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Does human capital shortage cause inequality? Evidence from Turkish provinces

Beşeri sermaye yetersizliği eşitsizliğe yol açar mı? Türkiye'deki bölgelerle ilgili bir çalışma

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ABSTRACT

The aim of this paper is to investigate the impact of human capital on regional income inequality which is one of the most serious problems of Turkey causing political and economic instability. To this end, a conditional convergence model based on real per capita gross value added and labour force with different education levels is estimated using the panel data set of Turkish regions for the time period 2004-2011. Results reveal that labour force with high and vocational high school education and above high school education contribute to increase in regional inequality, while labour force with less than high school education has no effect.

Keywords: Regional inequality, human capital, economic growth.

ÖZET

Bu çalışmanın amacı beşeri sermayenin Türkiye'nin en önemli sorunlarından biri olan ve aynı zamanda politik ve ekonomik istikrarsızlıklara neden olan bölgesel eşitsizliğe olan etkisini araştırmaktır. Bu amaçla Türkiye bölgelerinin 2004-2011 yıllarını kapsayan reel kişi başına toplam katma değer ve farklı eğitim düzeylerine sahip işgücü verileriyle bir koşullu yakınsama modeli tahmin edilmiştir. Çalışmanın sonuçlarına göre lise ve dengi meslek lisesi mezunu işgücü ile yükseköğretim mezunu işgücü bölgesel eşitsizliğin artmasına neden olurken lise altı eğitimlilerin herhangi bir etkisi olmamaktadır.

Anahtar kelimeler: Bölgesel eşitsizlik, beşeri sermaye, iktisadi büyüme

1. Introduction

Turkey as an upper middle-income country presents a high and persistent income inequality which contrasts with her economic performance. She is one of the fastest growing economies in the last ten years. Turkey's GDP has grown at an annual average rate of 4.4 percent between 1983 and 2013, a rate that was quite higher than many developed and developing countries. She has a gross national income per capita of 18,760 US dollar (in terms of PPP) in 2013 (World Bank, 2013) which has increased more than 100 percent in the last decade. At the same time, the favourable economic and political climates have also helped Turkey reap the benefits of high average rate of economic growth. However in terms of the indicator of quintiles, the country has generally high unequal income distribution when compared with other similar developing countries. For example, despite the decreasing trend of Gini coefficient which has fallen from 0.52 in 1983 to 0.40 in 2012, the richest 20 percent are 7 times as rich as the poorest 20 percent (World Bank, 2013). As a result of this inequality, the persistent poverty ratio becomes 16 percent in 2012. The picture of relatively strong economic performance and increasing income inequality in Turkey has encouraged this research on regional inequality in Turkey.

In addition to this contrast, there is a huge educational inequality exists between the regions (east, west, north and south) and income groups (richest, rich, middle, poor and poorest) of Turkey. Table 1 and table 2 present some inequalities on education by regions of Turkey.

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Table 1: Some Figures on Educational Inequalities of Turkey by Regions

Variables	2013				
	East	West	North	South	Average
Mean years of education	6.61	8.93	9	8.12	8.42
Never been to school (percentage)	16	1	1	2	4
Percentage of population living with less than 4 years of education[a]	19	2	4	6	7
Primary completion rate, (percentage)[b]	77	95	97	92	91
Lower secondary completion rate, (percentage)[b]	31	48	48	42	45

Notes: [a]for the group 20-24 years. [b]percentage of young people between 15-24. The World Inequality Database on Education brings various surveys together as well as some information between groups within countries. The database allows analysis and comparison of different aspects of inequalities by subgroups and geographical locations such as east-west-south and north. However there is no specific definition to determine each location of countries' subregions. In our opinion and based on the figures from Table 1, South part of Turkey indicates only the Mediterranean region. Southeast and East Anatolia regions are represented by the word of East.

Source: WIDE-World Inequality Database on Education, http://www.education-inequalities.org/ (17.08.2014)

Over the last twenty years, the percentage of the people who has never been to school in Turkey decreased from 16 percent to 10 percent in the eastern part of the country while it increased from 1 percent to 2 percent in the western part. This is the most notable progress in the country. In terms of primary school completion rate, we can see the opposite trend for the eastern and western parts of the country. Over the period 1993-2013, the completion rate figures decreased from 78 percent to 77 percent and from 97 percent to 95 percent respectively. Lower secondary school completion rate has increased in the eastern part but decreased in the western part of Turkey.

