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THE ROLE OF THE FEMALE EDUCATION IN ECONOMIC GROWTH: A CASE FOR TURKEY[1]

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ABSTRACT

Education is one of the most important fundamental factors that affect economic growth. Either by individually or as a society, education develops people's talents, skills, creativity, productivity, imagination, knowledge in any branch and also advances in technology. With all those critical points in hand, education has very important effect on economic progress in Turkey by increasing the welfare of the society. In this context, the aim of this study is to examine whether there is a long-term relationship between human capital (female education) and economic growth using yearly data covering the period 1980-2009. The relationshiop between human capital (female education) and economic growth will be analyzed by using Engle-Granger causality test, Johansen co-integration approach and VAR models.

Keywords: Human Capital, Economic Growth, Time Series.

KADIN EĞİTİMİNİN EKONOMİK BÜYÜME ÜZERİNE ETKİSİ: TÜRKİYE ÖRNEĞİ

ÖZET

Eğitim, ekonomik büyümeyi etkileyen en önemli faktörlerden biridir. Eğitim, birey veya toplum olarak insanların yeteneklerini, becerilerini, yaratıcılıklarını ve yaşam şartlarını geliştirmekte ve teknolojik gelişmelere de katkı sağlamaktadır. Tüm bu kritik noktaların sonucu olarak eğitim, toplumun refah düzeyini arttırmakta ve ekonomik ilerlemeye de önemli bir katkı sağlamaktadır. Bu bağlamda, bu çalışmanın amacı, beşeri sermaye (kadın eğitimi) ile ekonomik büyüme arasında uzun dönem bir ilişkinin olup olmadığını, 1980-2009 dönemi yıllık verileri kullanarak incelemektir. Çalışmada ekonomik büyüme ile beşeri sermaye (kadın eğitimi) arasındaki ilişki, Engle-Granger nedensellik testi, Johansen eş bütünleşme yaklaşımı ve VAR modelleri kullanılarak analiz ediecektir.

Anahtar Kelime: Beşeri Sermaye, Ekonomik Büyüme, Zaman Serisi.

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INTRODUCTION

In general human capital, in particular education is one of the pillars of the economic and social structure. Therefore, education plays a critical role in the transformation in the economic life, in other words in increasing the level of prosperity. Its strategic importance makes education the most important investment good. This issue is also handled in the economic literature in details.

The contribution of investing in human to economic growth dates back to A.Smith. Although A. Marshall and M. Friedman followed A.Smith with their studies, these studies haven't been integrated until 1950'ies (Becker, 1993: 392). With the technological developments in 1960'ies, investment in human gained importance and human capital theory was developed by T.W.Schultz (1961) and Denison (1962) and included in the economic literature. In the research made by T.W.Schultz and Denison, it was emphasized that education improved the skill and productivity capacity of labor force and thus contributed to an increase in national income.

This theoretical frame formed by T.W. Schultz and Denison and work of Becker (1964), Nelson and Phelps (1966) and Mincer (1974) increased interest of human capital in academic literature and gained new impetus with internal growth models beginning from the mid 1980'ies. Generally, these work handle human capital which is shaped by various informal learning types such as formal education and learning by doing (kinesthetic) and learning by seeing (visual) as an indicator of individuals' productive capabilities. Within this framework, while on one side human capital represents the information individuals have, on the other side it is an indicator of individuals to learn from other individuals and adaptability to changing conditions. Intrinsically, it emphasizes that since traditional production factors such as Internal Growth models, labor force, capital and soil have diminishing returns they couldn't form dynamic of growth, instead information which as increasing returns (human capital) is the gripping power of growth (Romer, 1986 and 1990; Rebelo, 1991; Cheng and Hsu, 1997; Grammy and Assane, 1996; Lucas, 1998; Barro, and Sala-i-Martin 1995).

