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Discussion Paper Series

No.18

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March 2004

Hitotsubashi University Research Unit
for Statistical Analysis in Social Sciences
A 21st-Century COE Program

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February 28, 2004

Human Capital, Migration, and Regional Income Convergence in the Philippines[ψ]

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[ψ] We would like to thank Kazumi Asako, Kyoji Fukao, Hirohisa Kohama, Tsutomu Miyagawa, Konosuke Odaka, Tetsuji Sonobe, Ken Togo and seminar participants at Hitotsubashi University and Japan Economic Society and the members of the Project for Economic Development and Industrial and Trade Structure in Asian Countries for helpful comments and suggestions. Loida D. Cruz, Estrella V. Domingo, Isidoro P. David, Raul V. Fabella, Yasuhiro Nimura and Shigeaki Fujisaki kindly provided us with data and information. All remaining errors are ours. Financial supports from J.S.P.S. Scientific Research Grand of Fundamental Reserach(C) (1) for "Economic Development and Industrial and Trade Structure in Asian Countries: Empirical Studies Based on Long-term Asian Statistics," The Japan Economic Research Institute for "Economic Development and Industrial and Trade Structure in Asian Countries," and Grand-in-Aid for Research in Nagoya City University are gratefully acknowledged.

Human Capital, Migration, and Regional Income Convergence in the Philippines

Abstract

We test the convergence of real income using the Philippine regional data over the period of 1980-2000. Differences in real income across regions were large and persistent. Though regional incomes did not converge towards a common level (absolute convergence), they did converge controlling for human capital measured by average schooling years (conditional convergence). Human capital and its accumulation contributed to economic growth. People with higher human capital were more likely to move across regions. In addition, people tended to move from poor to rich regions. The absence in the absolute convergence may be due to the fact that higher human capital tended to move from poor to rich regions.

Human Capital, Migration, and Regional Income Convergence in the Philippines

1. Introduction

Does regional dispersion in real income within a country tend to converge? If so, how fast do they converge? If not, how can we restore the regional balance? These questions have attracted many researchers' and policymakers' interests recently. Most empirical studies have tested the regional convergence within developed countries, e.g., the U.S., Japan, and Europe (e.g., Barro and Salai-i-Martin (1995), Sala-i-Martin (1996), Hofer and Wörgötter (1997), Funke and Strulik (1999), Kawagoe (1999), Shioji (1999)), possibly due to the availability of regional statistics. Though some studies are emerging that treat the regional convergence in developing countries (e.g., Koo et al. (1998) for Korea, Togo (2000) for Malaysia, Lyons (1991), Chen and Fleisher (1996), Raiser (1998), and Wei (2000) for China), there is still scarce evidence on the convergence in developing countries. Regional differences in developing countries are, however, generally by far larger and are more important policy issues than those in developed countries. In the Philippines, for example, the region with the highest per capita income enjoys more than five times higher income than that with the lowest per capita income. Though most of the studies on developed countries support the convergence hypothesis, it still remains unanswered whether regional income disparities converge in developing countries, taking into consideration the poor domestic transport and communication, the concentration of industry in the central region, etc. We aim at testing the convergence of regional income using the Philippine regional data. Especially, we focus on the role of human capital and its movement across regions in the differences of regional income across regions. The role of human capital in growth is emphasized by many preceding cross-country studies (e.g., Mankiw et al. (1992)).

We first test the absolute convergence, i.e., whether all the regions tend to move towards the same steady state level of income. Using the pooled regional data

of average growth rates over every 5 years from 1980 to 2000, we reject the absolute convergence, on the contrary to many preceding regional studies in the developed countries. We then test the conditional convergence, i.e., whether each region tends to move towards a level of income of each own steady state. Our results support the convergence conditional on human capital. We find that human capital measured by average schooling years contributed to growth, while physical capital investment ratios did not. We also examine whether migration across regions contributed to regional income convergence. If people move from poor to rich regions, initially rich regions may see an increase in population and a decrease in per capital income as long as there is little difference in human capital across regions. On the other hand, if human capital varies across regions, whether migration contributes to or hampers the income convergence depends on the quality of migrants. Our estimation results suggest that though rich regions actually attracted more people, people with higher human capital were more likely to move across regions. These facts concerning migration may account for the absence in regional income convergence.

In section 2, we describe the data used in the following empirical studies. In section 3, we test the absolute convergence. In section 4, we test the conditional convergence. In section 5, we explore the determinants and effects of migration on growth. Section 6 concludes.