Besides these figures, with the proportion of the 35 percent, Turkey has the highest proportion of young people neither employed nor in education or training (NEET) over the period of 2000s among the OECD countries. This figure is more than twice as high as the average figure of OECD, which is 16 percent (OECD, 2013, p. 1). Despite a significant improvement in many areas of educational performance in Turkey, such as the increasing rate of teachers' salaries, graduation rates at upper secondary education and the increasing rate of tertiary attainment levels, almost all of Turkey's related figures are still low compared to other OECD and some emerging countries.

Table 2: Some Figures on Educational Inequalities of Turkey by Income Groups

Variables	2013				
	Richest	Rich	Middle	Poor	Poorest
Mean years of education	11.56	9.28	8.21	6.77	5.71
Percentage of population living with less than 4 years of education[a]	1	2	4	8	20
Primary completion rate, (percentage)[b]	99	97	94	89	76
Lower secondary completion rate, (percentage)[b]	69	51	46	32	25

Notes: [a]for the group 20-24 years. [b]percentage of young people between 15-24.

Source: WIDE-World Inequality Database on Education, http://www.education-inequalities.org/ (17.08.2014)

Contrary to the pattern observed in the literature, these improvements have not been reflected in reducing the income disparity between regions in Turkey. Over the past three decades increased supply of educated labour has not decreased the returns of education in Turkey. In fact, *contrary to the expectations returns in the most developed regions (Marmara) are higher than the returns in less developed regions such as South-eastern and Eastern Anatolia and the Black Sea* (Tansel, 2004, p. 7). This is quite an interesting result that needs to be examined. One of the reasons is found in the statistics of labour force participation

which shows a tendency to fall over time. In terms of labour force participation, there is a serious inequality between regions and related mean years of schooling and its returns. Marmara, Aegean and West Black Sea regions have higher probability of being in the labour force than the other regions particularly Eastern and South-eastern Anatolia (Dildar, 2014, p. 17). As can be seen from Table 2, the share of income which is represented by the poorest group in 2013 has the lowest mean years of education and the same status repeats in other figures of educational inequalities. Similarly highest mean years of schooling are observed in the Marmara region and the lowest one is seen in the South-eastern Anatolia. According to Tansel (2004, p. 58) returns to education in Marmara region are higher than the returns in the Eastern and South-eastern Anatolia. Therefore there is a very clear link among less educated human capital and lowest labour force participation and income profile in the eastern side of Turkey.

The rest of the paper is structured as follows. The next section presents selected examples from the literature that investigates the relationship between educated labour force and regional inequalities in Turkey and other developed and/or developing countries. In the third part we present the data and methodology used in this study. We show our results in part four. Last part includes conclusion.

2. Prior Empirical Studies

There is a rich literature that analyses the role of human capital for economic development, particularly at the national level. Conceptually, human capital is represented by educational level in the context of formal education and on the job education (Romer (1986), Lucas (1988), Barro (1991), Mankiw et al. (1992)). Most of these studies argue that highly educated human capital throughout the economy increases the productivity and production or income per capita. In this framework, there are vast empirical studies on economic development of Asian miracle and the contribution of human capital on the economic performance of those countries. According to some scholars, this is an education miracle behind the economic miracle (Tilak (2001, p. 9), Bergheim (2005, p. 14)). The empirical findings suggest that primary and/or secondary education plays important role for the less developed countries than the developed ones and opposite is true in tertiary education (Esim (1994) and Petrakis and Stamatakis (2002, p. 520)). They assess that as the level of development of countries increases so does the contribution of higher educational levels. These studies have mostly used different versions of model adapted from endogenous growth theory.

"Prior empirical studies at regional level reach ambiguous conclusions on whether educational inequality leads to income inequality or not". For instance Di Liberto (2008, p. 106) indicates that economic growth of the Southern Italy did not benefit from the increase in educational level except the elimination of illiteracy. In fact, tertiary school education is negatively associated with growth, suggesting that relatively underdeveloped regions are not able to exploit advanced human capital.