Other than the researches which aim to find the contribution of human capital to economic growth many researches aim to test the relation between the economic growth and

education. Although strong and positive relation has been determined between human capital indications and growth in many researches, in some researches (Denison, 1962; Barro, 1991; Mankiw, Romer and Weil, 1992; Gregorio, 1992; Tallman and Wang, 1994; Piazola, 1995; Ranis, Stewart and Ramirez, 2000; Webber, 2002; McDonald and Roberts, 2002; Wilson, 2003; Martin and Herranz, 2004), the number of which are too limited, no relation between human capital and economic growth was identified. It is seen that empirical studies on Turkey about the subject had been conducted. Studies by Güngör (1997), Saygılı (1998), Ergen (1999), Canpolat (2000), Taymaz (2001), Çoban (2003), Kar and Ağır (2003), Bozkurt and Doğan (2003), Kar and Taban (2003) and Demir, Üzümcü and Duran (2006), In the work made about the subject, education expenditures and schooling rates were used as an indicator of human capital. It is identified that there is a positive relation between these indicators and growth.

Although there is no consensus about the effect of human capital on economic growth in literature, it is widely believed that theoretically human capital has a positive effect on growth.

The main goal of this study is to analyze for Turkey sample the relation between education and economic growth, on which theoretical and practical studies were conducted. The study aims to test relation between woman education and growth in Turkey by benefiting from Cobb-Douglas production function for 1990–2009 periods by using new and comprehensive variables by using annual data. Beyond this general goal, growth structure of Turkey's economy would be analyzed within the frame of education indicators and then empirical resolution would be found for Turkey sample. In this study, growth structure of the Turkish economy would be studied within the frame of education indicators and later empirical analysis would be made within the frame of Turkish sample.

I. DEVELOPMENT OF WOMAN EDUCATION IN TURKEY

Although women form a big part of the population of the world and Turkey, they aren't represented at the same rate in the economic activities. Not benefiting adequately from knowledge and skills of this population, which forms potential labor force according to human resources usage.

Although education of women wasn't taken into consideration in growth plans in history for a long time, today has an important place generally in all modern states. Women taking more effective role in economy have become an indispensable necessity for developing economies. Especially in Western states and developing Asia, in order to increase the participation of women in economy, the governments made many legal regulations and proposed institutional changes (Doğar, 1998: 13-18).

When we look at Table 1, which shows correlation between the education level of women and developmental level, it is seen that there is a linear correlation between the education levels of women and the welfare of countries.

Table 1. Educational Attainment by Sex

Region (no. of Countries)	Year	Population Age 25 & Over			Population Age 25 & Over		
		Average school year		Gender ratio (A/B, %)	Average School Year		Gender Ratio (A/B, %)
		Females A	Males B		Females A	Males B	
Developing Countries (73)	1960	1,16	2,39	48,5	1,46	2,63	55,7
	1980	2,20	3,97	55,9	2,74	4,37	62,5
	2000	4,03	5,74	70,2	4,33	5,92	73,2
Developed Countries (23)	1960	6,74	7,23	93,3	6,87	7,26	94,7
	1980	8,39	8,98	93,5	8,65	9,09	95,2
	2000	9,55	10,06	94,9	9,53	10,01	95,3
Transition Economies (11)	1960	6,70	7,80	85,9	7,01	7,95	88,2
	1980	8,21	9,20	89,2	8,5	9,36	90,7
	2000	10,01	9,87	101,5	9,89	9,44	104,7
World (107)	1960	4,28	4,96	86,4	4,31	4,98	86,7
	1980	5,27	6,31	83,6	5,42	6,43	84,3
	2000	6,18	7,28	84,9	6,13	7,19	85,9

Source: Barro, Robert J. ve Lee, J.W. (2001). "International Data on Educational Attainment: Updates and Implications," Oxford Economic Papers.

What is the situation of women in Turkey, who forms more than half of the population, about education which is so important for social development, economic growth and welfare? Although throughout the world the participation of women in labor force increases and the gap between the men and women decreases, it is remarkable that there is a reverse trend in Turkey.

