

# Why Do Some Turkish Provinces Generate So Much More Per-Capita Income Than Others?<sup>1</sup>

**Kahraman Kalyoncu\***

Aksaray Üniversitesi

## Abstract

There is enormous disparity in per capita output across Turkish provinces. The unfortunate province has per-capita incomes that are less than 10% of per capita incomes in the richest province at the year of 1997. Why such thing materializes? On an accounting origin, our investigation demonstrates that differences in electric consumption to educational attainment ratio can only somewhat explain the disparity in per capita output, however it is better than the MRW (1992) approaches for this data — we discover a great amount of variation in the level of the Solow residual across provinces. At a deeper level, the differences in physical to human capital ratio accumulation, productivity, and therefore output per capita may not be driven by differences in institutions and government policies.

## Keywords

Economic Growth, Human Capital; Physical Capital and Complementarities

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\*Aksaray Üniversitesi, Aksaray, Turkey, [kkalyunc@yahoo.com](mailto:kkalyunc@yahoo.com)

In the world, Jones (1998) points out that the poorest countries have per-capita incomes that are less than 5% of per capita incomes in the richest countries. Similarly to world, there is huge gap for Turkish regions. Therefore, aim of the paper is to understand the reasons for the income differences among the regions of Turkey since there is giant variation in per capita across Turkish provinces. Why such thing happens? Explaining such enormous differences in economic performance is one of the fundamental challenges of economics. For Turkish provinces, the richest province is at least 10 times higher per capita income than the poorest at 1997.

It is reported that investigation based on an aggregate production function offers some insight into these differences, an approach taken by Mankiw, Romer, and Weil (MRW) [1992], among others (Hall and Jones, 1999). They indicate that the differences among countries can be attributed to differences in human capital, physical capital, and productivity. However, none has been done how physical and human capital should interact in the production function. Based on their analysis, our results suggest that besides differences in each element of the production function being important, how each element of the production function are related and treated is important too. In particular, our results emphasize the key role played by physical to human capital ratio.

The setting and breaking down the aggregate production function are just the first step to understand the differences in output per capita. After setting the production function structure, the deeper questions are raised such as the following: why do some countries invest more than others in physical and human capital?, and why are some countries so much more productive than others? (Hall and Jones, 1999). These are not the questions that this paper tackles. However it will tackle whether the setting the production function in terms of physical and human capita level or their ratio fits better. Our hypothesis is that differences in capital accumulation, productivity, and therefore output per capita are fundamentally

related to differences in physical to human capital ratio across economies.

Across 67 provinces, we find a powerful and close association between output per capita and physical and human capita ratio. Provinces with long-standing physical to human capital ratio favorable to productive activities—rather than diversion—produce much more output per capita.

Our research is related to many previous contributions. The large body of theoretical and qualitative analysis of economic success with physical and human capital will be discussed in Section II. The current empirical growth literature associated with Barro [1991] and others shares some common fundamentals with our work, but our empirical framework differs fundamentally in its focus on levels of physical to human capital ratio and per capita income level instead of rates of growth. This focus is important for some reasons.

Some of the cross-country growth literature is familiar with this point. In specific, the economic growth regressions in Mankiw, Romer, and Weil [1992] and Barro and Sala-i-Martin [1992] are clearly forced by a neoclassical growth model in which long-run growth rates are the identical across countries or regions. These studies underline that differences in economic growth rates are transitory: economies grow more quickly the further they are far from their steady state. Nonetheless, the focus of such economic growth regressions is to explain the transitory differences in economic growth rates across countries. Our approach is different: we try to explain the variation in long-run economic performance by studying directly the cross-section relation in physical to human capital ratio rather than their levels.

We can summarize our analysis of the determinants of differences in economic performance among economies as (Inputs (physical to human capital ratio, Productivity) → per Capita Output. This structure serves numerous purposes. Firstly, it allows us to differentiate between the proximate causes of

economic success— capital ratio accumulation and productivity—and the more fundamental determinant. Secondly, the framework clarifies the contribution of our work. We concentrate on the relation between physical to human capital ratio and differences in economic performance. The production function-productivity analysis allows us to trace this relation through physical to human capital ratio accumulation and productivity.