Using difference GMM estimator for data of 31 provinces of China over the period 1997-2006, Zhang and Zhuang (2011) find that tertiary schooling stimulates growth. More importantly, they provide evidence that relatively more developed regions take far better advantage of tertiary education, while less developed regions benefit more from primary and secondary education. Therefore, education policy should be designed according to the characteristics of regions. "Fleisher et al. (2010) estimates a production function for 28 Chinese provinces for the time period of 1985-2003." They hypothesize that human capital has both direct and indirect effects. While human capital directly affects output via higher marginal product, it has also indirect effect since provinces with better educated individuals benefit more from new production techniques. Estimation results yield that human capital- the percentage of workers with greater than junior high school education- has statistically significant positive effect on total output. Moreover, spillover effect of human capital is also positively associated with TFP. Hence fostering education is an appropriate economic policy to reduce inequality across Chinese regions. Ramos et al. (2010) investigates the impact of different schooling levels on regional convergence by using panel data for Spain. The results of their study provide evidence that while labor force with secondary schooling has positive and significant impact on growth, primary and tertiary schoolings are found to be insignificantly associated with it.

Similarly Rodríguez-Pose and Tselios (2009, p. 2) find that across 102 regions in European Union, educational inequality has a positive relationship with income inequality; in other words their results indicate

high levels of inequality in educational attainment are related with high levels of inequality in income. They use a generalized entropy index (Theil index) for calculating income and educational inequalities over the period 1995-2000. However, they argue that the impact of educational attainment on income inequality is not clear. Sterlacchini (2008) analyses the relationship between economic growth and human capital endowments in the regions belonging to 12 countries of the former EU-15 for the time period of 1995-2002. But he finds that *investing more public and private resources in education does not guarantee equal growth opportunities among EU regions however with respect to human capital investment both developed and backward regions have been able to benefit from the presence of highly educated people* (Sterlacchini (2008, p. 1106)). This ambiguity partly arises from the relevance of different types of education such as tertiary, secondary and primary. Crenshaw and Ameen (1994) suggest that at the high level of educational expansion, because of expanding post-industrial regimes, the relationship between school enrolments and inequality would become positive. That means as the level of education increases income inequality first declines but increases after a certain level (Ha, 2009, p. 95). However according to Alderson and Nielsen (2002, p. 1278), educational improvement has a negative effect on income inequality in developed industrial societies. Their result has also been used to verify that secondary enrolments have no effect on development processes; they have analysed the relationship between inequality and educational diffusion and they found that the diffusion of education has a negative effect on income inequality (Alderson and Nielsen, 2002, p. 1262).

Although regional disparities in Turkey have also drawn a lot of attention, the role of human capital in explaining economic growth has been hitherto ignored. Altınbaş et al. (2002) examine convergence across Turkish regions by taking into consideration the Priority Provinces in Development (PPD) over the period 1987-1998 and find no evidence of convergence. Whereas Aslan and Kula (2011) argue that there exists convergence of provinces for Turkey for the time period of 1975-2001. Gezici and Hewings (2004) study regional convergence during the period of 1980-1997 and find divergence across regions. In addition, Gezici and Hewings (2007), by analysing 67 provinces, suggest that between regional inequalities increased while within regional inequalities are declined over the period 1990-2000. Moreover, they find strong indication for the existence of spatial dependence across Turkish provinces. Güçlü (2013) examines 71 Turkish provinces throughout the 1990-2000 period and find that manufacturing sector is the main driving force of regional growth. Besides, he finds evidence of spatial dependence, meaning that the growth of a province is associated with that of the neighbouring provinces. Önder et al. (2010) focus on the effects of public capital and transport capital. Employing data for 26 regions over the period 1980-2001, they argue that public capital stock stimulates convergence while transport capital discourages it.