One of the most leading reasons that women participates in labor force at low levels as %26 is that women can't reach education adequately.

Education seriously affects the participation rates of women and men to labor force. As indicated in address-based population registration system (ABPRS) in 2009, in our country %12.2 of women aren't literate and in order to get rid of this worrying situation economically as soon as possible and reach %100 literate rate as stated in Pekin commitments in 2000 considerable improvements were achieved in recent years in Turkish Education System. In 1997 compulsory primary education was raised from 5 years to 8 years, in 2005 compulsory secondary education was raised to 4 years and in 2009 the share of the budget allocated to education in GDP raised from %2,30 to %2,51 (Ministry of Education, 2008-2009). To strengthen vocational and technical training comprehensive projects were actualized with EU support. All these developments are highly positive incentives to increase the quality of education and schooling ratio however, for the economic adaptability to the increasing competition environment and to train qualified people more comprehensive reforms should be applied in the area of education because in Turkish economy stable growth will be actualized with the contribution of the more educated and working women. In last 20 years, progress of women in education and working life has given a new dynamism to the economy. Therefore, economy will be rescued from its one step forward to step back rhythm with the help of the progress of women in education and working life. (Table 2)

Table 2. Schooling Ratio by Level of Education, Labour Force Participation Rate and Economic Growth Rate

Year	Schooling Ratio (%)						Labour Force Participation Rate	
	Primary Education		Secondary		Higher Education			
	Males	Females	Males	Females	Males	Females	Males	Females
1995	76,23	65,55	44,05	33,21	10,57	8,07	77,8	30,9
2000	95,28	99,58	48,49	39,18	13,12	11,38	73,7	26,6
2005	92,29	87,16	61,13	51,95	20,22	17,41	70,6	23,3
2006	92,25	87,93	60,71	52,16	21,56	18,66	69,9	23,6
2007	98,53	96,14	61,17	55,81	22,37	19,69	69,8	23,6
2008	96,99	95,97	60,63	56,30	29,40	25,92	70,1	24,5
2009	98,47	97,84	67,55	62,21	29,83	26,34	70,5	26

Source: http://www.tuik.gov.tr/isgucuapp/isgucu.zul, http://www.tuik.gov.tr/VeriBilgi.do?tb_id=14&ust_id=5

II. ECONOMETRIC METHODS AND DATA SET

A. Econometric Methods

Since time series data were used in this study primarily data set should be tested for stationarity. When time series analysis are used in econometric analysis you can encounter dummy regression problems occurring in instable time series put forward by Granger and Newbold (1974). There can be significant correlation between series due to strong tendencies in the same way or same trend. To understand whether this correlation is real or dummy the level of stationarity of the series should be determined. There are different test methods for unit root test, however stationarity properties of the series has been researched with Augmented Dickey-Fuller (ADF) (1979-1981) unit root test used commonly in application. ADF in general is stated as follows in the following form (Sevüktekin and Nargeleçekenler, 2007: 321-323):

$$\Delta Y_t = \beta_0 + \beta_1 t + \delta Y_{t-1} + \sum_{i=1}^{n} \beta_i \Delta Y_{t-i} + u_t \qquad (1)$$

In the related equation, ΔY_t denotes first difference of the variable, t general tendency variable, ΔY_{t-1} lagged difference term. The basic reason of taking into consideration the lagged difference terms to provide consecutive independency of the error term. Accordingly, to obtain a reliable result by ADF test and not to cause consecutive dependency problem in the estimated variable AIC was utilized to determine the optimal lagging number denoted by “n” in the equation (Lutkepolh,1990: 53-78).