2. Data

The main data that we use are per capita real GRP (gross regional products) in the Philippines. GRP is available for 13 regions, i.e., NCR Metro Manila and the other 12 regions over 1980-2000 from *Philippine Statistical Yearbook* by NSCB. They are based on 1985 constant prices. Other data are from the *Philippine Statistical Yearbook* by NSCB, *Philippine Yearbook*, and Census of Population and Housing. Details of the definitions and variables are described in Appendix A. Descriptive statistics are shown in Appendix B. Physical capital

investment data is available only for the period of 1988 to 2000. Migration data is available only for the periods of 1975 to 1980 and 1985 to 1990.

We constructed the average schooling years based on Barro and Lee (1993). Specifically, letting ASY denote the average schooling years, we define

$$ASY = \sum_{i=1}^{6} Duration_i * PopShare_i \quad (1)$$

, where $Duration_i$ is the effective duration in years of the i th level of schooling and $PopShare_i$ is the fraction of the population for which the i th level of schooling is the highest attained. The levels of schooling consist of 1) elementary, 2) high school, 3) post secondary, 4) college undergraduate, 5) academic degree holder, and 6) post baccalaureate. Considering the presence of people who did not complete schooling, we set the effective duration less than the complete duration: 4, 8, 9, 10, 13, 15, and 17 years for each level of schooling.[1]

As for the net movement of human capital, we constructed the following measure.

$$Net\ Inflow\ of\ Human\ Capital_i = \frac{\sum_{j \neq i} (Migration_{i,j} \times ASY_j) - (\sum_{i \neq j} Migration_{j,i}) \times ASY_i}{Pop_i * ASY_i} \quad (2)$$

, where $Migration_{i,j}$, ASY_i, and POP_i denote the number of people who moved from region j to region i, average schooling years of region i, and population of region i, respectively. We implicitly assume that the schooling years of the migrants from region i are on average equal to those of the residents of region i. If net inflow of human capital is positive for region i, then those who migrates from the other regions to region i is on average higher than those who migrates from region i to the other regions.

3. The Absolute Convergence

[1] The duration of compulsory education is 6 years, followed by 4-year second level education (UNESCO, 95).

3.1 Stylized Facts

The average growth rates of real per capita GRP over the period of 1980-1985, for example, vary from 0.17% in Ilocos Region to -4.63% in Western Visayas (Table 1).Such large differences across regions can be seen for the other periods. The standard deviations are large and persistent.

We are interested in whether these large differences in growth rate tend to shrink the initial differences in the levels of regional income. Real per capita GRP are plotted in Figure 1. We see that NCR Metro Manila is consistently higher than any other regions. Little evidence seems to be found from Figure 1 that real per capita GRP tends to converge to a common steady state level.

3.2 Statistical Tests

We first test whether all the regions tend to move towards the same steady state. If such absolute convergence holds, the coefficient of the initial income, β, is significantly negative in the following OLS estimation:

$$\ln\left(\frac{q_{i,t}}{q_{i,t-1}}\right) = \alpha + \beta \ln\left(q_{i,t-1}\right) + \sum_t \delta_t DUM_t + u_{i,t} \qquad (3)$$

The dependent variable is the growth rate of GRP per capita for every five years over 1980-2000 for 13 regions. The explanatory variables are the logarithm of the initial real per capita GRP and period dummies. The number of observations is 52. The estimation result in the first column of Table 2 shows that the coefficient in the initial income is negative but not statistically significant. Therefore, we cannot reject the null hypothesis that regional income level did not converge to the same steady state level. This is in contrast to many preceding studies that often found the absolute convergence in developed countries, i.e., in the U.S. states and Japanese prefectures (Barro and Sala-i-Martin(1995)), and in the West German Länder (states) (Funke and Strulik (1999))[2]. Figure 2 shows that the negative correlation between the initial real per

[2] Hofer and Wörgötter (1997) found no significant absolute convergence in the Austrian

capita GRP and the following growth rate is not clear.

4. Conditional Convergence: Human Capital and Private Investment

Despite the lack in the absolute convergence, each region may tend to move towards an income level of its own steady state. We examine whether human capital and physical capital affect the steady state income level of each region and whether regional income disparities converge or not when these factors are controlled for.