Hence there is a surprising lack of research on the role of human capital in determining regional income inequality in Turkey. The aim of this paper is to investigate the impact of human capital on regional income inequality which is one of the most serious problems of Turkey causing political and economic instability. Our motivation depends on questioning the relationship between different levels of educated labour force and income inequalities using Turkish Statistical Institute's (TSI) regional statistics of Level 2 which includes 26 sub regions. We attempt to fill the void in the literature by considering the years between 2004 and 2011, a period which has not been investigated yet.

3. Data and Econometric Methodology

3.1. Data

Our analysis is based on the TSI's regional statistics of Level 2 that contains 26 sub regions and 8 time periods (2004-2011). The dependent variable is growth rate of the regional real value added per capita. There are three different indicators of the human capital: labour force with less than high school education, labour force with high and vocational high school education, and labour force with higher education (15 years old and over-thousand people). Instead of using school enrolment rates, we employ educated labour force since we believe that the latter contributes to total output while the former does not necessarily contributes to it[1].

Before going further, we would like to describe the main characteristics of Turkish regions in terms of population in addition to the dependent variable - real value added per capita and human capital indicators. Table 3 displays that by the year 2011; Istanbul (TR10) produces the highest real value added per

[1]See Di Liberto (2008) and Ramos et al. (2010) for similar approaches.

capita. TR42, which includes Kocaeli, Sakarya, Düzce, Bolu, and Yalova, has the second highest real value added per capita share. The poorest two regions from the east part of Turkey, TRB2 and TRA2 produce 1.70 percent and 1.93 percent of real value added per capita respectively, suggesting that there is a clear regional disparity between the western and eastern regions.

Table 3: Percentage of Main Indicators for Turkish Regions by 2011

Level 2 Regions	RVAPC	Population	Labor force with less than high school education	Labor force with high and vocational high school education	Labor force with higher education
TR62	3.50	5.05	5.30	5.48	4.47
TR51	5.93	6.55	4.38	8.44	12.25
TR61	4.90	3.62	4.30	4.31	4.40
TR32	4.20	3.72	4.98	3.58	3.93
TRA2	1.94	1.55	1.52	0.95	0.69
TR22	4.33	2.20	2.46	2.03	2.08
TR41	5.87	4.87	4.94	6.08	4.94
TRA1	2.86	1.44	1.33	1.23	0.92
TRC1	2.40	3.31	2.96	1.99	1.52
TR63	2.86	4.03	3.99	3.39	2.53
TR82	3.19	0.99	1.38	1.03	0.89
TR72	3.23	3.14	3.34	2.78	2.30
TR42	6.36	4.44	5.11	5.78	5.05
TR52	3.45	3.04	3.41	2.27	2.55
TR71	3.43	2.00	2.03	1.88	1.56
TRB1	2.82	2.23	2.08	2.07	1.90
TR33	4.01	3.94	4.79	3.26	3.04
TRC3	2.27	2.75	1.58	1.47	1.36
TR83	3.27	3.64	4.34	2.93	2.95
TR21	5.82	2.10	2.60	3.09	2.35
TR90	3.22	3.36	4.23	3.71	2.93
TRB2	1.70	2.74	2.17	1.44	1.27
TR81	4.13	1.36	1.75	1.55	1.43
TR10	6.71	18.23	16.70	20.47	22.61
TR31	5.54	5.31	5.62	6.97	8.27
TRC2	2.07	4.40	2.72	1.83	1.81

Notes: RVAPC is real value added per capita. See appendix for the details of the Level 2 regions. Source: Authors' estimations based on TSI's Regional Statistics Database.

Table 3 also indicates that there is an uneven distribution of human capital across Turkish regions. Both labor force with higher education and labour force with high and vocational high school education are concentrated on three major cities of Turkey; Istanbul, Ankara and İzmir. They have 36 percent of

the former and 44 percent of the latter group of labour force. Owing to the disproportionate distribution of population, Istanbul has also the highest share of labour force with less than high school education. On the other hand, its share in the poorest regions- TRB2 and TRA2- corresponds to 1.51 percent and 2.16 percent respectively. Hence those regions do not only suffer from the lack of highest educated labour force, but also the one with the basic education level.