We are aware that feedback may take place from output per capita back to physical capital to human capital ratio. For example, it may be that poor countries lack the resources to build effective physical capital to human capital ratio. We try to control for this feedback by using the geographical characteristics of an economy and time dummies as instrumental variables. We consider these characteristics as measures of the extent to which an economy is influenced by terrorism because of insecurity as the south part of Turkey and some financial crises. Controlling for endogeneity, we still find that differences in physical capital to human capital ratio across provinces account for much of the difference in long-run economic performance around Turkey.

## II. Some Discussion

We begin by examining the contiguous causes of economic success. We decompose differences in income per capita across provinces into differences in inputs and differences in productivity. Three approaches are mentioned to the decomposition of output per capita into inputs and productivity. Firstly, Christensen, Cummings, and Jorgenson [1981] developed one which involves the comparison of each country to a reference point. A province's productivity residual is produced by weighting the log-differences of each factor input from the orientation point by the arithmetic average of the country's factor share and the reference factor share. Similarly and secondly, except only that the factor shares are assumed to be the same for all countries; this amounts to calculating the residual from a Cobb-Douglas technology. Finally, Hall and Jones [1996, 1999] summarize that there is a method based directly on Solow [1957], discussed in a

predecessor to their paper which we employ. Because the Solow method provides results somewhat similar to those based on Christensen, Cummings, and Jorgenson or on Cobb-Douglas with typical elasticities, we will not settle on this aspect of the work. We present consequences based on the simplest Cobb-Douglas approach as Hall and Jones (1999) did.

It was assumed that output  $Y$  in provinces are produced according to

$Y_t = F_t [A_t, K_t, H_t, L_t] = K_t^\alpha H_t^\beta (A_t L_t)^{1-\alpha-\beta}$	1
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where  $K_t$  denotes the stock of physical capital,  $H_t$  is the amount of human capital-augmented labor used in production and  $A_t$  is a labor-augmenting measure of productivity. It is assumed that labor  $L_t$  is homogeneous within a province. Physical capital and Human capital dynamics are given by

$\dot{K}^* = s_k Y - \delta K \quad \text{and} \quad \dot{H}^* = s_h Y - \delta H$	2
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In this specification, the function reflects the evolution of the economy by letting the fraction of income invested in physical or human capital or together. With data on output, capital and schooling and knowledge of  $\alpha$  and physical capital and Human capital dynamics, we can calculate the level of productivity directly from the production function. It turns out to be handy to rephrase the production function in terms of output per capita,  $y = Y/L$ .

$\frac{Y}{L} = A \left[ \frac{K}{Y} \right]^{\left( \frac{\alpha}{1-\alpha-\beta} \right)} \left[ \frac{H}{Y} \right]^{\left( \frac{\beta}{1-\alpha-\beta} \right)} = A \chi$	3
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Rephrasing this way allows us to decompose differences in output per capita across countries into differences in the capital-output ratio, differences in educational attainment, and differences in productivity.

For two reasons, we follow Sohn [2000]; Mankiw, Romer and Weil [1992] in writing the decomposition in terms of the capital-output ratio rather than the

<sup>2</sup> Where its coefficient is found as a negative (Islam, 1995) and \* demonstrates the dynamic motions.

capital-labor ratio. Firstly, along a balanced growth path, the capital-output ratio is proportional to the investment rate, so that this form of the breakdown also has a natural interpretation. Secondly, considering a province that experiences an exogenous enlargement in productivity, while holding its investment rate constant, over time, the province's capital-labor ratio will increase as a result of the increase in the productivity. Therefore, some of the enlargement in output that is basically caused by the increase in productivity would be attributed to capital accumulation in a framework based on the capital-labor ratio. We thus are able to distinguish capital caused increases in output from productivity.