Depending on ADF test result if the series are not stationary at the same level they are made stable at the same level by taking their differences. In case the series are not stationary at the same level or not stable it should be tested if there is co-integrations before taking their differences. Although the series are not stationary if their linear component is stationary there is co-integration in the variables of the model and directly original data can be used in the model without taking their differences. Otherwise, if there is no co-integration among the series they can be used in the model after taking their differences until the series are made stationary (Enders, 1995: 469-470). The lack of co-integration means there is no long term equilibrium among the variables (Karaca, 2003: 247-255; Siregar ve Rajaguru, 2002). In this study,

Johansen- Juselius co-integration method was used from Engle and Granger (1987: 251-276), Johansen (1988: 231-254) and Johansen-Jeselius (1990: 169-210) co-integration tests used in the determination co-integration relation between series used.

Johansen (1988), and Johansen-Jeselius (1990) have developed a maximum likelihood testing procedure on the number of cointegrating vectors which also include testing procedures for linear restrictions on the cointegrating parameters, for any set of variables. Two set statistic and the maximum eigenvalue test statistic, are given here. Fort he null hypothesis that there are at most r distinct cointegrating vectors, the test statistic is

$$\lambda_{trace}(r) = T \sum_{j=r+1}^{n} \ln(1-\lambda_j), \quad (2)$$

where λ_j's the $n-r$ smallest square canonical correlations between Y_{t-k} and ΔY_t corrected for the effects of the lagged differences of the Y_t process. The maximum ratio or the maximum eigenvalue statistic for testing the null hypothesis of at most r cointegrating vectors against the alternative hypothesis of $r+1$ cointegrating vectors, is given by

$$\lambda_{\max}(r) = -T \ln(1-\lambda_{r+1}) \quad (3)$$

Some econometric software may not produce this last statistics, but it can be calculated by the first one as follows,

$$\lambda_{\max}(r) = \lambda_{trace}(r) - \lambda_{trace}(r+1) \quad (4)$$

Johansen (1988) argues that, λ_{trace} and $\lambda_{\max}$ statistics have non-standard distrubution under the null hypothesis, and provides approximate critical values for the statistic, generated by Monte Carlo methods.

After long term correlation is determined among the series causality relationship and the direction of the causality should be put forward between the series. In econometric models we can talk about the dependency of a variable to other variables but this dependency does not mean that there is absolute causality between these variables (Akkaya and Pazarlıoğlu, 1998: 177). To determine the direction of the real causality relationship several causality tests are used, however Granger Causality Test was used in this study for application simplicity and for some of the inferences in its result. But in case there is no co-integration relation between the

time series used in the study, since the standard Granger Causality test will not be Vector Error Correction Model (VECM) will be used to determine causality analysis instead of VAR (Vector Otoregresif) Model (Granger, 1988: 199-211).

Error-Correction Model is used to make a distinction between the long term equilibrium and short term dynamics and to determine short term dynamics. If the variables are cointegrated there must exit an error-correction representation that may take the following form (Gujarati, 2006: 726-730):

$$\Delta Y = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta X_{t-i} + \sum_{i=1}^{n} \beta_{2i} \Delta Y_{t-i} + \beta_{3i} ECT_{t-1} + \varepsilon_i \quad (5)$$

$$\Delta X = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i} \Delta Y_{i-1} + \sum_{i=1}^{n} \alpha_{2i} \Delta X_{1-i} + \alpha_{3i} ECT_{t-1} + \varepsilon_i \quad (6)$$

where ECT_{t-1} is the residuals of long-run (cointegrating) relationship and β_{3i} and α_{3i} are the error-correction coefficients. The inclusion of error- correction terms in equations (5) and (6) introduces an additional channel through which Granger casuality could be detected. According to Granger (1988), the error-correction models produce beter short-run forecasts and provide the short-run dynamics necessary to obtain long-run equilibrium. However, in the absence of cointegration, a vector autoregresion (VAR) in first-differences form can be constructed. In this case, the error-correction terms will be eliminated from equations (5) and (6). If the series are cointegrated, then the error-correction models given in equations (5) and (6) are valid and the coefficients β_{3i} and α_{3i} are expected to capture the adjustments of ΔY and ΔX towards long-run equilibrium, while ΔY_{t-i} and ΔX_{t-i} are expected to capture the short-run dynamics of the model.