Figure 1 depicts the mean and coefficient of variation of real value added per capita for Turkish regions. It clearly suggests that between 2004 and 2011, there is an increasing trend toward higher income. Despite the stagnation in 2008, and decline in 2009, real value added per capita soared from 6.75 in 2004 to 7.02 in 2011. Meanwhile, coefficient of variation of logarithm of real value added per capita is diminishing, indicating that regional differences have decreased in the sample period.

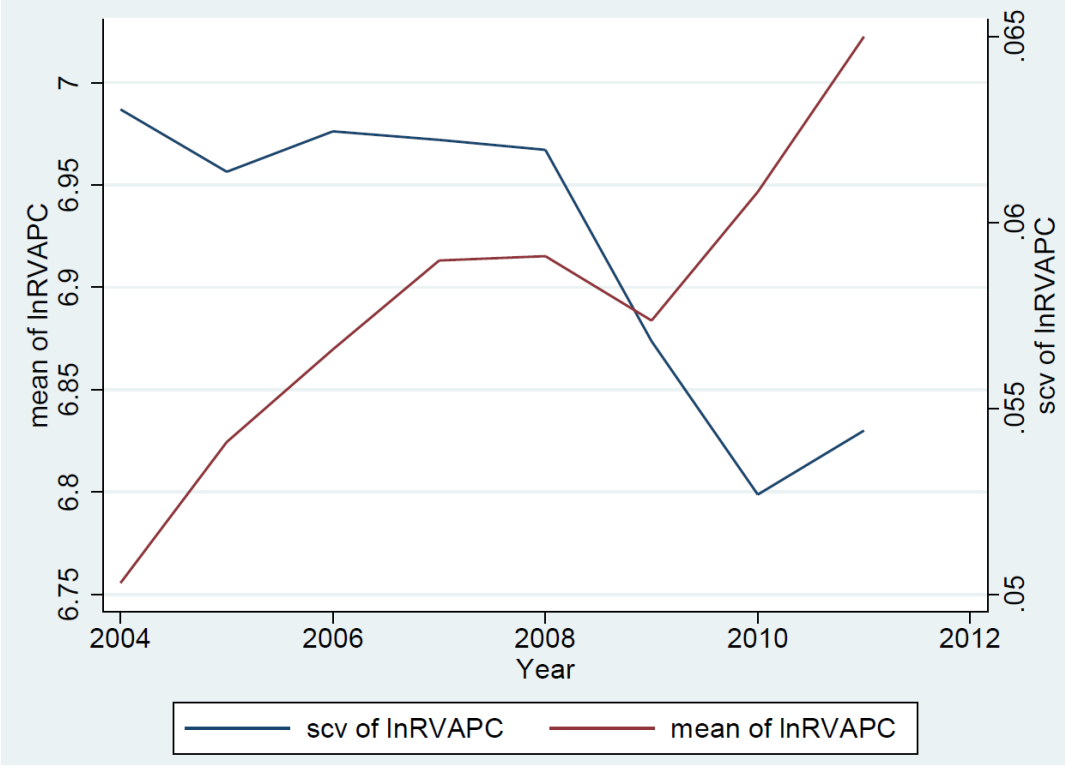

Figure 1: Dispersion and mean of income across Turkish regions, (2004-2011)

Notes: lnRVAPC is the logarithm of real value added per capita. Scv stands for coefficient of variation. Source: Authors' estimations based on TSI's Regional Statistics Database; level 2 (26 regions).

3.2 Econometric Methodology

We estimate standard growth regression by taking into account our variable of interest; human capital. Following the seminal works of Barro (1991), Barro et al. (1995) and Barro (1997), we employ extended Solow growth model for our analysis. The econometric specification used is so-called conditional convergence equation:

$$\Delta lnRVAPC_{it} = \beta_0 + \beta_1 lnRVAPC_{i,t-1} + \beta_2 HC_{it} + \sum_k \beta_k Z^k_{i,t} + \eta_i + \gamma_t + u_{i,t} \quad (1)$$

where $lnRVAPC_{it}$ is the logarithm of real value added per capita in region i and time t, HC_{it} is human capital, $Z^k_{i,t}$ is the set of control variables and η_i and γ_t are set of region and year fixed effects respectively.