These two reasons are applied for physical to human capital ratio. Firstly, along a balanced growth path, the physical to human capital ratio-output ratio is proportional to the investment rate of the physical to human capital ratio, so that this form of the breakdown also has a natural interpretation. Secondly, considering a province that experiences an exogenous enlargement in productivity, while holding its investment rate of the physical to human capital ratio constant, over time, the province's physical to human capital ratio-labor ratio will increase as a result of the increase in the productivity. Therefore, some of the enlargement in output that is basically caused by the increase in productivity would be attributed to physical to human capital ratio accumulation in a framework based on the physical to human capital ratio-labor ratio. We thus are able to distinguish physical to human capital ratio caused increases in output from productivity.

### **III. Physical and Human Capital Interaction In Production**

In early growth accounting studies, it has been recognized that economic growth is explained not only by conventional labor and capital measures but also by quality of labor, which is also a crucial component to explain the residuals (Mankiw et al., 1992). Zamao (2000) and Barro and Sala-i-Martin (1995) have the same opinion on the position of human capital in

growth theories. Human capital is considered to be the motivating force for innovation, learning and entrepreneurship which are significant preconditions for economic growth since it enhances capitals' ability to learn new technologies that increases their productivity. Enhances in capita productivity will also ultimately enhance the productivity of physical and human capital and promote greater investment. Therefore, countries with higher initial stocks of human capital are expected to grow faster. Since, mutually in endogenous and exogenous growth models, human capital turns out to be a major factor behind the economic growth (Mankiw et al., 1992; Barro, 1997; Barro and Lee, 1993, 1996; Lucas, 1988; Romer, 1986, 1990).

Even though in the literature the importance of the human capital is noticed, how it is represented in the production function still seems to be a problem. Bulutay (1995) disapproves and criticizes the "substitution between the inputs" approach of the traditional economic theory. The important interaction among inputs is not substitution but complementarities. It is because, if there is no physical capital and then there will be no human capital in production action or use of technology in production process. As it is in less developed countries, if there is not enough human capital, then mobility of physical capital from rich to poor is not worked (Lucas, 1990).

Ramcharan (2004) has somewhat emphasized the complementary association between the human and the physical capital with imbalances in these two stocks of capital, as well as human capital externalities. He also concludes from the more proper econometric evidence that the significant complementarities do exist between different types of human capital. consequently, extremely educated people, such as scientists and technicians emerge to have a proportional advantage in understanding and adapting innovative or existing ideas into production processes where most of the technology forms in physical capitals.

Lee (2007) considers that the complementarities between the human capital and the physical capital are

the nature of the production procedure since the machines require skilled capitals to manage them and to repair them. As an example, while modern productive agriculture needs a literate agricultural workforce where capitals should be able to read instructions on a fertilizer bag, realize information contained in literature distributed by extension agents and be aware of the contents of a repair manual for agricultural equipment. In the up-to-the-minute services, employee should be able to make plain calculations rapidly and precisely. Thus, if a country giving priority to its physical capital while neglecting its human capital, it will shortly find out that the profits to its physical capital are lower than they need to be. After that it will have lower output. Finally, the technological changes have need of complementary investment in people. He (2007) furthermore points out that it is not trouble-free to start improved methods of production, new ways of doing things and more multifaceted and sophisticated products if buyers, capitals and consumers have inadequate training and education to enable them to comprehend the technology. Erk et al. (1998) also point out that available technological level (buried in K) and improvement in it needs similar improvements in H and they emphasize that it is not the absolute sizes of physical capital (K) and the skilled-labor (H) but their comparative absorption values should be the key in determinant of long-term economic growth.

Kalyoncu (2008) also brings to attention the idea of the “tragedy of the commons” so do their degrees of excludability. Accordingly, physical capital and human capital should be coordinated with these degrees of excludability. The complementary and excludability depend on the production process besides, in brief, people have property rights in their own skills, as well as in their raw labor. These possessions rights in their personal skills are strongly related with capability of serving well as collateral on loans.

