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Demographic And Macroeconomic Determinants of Economic Growth: An Evidence of Turkey

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Abstract: *This paper aims to analyze whether life expectancy, labor force participation of female, unemployment rate and urban population have any significant effect on GDP growth rate for the period of 1988-2014 in Turkey. Within this framework, cointegration relationshipsamong variables are investigated using Bounds Testing procedure. The long run causalities are also estimated by performingautoregressive distributed lag methodology.The findings reveal that life expectancy, labor force participation of female, unemployment rate and urban population are the forcing variables of changes in the GDP growth. While urban population has negative impact on GDP growth, life expectancy and unemployment have positive effects in the long run. Further, short-run relationships imply that life expectancy affects economic growth positively, while urban population has a negative effect on growth, consistent with the long-run findings. However, contrary to long-run findings, unemployment rate affects GDP growth negatively in the short-run.*

Keywords: *GDP growth,ARDL,Labor Force Participation of Female Life Expectancy, Unemployment Rate, Urban Population*

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I. INTRODUCTION

High level of economic growth which is a substantial indicator of wealth is aimed by all countries in the world. Especially, growth is important indicator for developing countries.At this point, it is important to understand the leading factors of economic growth in detail.Several theoretical and empirical works have been done to explain the reasons of economic growth so far.On one hand, the classical economic theories([1]) claim that accumulation and productive investments are the main drivers of the economic growth under capitalist societies based on the reinvestment of the profits. On the other hand, according to the demand and supply model, there are both demand and supply side factors affecting economic growth. Demand side factors include consumption, investment, government spending and exportleading to theincrease in the growth of aggregate demand. In addition, aggregate demand is affected by interest rates, consumer confidence, asset prices, real wages and value of exchange rates. Also, levels of infrastructure, human capital and development of technology are related with economic growth in the long run. According to the new approaches, entrepreneurship is also considered to bean important factor in developing growth models.Moreover, various studies have been conducted in order to findthe impact of different factors on economic growth. Besides macroeconomic factors, demographic factors are also found to affect economic growth significantly. For example, population is considered as a considerably significant factor on economic growth. As the number of people increases, the consumption needs of them also increase, which causes an increase in production amount. Also, fertility rate and mortality rate are very important for developing countries which have direct effects on population growth, and accordingly economic growth.

Dynamic population in developing countries leads us to examine the effects of certain demographic factors on economic growth. This study examines both the impacts of certain demographic factors, and unemployment rate which is a debatable issue on economic growth. In this respect, it investigates whether life expectancy, labor force participation of female, urban populationand unemployment ratehave significant impact on GDP growth by performing time series analysis for the period of 1988-2014 in Turkey.To satisfy this purpose, cointegration relationships among all variables are investigated by performing Bounds Testing procedure. Further, long run coefficients and error correction models are estimated to discover the causal relationship among variables by using ARDL methodology both in long-run and short-run.The findings reveal that there exist four cointegration relationships. Most importantly, life expectancy, labor force participation of female, unemployment rate and urban population are found to be the forcing variables of GDP growth. In addition, according to the long run coefficient estimate results, life expectancy and unemployment have positive and significant effects on GDP growth in the long run while urban population affects GDP growth negatively.Further, short-run relationships imply that while life expectancy has a positive impact, urban

population has a negative effect on economic growth, consistent with the long-run findings. However, contrary to long-run findings, unemployment rate affects GDP growth negatively in the short-run.

The present paper contributes to the existing literature in certain aspects.First, it does not only take into account macroeconomic factors but it also considers demographic factors in order to understand the determinants of GDP growth in Turkey. Since Turkey is a dynamic and developing country, it has potential growth facilities. The rapidly rising youth population leads technological developments,which increasesproductivity, and creates diversity of industry increasing profitability. Further, with the increasing rate of labor force participation of female, workforce dynamics also change in recent years which can be considered as an important factor affecting economic growth pattern. For this reason, aforementioned demographic factors are critical in determining the characteristics of economic growth especially for the policy makers. The remainder of the paper is organized as follows. Next section presents a summary of theliterature. Then, the data and methods are explained. Later,the methodology and empirical results are presented. Last,the conclusion of the study is discussed.