We expect to estimate negative β_1, meaning that regions with lower initial per capita value added grow faster than the others and reach their income level. Regarding the human capital, we expect to obtain positive β_2 since human capital is the key to economic growth. We will consider various types of human capital since it is crucial to find out which type of human capital contributes to growth as much as whether human capital contributes to growth or not.

The literature on empirical estimations of cross-regional convergence has also related the per capita income growth to several important control variables. First, we include per capita electricity consumption of industrial establishments to proxy capital stock. Physical capital is found to lead higher growth in Chinese regions (Chen et al., 2014), to be nonsignificant in Spanish regions (Rivera and Currais, 2004) when it is considered as private investment, and to be positively associated with growth in Turkish regions when it is considered as public capital (Önder et al., 2010). Second, we employ the population growth rate. As we saw in table 1, the vast majority of the population is concentrated in the western regions of Turkey. Hence we should take into account the size of the regions to clearly link the human capital with growth since it proxies the agglomeration economies (Sterlacchini, 2008). Third, we include provincial road length and total length of village roads to proxy the transportation infrastructure. Finally, we take into consideration the health capital since it has been subject of great attention in regional studies. Among others, Chen et al. (2014) argue that health capital (which is defined as the number of doctors per 10,000 employed persons) has statistically significant positive effect on regional output in Chinese regions for the time period 1978- 2006. Considering Spanish regions over the period 1973-1993, Rivera and Currais (2004) suggest that health spending is positively associated with growth. Due to the lack of public expenditure database at regional level, we use number of total doctors and number of total beds to measure health capital.

4. Empirical Results

Table 4 illustrates the estimation results of equation 1. In column 1, we regress growth rate of real value added per capita on lagged real value added per capita and three different human capital variables in order to understand which human capital works in which direction. The coefficient of lag dependent variable is negative and statistically significant, suggesting that there exists convergence. Poor regions tend to grow faster than richer regions, which is a consistent fact with figure 1. Among the human capital variables, labour force with less than high school education, and labour force with high and vocational high school education are statistically insignificant, while the coefficient of labour force with higher education is found to be significant at 5 percent level with expected positive sign.

In column 1, we do not include region fixed effects, which could be correlated both with some of the explanatory variables and growth rate. Moreover, there might be some unobservable shocks a demand shock for instance- which are time variant but region invariant that affect regional growth through the explanatory variables we employ. If these are the cases, estimation results suffer from endogeneity arising from omitted variable bias. For these reasons, we include region and year fixed effects in column 2 and run the same regression. According to the estimation results, lagged per capita real value added variable is negative and statistically significant, albeit its magnitude changes dramatically. In addition to this, labour force with high and vocational high school education, and labour force with higher education have also statistically significant positive effect on real per capita value added growth. An increase of 1 percent in the former and in the latter leads to an increase of roughly 0.1 and 0.05 percentage point in real per capita value added growth respectively.

Table 4: Human Capital and Regional Growth

Dependent Variable: lnRVAPC(t)-lnRVAPC(t-1)	**(1)**	**(2)**	**(3)**	**(4)**
lnRVAPC(t-1)	-0.052***	-0.327***	-0.429***	-0.490***
	(0.015)	(0.064)	(0.092)	(0.084)
ln Labour force with less than high school education	-0.025	0.004	0.024	-0.006
	(0.020)	(0.034)	(0.036)	(0.034)
ln Labour force with high and vocational high school education	-0.000	0.098**	0.130***	0.140***
	(0.014)	(0.042)	(0.036)	(0.035)
ln Labour force with higher education	0.033*	0.045**	0.034*	0.035*
	(0.017)	(0.019)	(0.019)	(0.020)
ln Electricity consumption			0.033**	0.033***
			(0.013)	(0.012)
ln Road length			-0.072	
			(0.085)	
ln Village road length				-0.092
				(0.078)
ln Population			-0.519***	-0.661***
			(0.156)	(0.169)
ln Total number of doctors			0.027	
			(0.030)	
ln Total number of beds				0.089***
				(0.020)
Region Fixed Effects	NO	YES	YES	YES
Year Fixed Effects	NO	YES	YES	YES
Observations	182	182	182	177
R-squared	0.080	0.740	0.777	0.788

Notes: Robust standard errors clustered at region level in parentheses. All specifications in- clude a constant term and are estimated by OLS. RVAPC is real value added per capita. *** significant at 1%; ** significant at 5%; * significant at 10%. Source: Authors' estimations.