B. Data

The variables used in this study of human capital and economic growth of Turkey are real gross domestic product (LGDP), gross fixed capital (LK), female labour force (LL), less than high school education ratio (LHL), high and vocational high school education ratio (LHH), higher education education ratio (LHU), compulsory education was expandend to 8 years

dummy variance (DUM1) and economic and financial crisis dummy variance (DUM2). The variables in model are used logarithmic. The sample period covers annual data from 1990 to 2009. Those variables are obtained from Turkish Statistical Institute and State Planning Organization website.

In Table 3, the variables are used in the model and in figure 1 variables in model are gived time series graphic. In Figure 1, all the variables observed to have a stable structure.

Table 3. Variables Used in the Model

Dependent Variable	
LGDP	GDP (In Purchasers' Value, At 1987 Prices, in Millions of TL)
Independent Variables	
LK	Gross Fixed Capital (in Millions of TL)
LL	Female Labour Force (Thousand Person, 15+ age)
LHL	Less than High School Education Ratio (Females) (%)
LHH	High and Vocational High School Education Ratio (Females) (%)
LHU	Higher Education Ratio (Females) (%)
DUM1	Compulsory Education was Expandend to 8 Years Dummy Variance
DUM2	Economic And Financial Crisis Dummy Variance

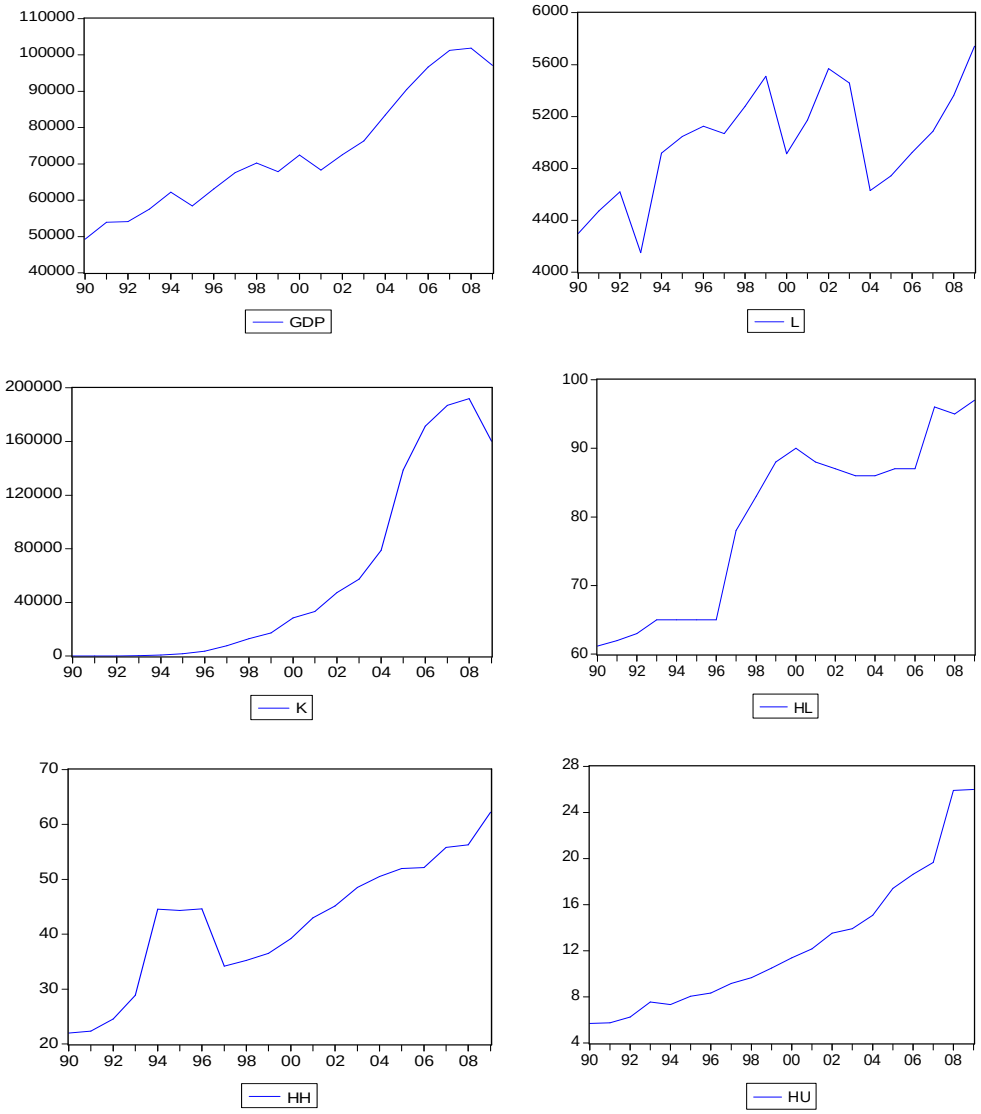

Figure 1. Time Series Graphic of Variables

C. Emprical Results

All the variables in this study are tested for stationarity using the Augmented Dickey-Fuller test statistics. The results are presented in Table 4. Table 4 shows that all variables are non-stationary in their original levels of series, but stationary in their first difference level of the series at 5% level of significance.