We estimate the following equation using pooled regional data for every 5 years over 1980-2000:

$$\ln\left(\frac{q_{i,t}}{q_{i,t-1}}\right) = \alpha + \beta \ln\left(q_{i,t-1}\right) + X_{i,t-1}\lambda + \sum_t \delta_t DUM_t + u_{i,t} \qquad (4)$$

, where X is a vector of the variables that may affect the steady state income level.

First, we control for the logarithm of the initial average schooling years and the growth rates of average schooling years. These are proxies of the average level of human capital and the human capital accumulation, respectively. Column 2 of Table 2 shows that both of the human capital indices are significantly positive. These positive correlations are illustrated by Figures 3 and 4. In addition, the initial per capita GRP is significantly negative, implying that regional income disparities tended to converge once the human capital level and its accumulation rate are controlled for. The estimated speed of convergence, $-\frac{1}{5}\ln(1+5\hat{\beta})$, is 1.1%.[3] In Figure 5, we see a clear negative partial relationship between the initial income level and the growth rate of income once human capital indices are controlled for. In column 3 of Table 2, we further divide the average schooling years into the primary, secondary, and higher schooling years. Though all the human capital indices and their growth rates are positive, the

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regions during 1961-1989.

[3] The estimated speed of conditional convergence, 1.1% per annum, is slower than the previously estimated speeds of absolute convergence. For example, Shioji (1999) obtained an estimate of 8.6% for the Japanese prefectures. Islam (19995) obtained estimates within a range from 4% to 10% for the cross-country evidence.

logarithm of initial higher schooling years and the growth rate of primary schooling years are significant at the 10 percent significance level.

Next, we control for the equipment investment as a proportion of GRP as a measure of physical capital investment. Surprisingly, column 4 of Table 2 shows that the equipment investment ratio is not significant. In column 5 of Table 2, we include the logarithm of the initial average schooling years, its growth rate, and equipment investment ratio as explanatory variables. While human capital indices are significant, equipment investment ratio is not. Though we cannot further explore the reasons why physical capital investment did not contribute to regional income growth, an a weak financial system might have lead to inefficient allocation of capital.

5. Migration and Human Capital

Given large income differences across regions, people may move from a poor to a rich region, which may contribute to the income convergence if human capital levels are the same across regions. On the other hand, if human capital varies across regions, whether migration contributes to or hampers the income convergence depends on the quality of migrants. In this subsection, we estimate the determinants of migration and its effect on regional income.

5.1 The determinants of migration

We explore the determinants of migration using the migration data over the periods of 1975-80 and 1985-90. Specifically, we first estimate the following equation following Barro and Sala-i-Martin (1995).

$$NetMigration_{i,t} = \alpha + \beta \ln(q_{i,t}) + \gamma Density_{i,t} + \delta CrimeRate_{i,t} + \eta DUM_{i,t} + \varepsilon_{i,t} \qquad (5)$$

, where $NetMigration_{i,t}$, $Density_{i,t}$, $CrimeRate_{i,t}$ are the inflow of population from the other regions to region i subtracted by the outflow of population from region i to the other regions as a proportion of total population in region i, the logarithm of population density of region i, and crime rate of region i. We try to

capture the degree of disamenity of region i by $Density_{i,t}$ and $CrimeRate_{i,t}$. Column 1 of Table 3 shows that the coefficient of the log of real per capita GRP is significantly positive, suggesting that people tend to move from a poor to rich region. This can be clearly seen by Figure 6. Columns 2 and 3 show that the logarithm of population density is significantly negative, as is expected, and the crime rate is negative but insignificant.

Next, to account for the quality of labor that moves across regions, we estimate the determinants of net inflow of human capital. Columns 4 through 6 of Table 3 show that the determinants of net inflow of human capital are similar to those of net inflow of population except for the fact that the coefficient of the crime rate is negative and marginally significant. Human capital, as well as population, moves from a poor region to a rich one.

5.2 The Effects of Migration on Growth

Because population tends to move from a poor to a rich region, migration may contribute to the convergence of regional income differences. On the other hand, because human capital also tends to move from a poor to a rich region, the movement of human capital may hamper the convergence of regional income differences. In this subsection, we explore the effects of migration on regional income.

In column 1 of Table 4, we see that net migration does not have a significant effect on regional growth. This is robust to whether human capital indices are included (in column 2) or not (in column 1).In columns 3 and 4 of Table 4, we see that net inflow of human capital does not have a significant effect on regional growth, either. These results suggest that migration did not contribute to the convergence of regional income.