As a next step, we include the control variables that we discussed above in column 3 to check whether the relationship between human capital variables and regional growth is robust to inclusion of other important growth determinants. Results reveal that per capita electricity consumption in industrial establishments is positive and statistically significant as expected. The total road length and the total number of doctors are found to be insignificant, suggesting that neither transportation infrastructure nor health capital has contributed to the regional income differences in Turkey. Contrary to the findings in Sterlacchini (2008) and Zhang and Zhuang (2011), population density is negatively related with regional growth, suggesting that increase in population brings about more damage than benefit to the economy.

Finally we add alternative variables for transportation infrastructure and health capital in column 4, where the former and the latter are proxied by total length of village roads and total number of beds respectively. Although total length of village roads is statistically insignificant, the coefficient sign of the total number of beds is found to be positive and significant. Consistent with the previous literature, health capital significantly increases regional output. A 1 percent increase in the total number of beds leads to an increase by about 0.09 percentage points in real value added per capita growth. We should also note that, both labor force with high and vocational high school education and labour force with higher education preserve their significance level with positive signs[2].

[2]We report here only fixed effects estimation results since Hausman test statistic is statistically significant with p-value< 0.0001, suggesting that random effect model is inconsistent. In addition, from column 2 to 4 we include year fixed effects as year dummies are jointly significant. The results, omitted for brevity are available upon request.

OLS estimation results might suffer from endogeneity and lead to inconsistent results owing to inclusion of both lag dependent variable and fixed effects in equation 1. Although Roodman (2006) suggests that as time period goes to infinity, the bias arises from lag dependent variable diminishes, the number of time periods in our sample is only 8. To tackle this issue, we use Generalized Methods of Moments system estimator (GMM-SYS) developed by Arellano and Bover (1995) and Blundell and Bond (1998). This method jointly estimates the equation in levels (equation 2) and in differences (equation 3):

$$lnRVAPC_{it} = \beta_0 + \beta_1 lnRVAPC_{i,t-1} + \beta_2 HC_{it} + \sum_k \beta_k Z^k_{i,t} + \eta_i + \gamma_t + u_{i,t} \quad (2)$$

$$\Delta lnRVAPC_{it} = \beta_0 + \beta_1 \Delta lnRVAPC_{i,t-1} + \beta_2 \Delta HC_{it} + \sum_k \beta_k \Delta Z^k_{i,t} + \Delta\gamma_t + \Delta u_{i,t} \quad (3)$$

and therefore improves the estimation by taking into consideration both the cross-regional and time dimension of the data.

Table 5: Human Capital and Regional Growth: System GMM Estimations

Dependent Variable: lnRVAPC(t)-lnRVAPC(t-1)	**(1)**	**(2)**	**(3)**
lnRVAPC(t-1)	-0.124 (0.172)	-0.236*** (0.080)	-0.242* (0.125)
ln Labour force with less than high school education	0.038 (0.073)		
ln Labour force with high and vocational high school education		0.206*** (0.055)	
ln Labour force with higher education			0.122** (0.051)
ln Electricity consumption	0.026 (0.044)	0.016 (0.032)	0.025 (0.037)
ln Road length	-0.042 (0.108)	-0.059 (0.043)	-0.000 (0.066)
ln Population	-0.146 (0.194)	-0.164* (0.099)	-0.057 (0.136)
ln Total number of beds	0.087 (0.170)	-0.023 (0.064)	-0.006 (0.090)
Hansen Test *(p-value)*	0.87	0.95	0.74
AR (1)	0.03	0.00	0.01
AR (2)	0.07	0.24	0.03
Observations	182	182	182

Notes: Robust standard errors are in parentheses. RVACP is real value added per capita. All tests are based on system GMM. Lagged RVACP and human capital variable are assumed to be endogenous. The instruments used for system GMM are the first and second lags of lnRVACP and human capital indicators. The Hansen p-value is the test for overidentification. AR (1) and AR (2) tests are test statistics for first and second order autocorrelations in residuals respectively, under the null hypothesis of no serial correlation. ***, **, * denote statistical significance at 1, 5 and 10 percent, respectively. *** significant at 1%; ** significant at 5%; * significant at 10%. Source: Authors' estimations.