II. LITERATURE REVIEW

Several studies have been conducted in order to determine the factors affecting economic growth. The early literature indicates that certain macroeconomic, sociological and demographic variables may affect economic growth significantly. In this respect, the effects of life expectancy, labor force participation of female, unemployment rate and urban population on economic growth have been widely examined in the literature. Bloom, Canning and Sevilla [2] develop a production function model for aggregate economic growth model by including work experience and health in the form of life expectancy to physical capital, labor, and human capital. The results of the study reveal that health has a significant and positive effect on aggregate output. Also, Bloom et al.[3]assert that improvements in healthy life expectancy lead an increase in the average age of retirement. They analyze the effect of changing the age of retirement on the savings by using a cross-country panel of macroeconomic data. The findings of the study show that the longer life span leads a longer working life, which increases savings. Azomahou, Boucekkine and Diene [4]examine the nonparametric inference of the relationship between life expectancy and economic growth for 18 countries over the period of 1820-2005. They conclude that a significant and positive relationship exists between life expectancy and economic growth. Bowser[5]also examines the relationship between life expectancy and economic growth by using a large data set for USA. He finds a significant and positive link between life expectancy and net earnings per capital (also supported by Lee, Mason and Miller [6], Bloom and Finlay [7]). On the other hand, Acemoglu and Johnson[8]investigate the increasing effect of life expectancy on economic growth by using ordinary least squares (OLS) technique. The findings of the study suggest that an increase in life expectancy causes an increase in population, but the effect of life expectancy on economic growth is very small both initially and over a 40 year horizon. Thus, they do not find any evidence that an increase in life expectancy leads a significant increase in economic growth. Ashraf, Lester and Weil[9] examine the impact of health improvements on economic growth by performing a simulation model. Consistent with the findings of Acemoglu and Johnson[8], they cannot find any significant evidence that an increase in life expectancy leads an increase in income per capita in the long run. However, theystate that improvement in life expectancy causes an increase in income in some extent, but due to the faster population growth, it also leads a decrease in income.

Further, Bloom et al. [10]examine the relationship between fertility on female labor force participation and economic growth in a cross-country panel data. Their findings indicate that fertility and female labor force participation are negatively related with each other. As fertility increases, female labor force participation decreases, which affects economic growth unfavorably. In addition, Bloom and Finlay[7] assert that economic growth performance is explained by the change in demographic factors in the late 1990s in East Asian Countries, and they reexamine the effect of change in demographic factors on economic growth in East Asia by performing regression analysis. Their findings show that the change of the demographic variables has significant impact on economic growth. Lahoti and Swaminathan[11]also investigate the relationship between economic growth and women's economic activity in India by using dynamic panel models. The findings of the study reveal that there is no evidenceexisting a significant relationship between level of economic development and labor force participation of female.

Besides those demographic factors mentioned above, Bean and Pissarides[12] examine the link among unemployment, consumption and growth, using a standard overlapping generations. In their models, they modify technology to show constant returns to scale. Their findings demonstrate that the cross-country bivariate correlation between unemployment and economic growth can either be positive or negative depending on the economic structures across countries.Castells-Quintana and Royuela[13] investigate the long-run relationship between economic growth-unemployment rate and inequality- unemployment rate byperforming OLS technique. Their findings suggest that unlike in short-run, there cannot be found any negatively significant relationship between economic growth and unemployment rate in the long-run. Rather, several theoretical

studies find positive relationship between unemployment rate and economic growth ([14], [15], [16]).

Dao[17] examines the economic impacts of the economic transition in developing countries. His findings reveal that the growth rate of per capita GDP is linearly dependent on population growth by using World Bank data from 43 developing countries. This study presents an important finding that demographic variables have significant impact on economic growth. Ali, Ali and Amjad[18] test empirically the impact of the population growth on economic development in Pakistan for the period of 1975-2008 by employing ARDL approach. Their findings indicate that population has a positive and significant effect on economic growth. Also, Brückner and Schwandt [19] investigate whether the increase in the population leads an increase in income by using a panel of 139 for countries for the period of 1960-2000. Their findings reveal that 1% point of increase in GDP per capita growth over a ten years period leads 0.1% increase in population growth. In this study, the co-movements between these demographic factors, life expectancy, labor force participation rate of female, and urban population, and one macroeconomic factor, unemployment rate, with economic growth are examined simultaneously with ARDL approach over the period of 1988-2014 for Turkey.

