east-and-north-africa.pdf

Crane, K., Simon, S., and Martini, J. (2011). Future challenges for the Arab world. The implications of demographic and economic trends. Rand Corporation. http://www.rand.org/content/dam/rand/pubs/technical_reports/2011/RAND_TR912.pdf

Davis, K. (1963). A theory of change and response in modern demographic history. Population Index 29(4), 345–366.

Drummond, P., Thakoor, V., & Yu, S. (2014). Africa rising: Harnessing the demographic dividend. IMF Working Papers, 14(143), 1. doi:10.5089/9781498379878.001

El-Khoury, G. (2016). Demographic trends and age structural change in Arab countries: selected indicators, Contemporary Arab Affairs, 9(2), 340-345, DOI: 10.1080/17550912.2016.1156300

Engelhardt, H., & Schulz, F. (2017). Demographic developments in the Middle East and North Africa. University of Bamberg, (20), 1-40.

European Training Foundation – ETF (2012), Union for the Mediterranean regional employability review. Publications Office of the European Union, Luxembourg, 2012, available at: www.etf.europa.eu/web.nsf/ pages/UfM_regional_employability_review

Furceri, D. (2012). Unemployment and labor market issues in Algeria. IMF Working Papers, 12(99), 1. doi:10.5089/9781475502893.001

Galor, O., and Weil; D. N. (2000). Population, technology and growth: From the Malthusian regime to the demographic transition. American Economic Review, 110, 806-828.

Galor, O. (2005). From stagnation to growth: Unified growth theory. in Handbook of Economic Growth, eds. by P. Aghion, and S. Durlauf, Chapter 4, Elsevier Science B.V., Amsterdam.

Ghafar, A. A. (2016). Educated but unemployed: The challenge facing Egypt's youth. Foreign Policy at Brookings, 1-16. Retrieved from https://www.brookings.edu/wp-content/uploads/2016/07/en_youth_in_egypt.pdf.

Gribble, J. N., & Bremner, J. (2012). Achieving a demographic dividend. Population Reference Bureau, 67(2), 1-16. Retrieved from http://www.prb.org/pdf12/achieving-demographic-dividend.pdf

ILO. (2006). Decent work pilot programme. 1-12. Retrieved from http://www.ilo.org/public/english/bureau/dwpp/download/bahrain/countrybriefbah.pdf

Katzman, K. (2013). Iraq: Politics, governance, and human rights. Congressional Research Service, 1-48. Retrieved from http://www.refworld.org/pdfid/52cff0d64.pdf

Katzman, K., & Humud, C. E. (2016). Iraq: Politics and governance. Congressional Research Service, 1-44. Retrieved from https://fas.org/sgp/crs/mideast/RS21968.pdf.

Kirk, D. (1996). Demographic transition theory. Population Studies 50(3), 361–387.

Lee, R. D. (2003). The demographic transition: Three centuries of fundamental change. Journal of Economic Perspectives 17(4), 167–190.

Lee, R. and A. Mason (2010). Fertility, human capital, and economic growth over the demographic transition. European Journal of Population 26(2): 159-182.

Lee, R. D., & Mason, A. (2012). Lower-income countries and the eemographic eividend. National Transfer Account, 1-8.

Lorentzen, P., and McMillan, J. and Wacziarg, R. (2008). Death and development. Journal of Economic Growth, 13(2), 81-124.

Loewe, M. (2007). A demographic dividend for the developing countries? Consequences of the global aging process . German Development Institute.

Majumder, R. (2013). India's demographic dividend: opportunities and threats. Munich Personal RePEc Archive (PMRA), 1-10. Retrieved from https://mpra.ub.uni-muenchen.de/46880/1/MPRA_paper_46880.pdf.

Mason, A. (2001). Population, capital, and labor. Population change and economic development in East Asia: Challenges met, opportunities seized. eds. by Mason A., Chapter 8, Stanford: Stanford University Press.

Mason, A. (2005). Demographic transition and demographic dividends in developed and developing countries. United Nations Expert Group Meeting on Social and Economic Implications of Changing Population Age Structures, Mexico City.

Mason, A. and R. Lee (2007). Transfers, capital, and consumption over the demographic transition. Population Aging, Intergenerational Transfers and the Macroeconomy. R. Clark, A. Mason and N. Ogawa, Elgar Press: 128-162.

Mason, A. and S.-H. Lee (2011). Population, wealth, and economic growth in Asia and the Pacific. Aging, Economic Growth, and Old-age Security in Asia. D. Park, S.-H. Lee and A. Mason. Cheltenham, UK and Northamption, MA, Edward Elgar: 32-82.

Medina, E., & Chager, S. (2015). Opportunities of the demographic dividend on poverty reduction in Sub-Saharan Africa. NOPOOR, (70), 1-22. Retrieved from http://www.nopoor.eu/publication/opportunities-demographic-dividend-poverty-reduction-sub-saharan-africa-short-version

Mody, A., & Aiyar, S. (2011). The demographic dividend: Evidence from the Indian states. IMF Working Papers, 11(38), 1. doi:10.5089/9781455217885.001

Pool, I. (2007). Demographic dividends: Determinants of development or merely windows of opportunity. Ageing Horizons, 7, 28-35.

Lee, R. and Mason, A. (2006). What is the demographic dividend?. Finance & Development 43(3) September. http://www.imf.org/external/pubs/ft/fandd/2006/09/basics.htm

Rosenzweig, M. R. (1990). Population growth and human capital investments: Theory and evidence. Journal of Political Economy, 98(5), 38-70.

Ross, J. (2004). Understanding the demographic dividend. POLICY Project, 1-8. Retrieved from http://www.policyproject.com/pubs/generalreport/Demo_Div.pdf

Saxena, P. C. (2011). Demographic profile of the Arab countries: Analysis of the ageing phenomenon. United Nations, 1-43. Retrieved from http://www.csa.org.lb/cms/assets/2013/un%20escwa_sdd_11_.pdf

Soares, R. R. (2005). Mortality reductions, educational attainment, and fertility choice. American Economic Review, 95(3), 580-601.

Soares, R. R., and Falcao, L. S. (2008). The demographic transition and the sexual division of labor. Journal of Political Economy, 116(6), 1058-1104.

Stampe, M. Z., Porsse, A. A., & Portugal, M. S. (2011). Demographic change and economic growth in Brazil: an exploratory spatial data analysis. 1-36.

Thakur, V. (2012). The demographic dividend in India: Gift or curse? A State level analysis on differing age structure and its implications for India's economic growth prospects. Development Studies Institute. London School of Economics and Political Science, (12), 1-29.

Ven, R. V., & Smits, J. (2011). The demographic window of opportunity: age structure and sub-national economic growth in developing countries. Nijmegen Center for Economics (NiCE), 1-37.

Williamson, J.G., and M. Higgins (2001). The accumulation and demography connection in East Asia. in Population Change and Economic Development in East Asia: Challenges Met, Opportunities Seized, eds. by Mason A., Chapter 5, Stanford: Stanford University Press.

World Bank. (2016). Population estimates and projections. Retrieved from https://data.worldbank.org/data-catalog/population-projection-tables