5.3 The effects of Migration on Human Capital

Migration may affect the levels of regional human capital. If, for example, people

who attained higher education are more likely to migrate, the region that receives migrants tend to attain a higher level of human capital. To explore this possibility, we estimate the following equation:

$$\Delta ASY_{i,t} = \alpha + \beta NetMigration_{i,t-1} + \gamma \ln(ASY_{i,t-1}) + \delta DUM_t + \varepsilon_{i,t} \quad (6)$$

, where $\Delta ASY_{i,t}$ is the growth in average schooling years. Column 1 of Table 5 shows that net inflow of population have a positive but insignificant effect on the growth in human capital. In columns 2 to 4, we estimate the effects of migration on the growth rate of each level of education. The estimation results reveal that net inflow of population have a significantly negative correlation with the growth in primary and secondary schooling years, while it has a significantly positive correlation with the growth in higher schooling years. The latter relationship is illustrated by Figure 7. These results suggest that people who attained higher education were more likely to migrate than those who attained primary or secondary education. If this is the case, migration has two opposing effects on the growth of the region that receives migrants. One is a growth-retarding effect through an increase in population growth. The other is a growth-enhancing effect through an increase in human capital. These two opposing effects may account for the insignificant effect of migration on regional growth.

To investigate more closely the effect of migration on human capital, we estimate the following equation:

$$\Delta ASY_{i,t} = \alpha + \beta NetInflowofHumanCapital_{i,t-1} + \gamma \ln(ASY_{i,t-1}) + \delta DUM_t + \varepsilon_{i,t} \quad (7)$$

Column 1 of Table 6 shows that net inflow of average schooling years has a significantly positive effect on the growth in total schooling years. Estimating Eq. (7) for each educational level (column 2 to 4), we see that net inflow of human capital has a significantly positive effect on the growth in higher schooling years. These results again suggest that people who attained higher education were more likely to migrate than those who attained primary or secondary education.

6. Conclusion

Our results can be summarized as follows. First, there is no evidence that regional income converges on a common steady state level from 1980 to 2000. Second, there is statistical evidence that regional income converged conditional on human capital. Third, while human capital and its accumulation tended to enhance real per

capita income, physical capital investment did not. Fourth, while people tended to move from a poor region to a rich one, migration did not have a significant and independent effect on real per capital income. Finally, people who accumulated higher human capital were more likely to migrate. The absence in income convergence may be due to the fact that higher human capital tended to move from poor to rich regions.

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Appendix A: Definitions and Sources of Variables

Variables	Definition	Period	Source
GRP per capita growth	Average annual growth rate of real per-capita Gross Regional Products	1980-1985, 1985-1990, 1990-1995, and 1995-2000	PSY
Log of initial GRP per capita	Logarithm of GRP per capita in each initial period	1980, 1985, 1990, and 1995	PSY
Log of initial total schooling year	Logarithm of average year of total schooling in each initial period	1980, 1985, 1990, and 1995	CP
Log of initial primary schooling year	Logarithm of primary schooling year in each initial period	1980, 1985, 1990, and 1995	CP
Log of initial secondary schooling year	Logarithm of secondary year in each initial period	1980, 1985, 1990, and 1995	CP
Log of initial higher schooling year	Logarithm of higher schooling year in each initial period	1980, 1985, 1990, and 1995	CP
Growth in total schooling year	Growth in total schooling year in each initial period	1980-1985, 1985-1990, 1990-1995, and 1995-2000	CP
Growth in primary schooling year	Growth in primary schooling year in each initial period	1980-1985, 1985-1990, 1990-1995, and 1995-2000	CP
Growth in secondary schooling year	Growth in secondary year in each initial period	1980-1985, 1985-1990, 1990-1995, and 1995-2000	CP
Growth in higher schooling year	Growth in higher schooling year in each initial period	1980-1985, 1985-1990, 1990-1995, and 1995-2000	CP
Equipment investment / GRP	Average gross domestic capital formation in durable equipment / GRP	1985-1990*, 1990-1995, and 1995-2000	PSY
Population growth	Growth in total population	1980-1985, 1985-1990, 1990-1995, and 1995-2000	PSY
Net migration	Net inflow of population for the previous period / total population	1975-1980 and 1985-1990	CP
Net inflow of human capital	Net inflow of total schooling year for the previous period / total schooling year	1975-1980 and 1985-1990	CP
Log of population density	Logarithm of population density	1980 and 1995	PSY
Crime rate	Average crime rate for the previous period	1975-1980 and 1985-1990	PY

Sources:
PSY: Philippines Statistical Yearbook
CP: Census of population
PY: Philippines Yearbook

*We applied the data for 1988-1990 to the period of 1985-1990 due to the limited data availability.