We should also point out that setting their level of physical capital and human capital in the production function implies that even the one unit of either


physical or human capital is enough to continue for production:

$$Y_t = F_t[A_t, K_t, H_t, L_t] = F_t[A_t, 1, H_t, L_t] = 1_t^\alpha H_t^\beta (A_t L_t)^{1-\alpha-\beta}$$

or

$$Y_t = F_t[A_t, K_t, H_t, L_t] = F_t[A_t, K_t, 1, L_t] = K_t^\alpha 1_t^\beta (A_t L_t)^{1-\alpha-\beta}$$

However, it is not realistic to set such interaction since any type of machines requires skilled labor to operate. We also have to mention that some human capital becomes a brand to operate physical capital or vice versa. Otherwise it will not function as expected. Therefore, our production function is as follows. Please consider (K/H) is as the rate so H does not effect the growth rate negatively but how it shares the K very important.

$Y_t = F_t \left[ A_t, \frac{K_t}{H_t}, L_t \right] = \left( \frac{K}{H} \right)_t^\alpha (A_t L_t)^{1-\alpha}$	4
$\frac{Y}{L} = A \left[ \frac{K}{H * Y} \right]^{\left( \frac{\alpha}{1-\alpha} \right)} = A \chi$	5
	6

Our crucial measure of economic performance is the level of income per capita. We should also mention about the optimality and transversality condition as Turnovsky and Chatterjee (2002) where without them the level of variable presents meaningless insight.

#### IV. Data

We employ per capita income, gross domestic product, total electric consumption (mwp), public office electrical consumption (mwp), industrial electrical consumption (mwp), commercial electrical consumption (mwp), total secondary schooling where it is also decomposed as usual secondary schooling and technical secondary schooling besides employing the primary schooling. These data ranges from 1997 to

20013 and it is taken from Turkish Statistics Institutions (TUİK) web side.

### A. Discussion

We try to compare the results based on the Cobb-Douglas formulation of MRW and ours. The results are not very similar. There are 335 observations for 67 provinces. Before we do, we consider the figures and correlations to continue.

Figures show physical capital or human capital level or physical to human capital ratio across provinces plotted against output per capita. The figure for human capital against per-capita output has negative interaction where also the correlation between the human capital and the per capita income (in logs) is -0.2500 (-0.2491). However, the figure for physical capital against to per-capita output is positive (in logs) is 0.2091 (0.4929). We also present the figure physical to human capital ratio against to per-capita income. We observe positive interaction. The correlations are 0.7247, 0.7293, 0.4407 and 0.4434 for each description of physical capital to human capital ratio. The figures and the correlations are presented at the table 3.

INSERT:Table 1: Cross-sectional time-series FGLS regression, Coefficients: generalized least squares, Panels: heteroskedastic with cross-sectional correlation, Correlation: panel-specific AR(1)

Our first regression of per-capita output across provinces is related to a calculation performed by Mankiw, Romer, and Weil [1992]. We observe that interaction of human capital with per capita income is negative. This can be concluded that human capital should be considered as physical to human capital ratio. We also run the per capita income on physical to human capital and we observe that this interaction is positive. Using the physical to human capital ratio in per capita income regression have the highest wald statistics (56, 25.34).

<sup>3</sup> Turkish statistical institution has not published per capita income after 2001. That is why the data seems to be old.

### B. Determinants of Economic Performance

At an accounting level, differences in per capita output are due to differences in physical and human capital ratio per capita and to differences in productivity or physical to human capital ratio and productivity. However why do capital and productivity or physical to human capital ratio and productivity differ so much across provinces? Therefore, the central hypothesis of this essay is that the primary, basic determinant of a country's long-run economic performance is its social infrastructure which is considered as socio-economic development index. How per-capita income and social and cultural facilities are distributed is important since the developments levels of provinces vary and show unbalanced stages since every one of the provinces have different resources and characteristics. On one side we have hugely growing cities, whereas we have undeveloped provinces on the other. These socio-economic structures cause some problems at the ratio of (K/H) and some demand problem of housing, water, energy, infrastructure, crowded street and traffic jams, noises, education, health services or insufficient. State Planning Organization (DPT) (2003) calculates the socio-economic indices. According to DPT (2003) report, we divide our sample into two main regions where depending on the values of provincial indices are negative or positive<sup>4</sup>.