III. DATA AND METHODS

In the current paper, GDP growth (annual, %) (GDP), life expectancy at birth (annual, years) (LE), labor force participation rate of female (annual, % of female population ages 15+) (LF), unemployment rate (annual, %) (UE) and urban population (annual, % of total) (UP) from the database of World Development Indicators are used for the period of 1988-2014. Descriptive statistics for GDP growth, life expectancy, labor force participation of female, unemployment rate and urban population are tabulated in Table 1. The results indicate that mean GDP growth rate is about 4%, the average life expectancy is approximately 70 years, the mean labor force participation of female is 28.7%, the average unemployment rate is about 9% and the mean of urban population is 65.14%. All the data are normally distributed, and when looked at the standard deviations, volatilities for the five factors are low, which is a desirable result.

Table 1: Descriptive Statistics

	UP	UE	LF	LE	GDP
Mean	65.13569	9.161538	28.7	69.83182	4.006424
Median	65.0365	8.8	28.75	70.27511	5.15045
Maximum	72.37	14	36.1	76.3	9.362808
Minimum	56.587	6.5	23.3	63.29454	-5.697476
Std. Dev.	4.516224	1.776306	3.641758	3.878591	4.681456
Skewness	-0.086914	0.606937	0.254531	-0.16358	-0.762844
Kurtosis	1.96197	3.345352	2.262771	1.776067	2.430146
Jarque-Bera	1.200031	1.72549	0.869538	1.738805	2.873496
Probability	0.548803	0.422002	0.647414	0.419202	0.2377
Sum	1693.528	238.2	746.2	1815.627	104.167
SumSq. Dev.	509.907	78.88154	331.56	376.0866	547.9008
Note: Full Sample. Thefullperiod is 1988-2014.					

Since unit root testspresent mixed results, ARDL([20] , [21]) approach is preferred for the present study. In ARDL approach, the series do not have to be integrated of order one, so it is also suitable for mixed series. Since it gives superior cointegration relationships even in small series, it is a quite advantageous technique([22]). In order to test the cointegration relationships, Bounds Testing procedure is employed. Also, to estimate long run causal relationships among variables, long run coefficients are estimated, and error correction model is interpreted,which shows the speed of adjustment to restore the equilibrium.

IV. METHODOLOGY AND EMPIRICAL RESULTS

4.1. Unit Root Test Results

In order to understand whether the data is stationary, unit root testsareperformed. There exist five unit root tests that can be examined: Dickey and Fuller[23] (ADF), Phillips and Perron[24] (PP), Dickey and Fuller[23] (GLS, DF-GLS), Kwiatkowski et al. [25] (KPSS), and Ng and Perron's MZα[26] (NPZa). Table 2 indicates the unit root test results for levels. For level data with intercept, while GDP growth is found to be stationary, life expectancy, labor force participation of female, unemployment and urban population are integrated of order one. For level data with intercept and trend, the results indicate that while GDP growth and urban population are stationary, life expectancy, labor force participation of female, unemployment are integrated of order one, so the difference of the data should be taken in order to be stationary shown in the Table 2.

Table 2: Unit Root Test Results (Levels)						
		Adf	Df_Gls	Pp	Kpss	Ng_Perron
		Statistics	Statistics	Statistics	Statistics	Statistics
GDP GROWTH	Intercept	-5.645079[c] (0)	-5,691988[c]	-5,690321[c]	0,070017	-12.1919[b]
LIFE EXP.		-2.402849 (8)	2.224695 (3)	-0.255587	0.759072[c]	-28.4925[c]
LABOR FORCE PART. of FEM.		-1.416737 (10)	-1.512102 (0)	-1.79586	0.511718[b]	-2.94148
UNEMPLOYMENT		-1.627179 (0)	-1.633940[a] (0)	-1.743299	0.440107[a]	-4.46294
Urban Populatıon		-5.363069[c] (10)	-2.418208[b] (9)	-2.111962	0.765817[c]	1.67623
GDP GROWTH	Interceptand Trend	-2.185111 (8)	-5.774349[c] (0)	-5.577518[c]	0.051472	-12.1503
Lıfe Exp.		-3.792171[b] (2)	-3.955609[c] (2)	-1.636418	0.166947[b]	-0.33946
Labor Force Part. Of Fem.		-1.628888 (0)	-1.845526 (0)	-1.527197	0.150926[b]	-5.95567
Unemployment		-2.692545 (1)	-2.687925 (1)	-2.246654	0.111231	-14.2013[a]
Urban Populatıon		-7.298516[c] (1)	-3.614148[b] (2)	-6.820545[c]	0.096325	0.04551
Superscripts a, b and c representsignificance at 1%, 5% and 10%, respectively. ADF, DF-GLS, PP, KPSS and NP-Zα refertoDickey-Fuller Dickey-Fuller GLS detrended, Phillips-Perron, Kwiatkowski-Phillips-Schmidt-ShinandNg-Perron Zα, respectively. LaglengthsaredeterminedbyAkaike Information Criterion (AIC).						