Table 5 reports the GMM-SYS estimation results. Due to the low number of observations, we add each human capital variable one-by-one. Results confirm that labour force with high and vocational high school education as well as labour force with higher education spurs growth in Turkish regions. Whereas, labour force with less than high school education is found to be statistically insignificant, suggesting that an increase in this type of workforce does not influence economic growth. Moreover, comparing the results with those obtained in 4, we observe that there are sizeable differences between coefficient estimates of human capital variables. Other things being equal, a 1 percent increase in labour force with high and vocational high school education and higher education lead to about 0.20 and 0.13 percentage point increase in growth respectively. Regarding the control variables, population has statistically significant impact on growth only in column 2. In accordance with previous results, population is negatively associated with it. According to regression diagnostics, the Hansen test of over-identifying restrictions does not reject the overall validity of instruments in all regressions, while second order autocorrelation does not exist in the first and second regression only.

5. Conclusion

Income inequality has been a major problem of Turkey for many years. Besides, regional inequality is another big problem in the country's agenda and there is also huge educational inequality between the various regions and income groups. In the literature it has been generally claimed that decreasing educational inequality brings higher share of income. In order to show the status of educational inequalities, sometimes the years of schooling or enrolment ratios are used, but the result does not change. As shown in Table 2, the poorest income group in Turkey has the lowest level of schooling and/or secondary completion rate. Also this picture is situated in the east side of Turkey.

The aim of this paper is to provide quantitative evidence on the importance of human capital in driving income inequality across Turkish regions. To that end, we have estimated a standard growth regression using different levels of educated labour force over the period between 2004 and 2011. Our results suggest that while labour force with high and vocational high school education and labour force with higher education have statistically significant positive effect on regional value added growth, labour force with less than high school education does not contribute to it. It means Turkey does not benefit from the labour force with low level of education. Our empirical results show that highly educated labour force within the region may also lead to a larger income differential between highly-educated and less-educated labour force. This situation tends to increase income inequality.

Therefore, funding high and vocational high school education and higher education specifically in poor and poorest regions will be beneficial both labour force and regional development itself. Future research will be needed to explore the policy implications of these results and the impact of current policies; such as the foundation of new universities in every city to eliminate educational inequality. Meanwhile since we have data on a limited time period our empirical results should be interpreted with some caution.

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A Appendix: List of Turkish Regions at Level 2

Region ode	Region Name
TR62	Adana, Mersin
TR51	Ankara
TR61	Antalya, Isparta, Burdur
TR32	Aydın, Denizli, Muğla
TRA2	Ağrı, Kars, Iğdır, Ardahan
TR22	Balıkesir, Çanakkale
TR41	Bursa, Eskişehir, Bilecik
TRA1	Erzurum, Erzincan, Bayburt
TRC1	Gaziantep, Adıyaman, Kilis
TR63	Hatay, Kahramanmaraş, Osmaniye
TR82	Kastamonu, Çankırı,Sinop
TR72	Kayseri, Sivas, Yozgat
TR42	Kocaeli, Sakarya, Düzce, Bolu, Yalova
TR52	Konya, Karaman
TR71	Kırıkkale, Aksaray, Niğde, Nevşehir, Kırşehir
TRB1	Malatya, Elazığ, Bingöl, Tunceli
TR33	Manisa, Afyon, Kütahya, Uşak
TRC3	Mardin, Batman, Şırnak, Siirt
TR83	Samsun, Tokat, Çorum, Amasya
TR21	Tekirdağ, Edirne, Kırklareli
TR90	Trabzon, Ordu, Giresun, Rize, Artvin, Gümüşhane
TRB2	Van, Muş, Bitlis, Hakkari
TR81	Zonguldak, Karabük, Bartın
TR10	İstanbul
TR31	İzmir
TRC2	Şanlıurfa, Diyarbakır