Appendix B: Summary of Statistics of all Variables Used in the Analysis

	Mean	Standard deviation	Number of Observations
GRP per capita growth	0.001	0.023	52
Log of initial GRP per capita	9.104	0.447	52
Log of initial total schooling year	1.918	0.168	52
Log of initial primary schooling year	0.718	0.246	52
Log of initial secondary schooling year	0.825	0.309	52
Log of initial higher schooling year	0.832	0.294	52
Growth in total schooling year	0.016	0.006	52
Growth in primary schooling year	-0.005	0.021	52
Growth in secondary schooling year	0.033	0.012	52
Growth in higher schooling year	0.011	0.022	52
Equipment investment / GRP	0.058	0.053	39
Population growth	0.022	0.007	52
Net migration	-0.002	0.016	26
Net inflow of human capital	-0.002	0.012	26
Log of population density	5.409	1.221	26
Crime rate	0.003	0.001	26

Table 1: Average growth rates of real per capita GRP (%)

Region		1980-1985	1985-1990	1990-1995	1995-2000
Metro Manila	NCR	-4.67	3.43	-1.26	1.58
ILOCOS REGION	R1	0.17	2.99	-1.17	1.98
CAGAYAN VALLEY	R2	-4.38	0.83	-0.69	4.25
CENTRAL LUZON	R3	-2.96	1.57	-0.13	-0.97
SOUTHERN TAGALOG	R4	-2.69	3.17	-1.16	0.10
BICOL REGION	R5	-1.96	0.98	1.78	0.12
WESTERN VISAYAS	R6	-4.63	0.87	1.46	0.99
CENTRAL VISAYAS	R7	-3.39	3.95	-0.87	2.57
EASTERN VISAYAS	R8	-1.53	0.41	1.24	0.68
WSTERN MINDANAO	R9	-2.44	0.03	3.81	0.65
NORTHERN MINDANAO	R10	-2.31	0.95	-0.22	4.46
SOUTHERN MINDANAO	R11	-1.02	0.25	-2.86	2.37
CENTRAL MINDANAO	R12	-2.26	0.54	2.50	-0.23
Mean		-2.62	1.54	0.19	1.43
Std. Dev		1.37	1.30	1.78	1.59

Table 2: Growth convergence and the relationship between Human capital and Growth

Dependent variable: GRP per capita growth (1980-1985, 1985-1990, 1990-1995, and 1995-2000)

	1	2	3	4	5
Constant	0.043	-0.054	0.075	0.071	-0.060
	(0.916)	(-1.034)	(1.014)	(0.977)	(-0.782)
Log of initial GRP per capita	-0.008	-0.011	-0.019	-0.006	-0.010
	(-1.492)	(-1.772)	(-2.183)	(-0.762)	(-1.104)
Log of initial total schooling year		0.057			0.071
		(2.230)			(2.170)
Log of initial primary schooling year			0.016		
			(0.778)		
Log of initial secondary schooling year			0.012		
			(0.605)		
Log of initial higher schooling year			0.065		
			(1.681)		
Growth in total schooling year		1.613			1.915
		(3.483)			(3.384)
Growth in primary schooling year			0.919		
			(1.701)		
Growth in secondary schooling year			0.387		
			(1.255)		
Growth in higher schooling year			0.529		
			(1.330)		
Equipment investment / GRP				0.034	0.028
				(0.466)	(0.407)
Dummy for 1985-1990	0.041	0.038	0.036		
	(7.096)	(6.091)	(3.907)		
Dummy for 1990-1995	0.028	0.016	0.013	-0.013	-0.024
	(4.692)	(2.234)	(0.974)	(-2.022)	(-3.679)
Dummy for 1995-2000	0.040	0.023	0.007	-0.001	-0.018
	(6.838)	(2.748)	(0.181)	(-0.206)	(-2.562)
Number of observations	52	52	52	39	39
Adjusted R2	0.533	0.594	0.589	0.047	0.221

Numbers in parentheses are t-values based on the White (1980) heteroscedasticity-consistent covariance matrix.