Further, according to the Jarque-Bera Lagrange Multiplier test statistics, error terms are normally distributed for all series. Breusch-Godfrey Test to examine whether any serial correlation exists, Cusum and Cusum of Squares Test to test stability of the parameters, and White Test to detect heteroscedasticity are performed, to conclude, no violation of assumptions can be found (diagnostic tests are available upon request).

Table 3: Unit Root Test Results (First-Differences)						
		ADF	DF_GLS	PP	KPSS	NG_PERRON
		Statistics	Statistics	Statistics	Statistics	Statistics
Gdp Growth	Intercept	-4.129582[c] (3)	-9.184474[c] (0)	-33.85716[c]	0.500000[b]	-7.43487[b]
Lıfe Exp.		-2.765134[a] (2)	-1.760442[a] (0)	-1.574844	0.112269	-9.59880[b]
Labor Force Part. Of Fem.		-2.431851 (5)	-5.481527[c] (0)	-5.853843[c]	0.22923	-11.5294[b]
Unemployment		-4.246324[c] (0)	-4.326149[c] (0)	-4.221725[c]	0.099203	-11.8763[b]
Urban Populatıon		-20.30398[c] (1)	-2.377338[b] (1)	-5.739194[c]	0.320762	-4.72985
Gdp Growth	Interceptand Trend	-3.539827[a] (5)	-8.822564[c] (0)	-17.00122[c]	0.421925[c]	-8.42482
Lıfe Exp.		-2.972174 (5)	-2.808391 (2)	-0.695156	0.104646	13.5495
Labor Force Part. Of Fem.		-3.329011[a] (5)	-2.490507 (5)	-8.503619[c]	0.226775[c]	-3.27056
Unemployment		-4.144825[b] (0)	-4.339910[c] (0)	-4.088639[b]	0.114682	-11.8816
Urban Populatıon		-19.68757[c] (1)	-3.626539[b] (1)	-6.351091[c]	0.144723[a]	-7.53515
Superscripts a, b and c representsignificance at 1%, 5% and 10%, respectively. ADF, DF-GLS, PP, KPSS and NP-Zα refertoDickey-Fuller Dickey-Fuller GLS detrended, Phillips-Perron, Kwiatkowski-Phillips-Schmidt-ShinandNg-Perron Zα, respectively. LaglengthsaredeterminedbyAkaike Information Criterion (AIC).						

Since the data includes both I(0) and I(1), which means mixed order of integration, ARDL methodology developed by Pesaran and Pesaran[20] and Pesaran, Shin and Smith [21]is employed in the current study. In this approach, cointegration relationships are examined among the macroeconomic and demographicfactors by using Bounds Testing procedure. In this framework, the following regression equation is estimated;

$$\Delta \mathrm{GDPt} = a_{0GDP} + \sum_{i=1}^{k} bi\Delta GDPt - i + \sum_{i=1}^{k} ci\Delta LEt - i + \sum_{i=1}^{k} di\Delta LFt - i + \sum_{i=1}^{k} ei\Delta UEt - i + \sum_{i=1}^{k} fi\Delta UPt - i + \varphi 1GDPt - 1 + \varphi 2LEt - 1 + \varphi 3LEt - 1 + \varphi 4UEt - 1 + \varphi 5UPt - 1 + \varepsilon tGDP,$$

The coefficients b, c, d, e and f are the short-run coefficients for GDP, LE, LF, UE and UP, respectively. Also, φs are the long-run coefficients for the ARDL model. The null hypothesis of no cointegration is $\varphi_1=\varphi_2=\varphi_3=\varphi_4=\varphi_5=0$. The hypothesis is tested using F-statistic, and compared with the critical value by Narayan [27]. The lag order should be determined by considering the VAR order selection criteria shown in Table 4. All selection criteria, except LogL, suggest that the optimal lag length is 3.