Meanings of the social-economic indices are the demographic structure, employment condition, educational and health related variables, infrastructural conditions (implies the institutions and

<sup>4</sup> We calculate the mean of the indices where we divide the provinces according to whether their per-capita income is either greater or less than \$2000 in year 1994 value that while the richer 22 provinces seem to be better structured in terms of social-economic, manufacturing, health and education sector indices for the year 2000. However, poorer 59 provinces do not seem to be better structured in terms of social-economic, manufacturing, health and education sector indices for the year 2000. Therefore, According to DPT (2003) report, we speculate that the regional differences in terms of social-economic structure, manufacturing, health and education structure cause migration and this migration also negatively influences welfare of the society; these factors may be some of the reasons for people to migrate since the mean rate of migration for the richer is positive, the mean rate of migration for the poorer is negative.

government policies and geographical conditions) and manufacturing, construction, agricultural and fiscal variable (involves the institutions and government policies and geographical conditions) that provide the incentives for individuals and firms in an economy. Those incentives can hearten creative activities such as the accumulation of skills or the development of new goods and construction techniques, or those incentives can promote voracious behavior such as rent-seeking, corruption, terrorism and theft.

Creative activities are defenseless to predation. If a firm can not be sheltered from terrorism or theft, then terrorism or thievery will be an attractive option to firming. A portion of the labor force will be employed as terrorists or thieves, making no contribution to output. Firms will expend more of their time protecting their firms from terrorists or thieves and as a result grow smaller amount of yields per day of effort.

Public control of diversion has two benefits. First, in a society at no cost of diversion, creative units are rewarded by the full amount of their creation: where there is diversion, on the other hand, it acts like a tax on production. Second, where public control of diversion is efficient, entity units do not need to devote resources in avoiding diversion. In various cases, public control is much cheaper than private prevention. Where there is no efficient public control of burglary, for example, assets owners must hire guards and put up fences. Public control of burglary implies two elements. Firstly it teaches that stealing or burglary is wrong. Secondly it is the threat of punishment. This threat itself is almost at no cost: the simply vital resources are those needed to make the threat credible. The importance of public infrastructure goes far beyond the notion that communal accomplishment can take advantage of returns to scale in prevention. It is not that the municipality can construct fences more cheaply than can individuals: in a municipality run well, no fences are needed at all. Any social action taken by typically through the government is a prime determinant of output per capita in almost any view. For more detail there are important contributions done by Olson [1965, 1982],

Baumol [1990], North [1990], Greif and Kandel [1995] and Weingast [1995].

If the capitals have to choose between production and diversion, there may be more than one equilibrium. For example, there may be an unfortunate equilibrium where production pays little because diversion is so widespread, and diversion has a high payoff because enforcement is useless when diversion is widespread. There is as well a good balance with little diversion, because fabrication has a high payoff and the high probability of penalty discourages approximately all diversion. Even though there is only a solitary equilibrium in these models, it may be extremely sensitive to its determinants because of near-indeterminacy.

Consequently, the restraint of distraction is an essential element of a favorable social infrastructure. The government enters the portrait in two ways. Firstly, the restraint of distraction emerges to be most well-organized if it is performed carried out communally, so the government becomes the natural instrument of antidiversion hard works. Secondly, the authority to make and enforce regulations makes the government itself a very efficient instrument of diversion. A government supports creative activity by discouraging personal distraction and by nonparticipation from diverting itself. Obviously, governments require returns in order to achieve prevention, which needs no less than a little diversion through taxation.