Table 4. Augmented Dickey-Fuller Unit Root Tests for Turkey

Variables	ADF Test Statistic		Result
	Level	1st Difference	
LGDP	-1.9607	-4.4794	I(1)
LK	-0,6794	-6.0807	I(1)
LL	-2.5278	-5.2517	I(1)
LHL	-1.7597	-6.0757	I(1)
LHH	-3.5548	-5.8816	I(1)
LHU	-2.4969	-6.6505	I(1)

Note: Significance level at 5% and 1% critical values are respectively -4.80 and -3.79.
Lag lengths are given in parentheses.

The results indicate that all variables chosen for the purpose of this paper are stationary of I (1). The next step is to check the optimal lag length, for this purpose the Akaike information criteria is used. The optimal lag length is turned to be one.

According to the optimum lag lengths are determined. The other step involves applying Engle-Granger two-stage cointegration procedure and Johansen-Juselius cointegration test to check whether stationary variables are cointegrated.

Firstly, the Johansen-Juselius cointegration test has been performed for the variables and the results of this test which has been presented in Table 5 below.

Table 5. Johansen Cointegration Tests Results

Hypothesized	SIC	Eigenvalue	Trace	0,05 Critical	Max-Eigen	0,05 Critical
None*	1	0.205	54.702	47.856	28.909	27.584
At most 1	1	0.141	25.792	29.797	19.244	21.131
At most 2	1	0.038	6.5484	15.494	4.8890	14.264
At most 3	1	0.013	1.6594	3.8414	1.6594	3.8414
At most 4	1	0.011	0.9203	1.9871	0.4229	2.2871
At most 5	1	0.009	0.4443	0.8642	0.0137	0.0029

Note: Trace test and max-eigenvalue test indicate 1 cointegrating eqn(s) at the 0.05 level.
* denotes rejection of the hypothesis at the 0.05 level.