Table 4: VAR Lag Order Selection Criteria						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-228.122	NA	438.0717	20.2715	20.5183	20.3336
1	-76.1063	224.7191	0.0074	9.2266	10.7077	9.5991
2	-28.402	49.7784	0.0015	7.2523	9.9677	7.9352
3	48.2874	**46.6805***	**5.54e-05***	**2.7576***	**6.7072***	**3.7509***

* indicateslagorderselectedbythecriterion	

4.2. Cointegration Test Results

Table 5 presents the cointegration relationships among the variables. According to the Narayan[27]table, lower and upper critical values are determined as 4.614 and 5.966 for 1%, 3.272 and 4.306 for 5% and 2.676 and 3.586 for 10%, respectively. F-statistics suggest that four cointegrating relationships exist among the variables. First estimated equation approached in the scope of the current studyimplies that life expectancy, labor force participation of female, unemployment and urban population are forcing variables of GDP growth. There exist also three more cointegrating relationships:Second estimated equation shows that GDP growth, labor force participation of female, unemployment and urban population are forcing variables of life expectancy. Third estimated equation reveals that life expectancy, GDP growth, unemployment and urban population are forcing variables of labor force participation of female. Last estimated equation suggests that life expectancy, labor force participation of female, unemployment and GDP growth are forcing variables of urban population.However, only the first cointegrating relationship is considered in the scope of the present study.

Table 5: Bounds Testing Procedure Results	
CointegrationHypotheses	F Statistics
$F(GDP_t\backslash LE_t, LF_t, UE_t, UP_t)$	**5.048797****
$F(LE_t\backslash GDP_t, LF_t, UE_t, UP_t)$	**58.14441***
$F(LF_t\backslash LE_t, GDP_t, UE_t, UP_t)$	**120.2561***
$F(UE_t\backslash LE_t, LF_t, GDP_t, UP_t)$	0.943174
$F(UP_t\backslash LE_t, LF_t, UE_t, GDP_t)$	**115.3531***
Notes: Full sample. Thefullsamplecoverstheperiod 1988-2014. Laglength is 3, as suggestedbythe LR, FPE, AIC, SC, HQ tests. Theasterisks *, ** and *** denotessignificance at the 1%, 5% and 10% level, respectively.	

4.3. Long-run Relationship Results

Following thecointegratinganalysis, the long run relationship between GDP growth and the forcing variables areexamined using the specified ARDL model.The orders of the lags are determined according to the Schwarz Bayesian Criterion (SBIC). Table 6 reports that life expectancy and unemployment rate have positive and significant impacts on GDP growth while urban population has a negative and significant effect in the long run. Surprisingly, the long run relationship between GDP growth and unemployment is positive. Last, there is no evidence that labor force participation of female affects GDP growth in the long run. When checked these results for Akaike Information Criterion (AIC), same results are reached.

Regressor	Coefficient	T-Ratio	Probability
LE	8.6645	2.5382	**0.050****
LF	0.22526	0.55693	0.609
UE	3.6442	2.9041	**0.028****
UP	-8.527	-2.6395	**0.044****

4.4. Short-run Relationship Results

The error correction term (ecm(-1)) indicates that the speed of adjustment in the short-run to restore the deviations from the long run equilibrium. Table 7 demonstrates the error correction term for the GDP growth which is negative and significant. This means GDP growth responds significantly to a deviation from long run equilibrium, and the considerably high error correction term suggeststhat the speed of adjustment is quick. Further, in the short-run, life expectancy affects economic growth positively, while urban population has a negative effect on growth, consistent with the long-run findings. However, contrary to long-run findings, unemployment rate affects GDP growth negatively in the short-run which will be discussed in conclusion part. Further, there is no evidence regarding labor force participation of female has any effect on GDP growth in the long run, but labor force participation of female seems to negatively affect GDP growth in the short-run.