Distraction obtains the form of rent-seeking in economies of all types and is possibly the most important appearance of distraction in more highly developed economies [Krueger 1974]. Potentially creative persons use up their labors influencing the government. At high levels, they try to influence the legislatures and agencies to provide benefits to their clients. At lower levels, they use time and possessions looking for government employment. They employ legal action to pull out value from private company. They obtain benefit of ambiguities in property rights.

Successful economies restrict the range of rent-seeking. Legitimate requirements restrict government

involvement. A high-quality communal infrastructure will stop as many holes as it can where if not people could expend time bettering themselves cost-effectively by methods other than production. As well as its straight possessions on production, a high-quality communal infrastructure may have vital indirect effects by heartening the implementation of new ideas and new technologies as they are invented throughout the world. Therefore, it may also be assumed that output  $Y_i$  in  $i$  provincial group are produced according to

$Y_{it} = F_{it} \left[ A_{it}, \frac{K_{it}}{H_{it}}, L_{it} \right] = \left( \frac{K}{H} \right)_{it}^{\alpha_i} (A_{it} L_{it})^{1-\alpha_i}$	7
$\left( \frac{Y}{L} \right)_{it} = A_{it} \left[ \left( \frac{K}{H} \right)_{it} / Y_{it} \right]^{\left( \frac{\alpha_i}{1-\alpha_i} \right)} = A_{it} \chi_{it}$	8
$\left( \frac{K}{H} \right)_{it}^* = s_{k_{it}} Y_{it} - \delta_{it} \left( \frac{K}{H} \right)_{it}$	9

This enables us to distinguish whether there is a difference between these two groups. We only report the physical to human capital ratio estimation since we conclude that physical to human capital ratio fits in the production function for the provinces. We have two constant terms and two coefficients for physical to human capital ratio for each sample. The constant terms may indicate the differences in the institutions and government policies and geographical conditions besides others. Except the significance level, the values for both samples are very close. Therefore, we may say that in terms of socio-economic indices, we have not observed great deal of differences. However, we observe that there is a great deal of physical to human capital differences. The physical to human capital ratio in the high socio-economic group has greater influences on the per-capita income level than poorer socio-economic group.

INSERT: Table 2: Cross-sectional time-series FGLS regression, Coefficients: generalized least squares, Panels: heteroskedastic with cross-sectional correlation, Correlation: panel-specific AR(1)

## VI. Conclusion

Provinces generate high levels of per capita output in the long run because they accomplish high rates of investment in physical capital to human capital ratio and because they employ this ratio with a high level of efficiency. Our experiential study proposes that achievement on each of these frontages is motivated by communal infrastructure. A province's long-run economic performance is determined mainly by the organizations and administration strategies that make up the economic atmosphere within which persons and firms formulate investments, generate and relocate ideas, and create goods and services.

Public control of diversion has two paybacks. First, for people at no cost of deviation, creative units are satisfied by the full amount of their creation: where there is deviation, on the other hand, it acts like a duty on production. Second, where public control of deviation is efficient, object units do not need to devote resources in avoiding diversion. In numerous cases, public control is much economical than private prevention. Where there is no efficient public control of housebreak, for example, assets owners must employ guards and put up barriers. In stead of person, the municipality can construct fences more cheaply than can individuals. However main imğlication is not that. If a municipality run well, there is no need to fences at all.

Our chief conclusions can be summed up by the following points:

Numerous of the predictions of growth theory can be effectively measured in a cross-section perspective by examining the levels of income across provinces.

The huge disparity in per capita input across provinces is only incompletely explained by differences in electric consumption to educational attainment ratio.

Differences in socio-economic conditions across provinces cause large differences in electrical consumption to educational attainment ratio and efficiency and consequently huge differences in income across provinces.



Differences in socio-economic conditions may not cause huge differences; however it may be subject to strong measurement error and endogeneity concerns.