Two criterion, Trace statistics and Eigen value are used for cointegration test at 5% level of significance which are presented in Table 5. Result shows that there is one cointegrating equation for GDP, ınvestment, labour force, females human capital. Results of cointegrating equation show that there is positive relationship for females human capital and economic growth. From Table 5 above, we see that the likelihood ratio test indicates one cointegrating

equation at 5 % significance level. This result show that Johansen-Juselius cointegration test imply a long-run association between females human capital and GDP series for Turkey.

$$LGDP = 18.44 + 0.03LK - 0.64LL + 0.72LHL + 0.18LHH + 0.36LHU + 0.20DUM1 - 0.01DUM2$$
$$(0.315)\quad (0.008)\quad (0.012)\quad (0.002)\quad (0.003)\quad (0.127)\quad (0.069)$$
$$[-2.089]\quad [79.093]\quad [58.642]\quad [-63.432]\quad [-102.50]\quad [-1.602]\quad [-0.229]$$

This equation shows that if there is 3 percent, 64 percent, 72 percent, 18 percent and 36 percent change in real gross domestic product due to 1 percent change in labour, capital, less and high school education ratio, high and vocational high school education ratio and higher education ratio, respectively. These results are significant at 5 percent level of significance. There is positive relationship between female education and real gross domestic product.

Since there is cointegration between the variables, the final step is to test for the direction of causality using the vector error correction model. The presence of a cointegrating vector allows fort he use of a vector error correction (VECM) model to test casuality. The emprical results of the estimeted error-correction (VECM) models and the Granger casuality test are presented in Table 6 and in Table 7, respectively.

Table 6. Vector Error Correction (VEC) Estimates

LY	LL	LK	LHL	LH	LU	D1	D2
1.302	0.102	0.866	0.076	0.419	0.500	0.043	0.003
(0.032)	(0.057)	(0.031)	(0.014)	(0.038)	(0.053)	(0.071)	(0.001)

Note: Values in parentheses show standard error values.

Table 7. Results of Granger Casuality Tests

Null Hypothesis	F-Statistic	Probability
LK does not Granger Cause LGDP	3.69679	0.05863
LGDP does not Granger Cause LK	5.56281	0.04289
LL does not Granger Cause LGDP	1.16508	0.34243
LGDP does not Granger Cause LL	1.46560	0.26670
LHL does not Granger Cause LGDP	6.34168	0.01196
LGDP does not Granger Cause LHL	1.07531	0.36969
LHH does not Granger Cause LGDP	9.66991	0.00268
LGDP does not Granger Cause LHH	0.11711	0.89042
LHU does not Granger Cause LGDP	5.03122	0.01707
LGDP does not Granger Cause LHU	1.20872	0.33003

Table 7 is show that there is uni-directional casuality between less than high school education ratio, high and vocational high school education ratio and higher education education ratio and real gross domestic product. It is shown that there is bi-directional casuality between capital and gross domestic product, but labour do not Granger cause gross domestic product.

CONCLUSIONS

In this study, in Turkey relationship between female education level and growth has been tested with using using data from 1990 to 2009 annual data. The econometric model is used bi-directional logarithmic. In this study, firstly, the series has become causality by the ADF unit root testing. Then the long-run relationship between the series is determined by whether the Johansen cointegration test.

Femael education as a human capital indicator, with cointegration results that indicate there has been a positive relationship among them in the long-run. Whereas the results of cointegration demostrate the direction of casuality, with the help of casuality test when the level of female education increases, there has been bi-directional casuality between GDP and females education. Despite, to check the size of the effect of used parametres on GDP, VAR model is tested. Female education is affecting GDP in short time like one year. Because there has been time lags between starting education, graduating, finding a job, earning salary and increasing wealth. Additionally error correction and Granger causality test gives supportive result that increase in women education level affects economic growth positively.

Turkey's economy to stable growth will be realized rapidly rising level of education and contribution women in working life. Women's developments in fields of education and employment in the last 20 years will be bring new dynamism to economy in next 10 years. A two-forward-one back rhythm of economy will be saved with the support of women in education and working life.

In summary, existing evidence indicates that improving the level of education of females will lead to higher economic development. In addition to this, the combination of all of these variables will lead to better positions of women in the society with higher wealth. As a result, there is a positive correlation between female education and economic development in Turkey. To have a sustainable economic growth, it is also necessary to give great importance to education of female in Turkey.

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