Table 7: The Error Correction Representation for the Selected ARDL Model (ARDL(1,0,2,3,0)) based on SBIC, dependent variable is DGDP			
Regressor	Coefficient	T-Ratio	Probability
DLE	8.6634	2.4379	0.029
DLF	-0.93448	-2.4193	0.03
DLF1	0.55351	1.2208	0.242
DUE	-1.6924	-2.7179	0.017
DUE1	-1.8849	-1.6072	0.13
DUE2	-1.9208	-2.4965	0.026
DUP	-8.5258	-2.5349	0.024
DCC	-84.0455	-1.5406	0.146

ECM(-1)	**-0.997**	**-4.6218**	**0.00**
Note: Full Sample			

V. CONCLUSION

The present paper investigates the relationship among GDP growth, life expectancy, labor force participation of female, unemployment rate and urban population performing ARDL approach. On this basis, four cointegrating relationships are found. First cointegrating relationship suggests that life expectancy, labor force participation of female, unemployment and urban population are forcing variables of GDP growth, and the long run coefficient estimates suggest that life expectancy has apositive and significant impact on GDP growth while urban population has a negative and significant effect in the long run as expected. However, the long run relationship between GDP growth and unemployment is found to be positive, which needs to be further discussed.According to the Okun's Law [28], when the level of employment rises, the output obtained from those activities also increases,which raises the economic growth as well.Thus, a negative relationship between labor forceparticipation of female and economic growth can be logical. On the other hand, various theoretical explanations have been made regarding the questionable relationship between GDP growth and unemployment rate. For example, Aghion and Howitt [14] try to explain the relationship between economic growth and unemployment with the creative destruction effect suggesting that an increase in growth causes a decrease in the duration of job match, and thus, the unemployment level rises directly by increasing the job separation rate. Also, the unemployment level increases indirectly, due to the existence of job vacancies.Further, Bean and Pissarides [12] state that the relationship between unemployment rate and GDP growth can either be positive or negative depending on the source of the differences in economic structures across countries.Meckl[15], [16] on the other hand, proposes a model in order to examine the relationship between GDP growth and unemployment rate within the intersectoral wage differential framework. According to this model, an increase in minimum wages for unskilled workers leads an increase in the growthand unemployment rate, while this leads to a possible decrease in unemployment among skilled workers.Also, Acemoglu [29] proposes a matching model by dividing labor market as skilled and unskilled workforce, accordingly, on one hand, firms adopt new technologies, and thus, they can make higher profits resulting in lower unemployment due to the higher skilled workforce. On the other hand,other firms do not prefer adopting new technologies and skills since they expect their future workers will be unskilled causing the training cost, which reduces the profitability of new investment. Under these circumstances, he concludes that an ambiguous relationship exists between economic growth and unemployment rate due to the lack of the coordination of firms' decisions, which is also called the coordination failure effect. Turkey can also be considered in this content as one of the most rapid developing country. Although Turkey has a dynamic and young labor force, the quality of the labor force can be questionable implying that considerable amount of unskilled labor force may cause such a positive relationship between economic growth and unemployment rate, which needs to be further investigation.

The cointegration results indicate that besides unemployment rate, life expectancy and urban population are the forcing variables of GDP growth. Long-run causalities indicate that life expectancy has a negative effect on GDP growth partially consistent with the results of Acemogluand Johnson [8]. Theyconcludethat life expectancy, which is used as a proxy for health, has a small positive effect on GDP. This finding is also supported by Bowser [5] and Azomahou, Boucekkine and Diene [4]. Also, urban population has a negative impact on GDP growth in the long-run. One possible reason may be therural-urban migration beginning from the 1950s. Although urbanization is astrong indicator of modernization, there has been a substantial decrease in agricultural production which may have an adverse effect on economic growth.

The current study has also some limitations. First, theanalyses areperformedonly on a yearly basis,although unemployment rates are announced quarterly. Since frequency of the datamay change the results, the analysis can also be performed quarterly basis for further research. Obviously, there may be other factors that can explain the change in GDP growth in Turkey, which is not be included in the scope of the current study, so the study can be expanded by including different macroeconomic and demographic factors for further research.

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