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Table 1: Cross-sectional time-series FGLS regression, Coefficients: generalized least squares, Panels: heteroskedastic with cross-sectional correlation, Correlation: panel-specific AR(1)

Dependent Variable: Per capita GDP											
k	0.034			0.114							
	(3.01)**			(3.72)**							
k1		0.062	0.222		0.2						
		1.72	(3.53)**		(3.33)**						
h			-0.228				-0.108				
			(4.12)**				-1.83				
h1				-0.184	-0.216		-0.106				
				(3.00)**	(4.65)**		-1.85				
Constant	8.224	8.714	5.545	5.057	5.617	5.045	5.121	7.125	7.157	5.644	6.261
	(44.46)**	(16.20)**	(5.58)**	(4.71)**	(7.82)**	(3.61)**	(3.82)**	(31.61)**	(33.53)**	(11.87)**	(24.57)**
k1h										0.226	
										(5.03)**	
kh1									0.062		
									(2.01)*		
kh								0.064			
								(2.07)*			
k1h1											0.177
											(7.48)**
Wald chi2(1)=	9.05	2.96	18.06	13.87	21.77	3.35	3.41	4.30	4.05	25.34	56.00
Prob > chi2=	0.0026	0.0854	0.0001	0.0010	0.0000	0.0672	0.0646	0.0381	0.0442	0.0000	0.0000
Absolute value of z statistics in parentheses											
* significant at 5%; ** significant at 1%											

All the variables are in log terms:  $h=(total\ secondary\ schooling+primary\ schooling)/gdp$ ,  $h1=(general\ secondary\ schooling+vocational\ secondary\ schooling+primary\ schooling)/gdp$ ,  $k=(total\ electric\ consumption)/gdp$ ,  $k1=(public\ office\ consumption(mwh)+industry\ consumption(mwh)+commercial\ consumption(mwh))/gdp$ ,  $kh=(k*gdp)/h$ ,  $k1h=(k1*gdp)/h$ ,  $kh1=(k*gdp)/h1$ ,  $k1h1=(k1*gdp)/h1$

Table 2: Cross-sectional time-series FGLS regression, Coefficients: generalized least squares, Panels: heteroskedastic with cross-sectional correlation, Correlation: panel-specific AR(1)

Poor and rich comparison according to socio-economic index				
	Poor	Rich	Poor	Rich
K1h	0.106	0.15		
	(2.30)*	(2.42)*		
K1h1			0.101	0.157
			(2.22)*	(2.56)*
Constant	6.585	6.546	6.66	6.517
	(16.01)**	(9.13)**	(17.04)**	(9.40)**
Wald chi2(1)=	5.31	5.85	4.93	6.55
Prob > chi2=	0.02	0.016	0.026	0.01

All the variables are in log terms:  $h=(total\ secondary\ schooling+primary\ schooling)/gdp$ ,  $h1=(general\ secondary\ schooling+vocational\ secondary\ schooling+primary\ schooling)/gdp$ ,  $k=(total\ electric\ consumption)/gdp$ ,  $k1=(public\ office\ consumption(mwh)+industry\ consumption(mwh)+commercial\ consumption(mwh))/gdp$ ,  $kh=(k*gdp)/h$ ,  $k1h=(k1*gdp)/h$ ,  $kh1=(k*gdp)/h1$ ,  $k1h1=(k1*gdp)/h1$

Table 3: cross-sectional correlation

	lnyl	k1h1	k1h	kh1	kh	lnh1	lnh	lnk1	lnk
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lnyl	1								
klh1	0.7247	1							
klh	0.7293	0.9995	1						
kh1	0.4407	0.5893	0.5874	1					
kh	0.4434	0.5871	0.5861	0.9996	1				
lnh1	-0.25	-0.3601	-0.3697	0.0187	0.0118	1			
lnh	-0.2491	-0.3507	-0.3614	0.0237	0.0158	0.9993	1		
lnk1	0.4929	0.6681	0.6599	0.5778	0.5702	0.4536	0.462	1	
lnk	0.2091	0.2645	0.2574	0.8144	0.8101	0.5954	0.599	0.7276	1