Table 3: The determinants of inflow of population

Dependent variable	Net migration (1975-1980 and 1985-1990)			Net inflow of human capital (1975-1980 and 1985-1990)		
	1	2	3	4	5	6
Constant	-0.140	-0.150	-0.148	-0.077	-0.096	-0.093
	(-9.980)	(-10.742)	(-8.682)	(-3.070)	(-8.177)	(-6.494)
Log of initial GRP per capita	0.031	0.038	0.037	0.017	0.030	0.029
	(10.19)	(9.274)	(8.307)	(3.008)	(7.410)	(6.822)
Log of population density		-0.004	-0.003		-0.007	-0.006
		(-2.205)	(-1.522)		(-5.304)	(-4.082)
Crime rate			-1.644			-2.440
			(-1.036)			(-1.792)
Dummy for 1985-1990	-0.002	-0.001	-0.001	-0.002	-0.000	-0.001
	(-0.570)	(-0.308)	(-0.369)	(-0.571)	(-0.131)	(-0.251)
Number of observations	26	26	26	26	26	26
Adjusted R2	0.709	0.743	0.744	0.332	0.628	0.660

Numbers in parentheses are t-values based on the White (1980) heteroscedasticity-consistent covariance matrix.

Table 4: Inflow of population and Growth

Dependent variable: GRP per capita growth (1980-85 and 1990-95)

	1	2	3	4
Constant	0.185	0.066	0.157	0.035
	(2.349)	(0.764)	(3.014)	(0.527)
Log of initial GRP per capita	-0.023	-0.020	-0.020	-0.016
	(-2.698)	(-1.677)	(-3.556)	(-1.514)
Log of initial total schooling year		0.037		0.036
		(1.265)		(1.231)
Growth in total schooling year		1.446		1.513
		(2.967)		(2.990)
Net migration	0.167	0.052		
	(0.807)	(0.210)		
Net inflow of human capital			0.105	-0.095
			(0.594)	(-0.387)
Dummy for 1990-1995	0.027	0.019	0.027	0.019
	(4.862)	(2.685)	(4.830)	(2.712)
Number of observations	26	26	26	26
Adjusted R2	0.550	0.617	0.546	0.619

Numbers in parentheses are t-values based on the White (1980) heteroscedasticity-consistent covariance matrix.

Table 5: Inflow of population and human capital accumulation

Dependent variable	Growth in total schooling year	Growth in primary schooling year	Growth in secondary schooling year	Growth in higher schooling year
	1	2	3	4
Constant	0.077	-0.014	0.048	0.046
	(5.795)	(-1.146)	(9.333)	(14.69)
Net migration	0.074	-0.304	-0.263	0.204
	(1.318)	(-2.840)	(-2.135)	(2.356)
Log of initial total schooling year	-0.034			
	(-4.676)			
Log of initial primary schooling year		-0.003		
		(-0.246)		
Log of initial secondary schooling year			-0.008	
			(-0.834)	
Log of initial higher schooling year				-0.034
				(-7.960)
Dummy for 1990-1995	0.007	0.000	-0.010	0.009
	(2.737)	(0.062)	(-1.591)	(3.143)
Number of observations	26	26	26	26
Adjusted R2	0.497	0.160	0.465	0.606

Numbers in parentheses are t-values based on the White (1980) heteroscedasticity-consistent covariance matrix.

Table 6: Inflow of human capital and human capital accumulation

Dependent variable	Growth in total schooling year 1	Growth in primary schooling year 2	Growth in secondary schooling year 3	Growth in higher schooling year 4
Constant	0.072	-0.022	0.054	0.043
	(6.597)	(-1.903)	(11.13)	(18.55)
Net inflow of human capital	0.100	-0.160	-0.056	0.229
	(1.950)	(-1.043)	(-0.376)	(2.771)
Log of initial total schooling year	-0.032			
	(-5.195)			
Log of initial primary schooling year		0.007		
		(0.544)		
Log of initial secondary schooling year			-0.019	
			(-2.006)	
Log of initial higher schooling year				-0.029
				(-7.977)
Dummy for 1990-1995	0.007	0.002	-0.005	0.008
	(2.753)	(0.570)	(-0.728)	(2.814)
Number of observations	26	26	26	26
Adjusted R2	0.509	-0.011	0.392	0.617

Numbers in parentheses are t-values based on the White (1980) heteroscedasticity-consistent covariance matrix.

Figure 1: Gross regional product per capita from 1980 to 2000

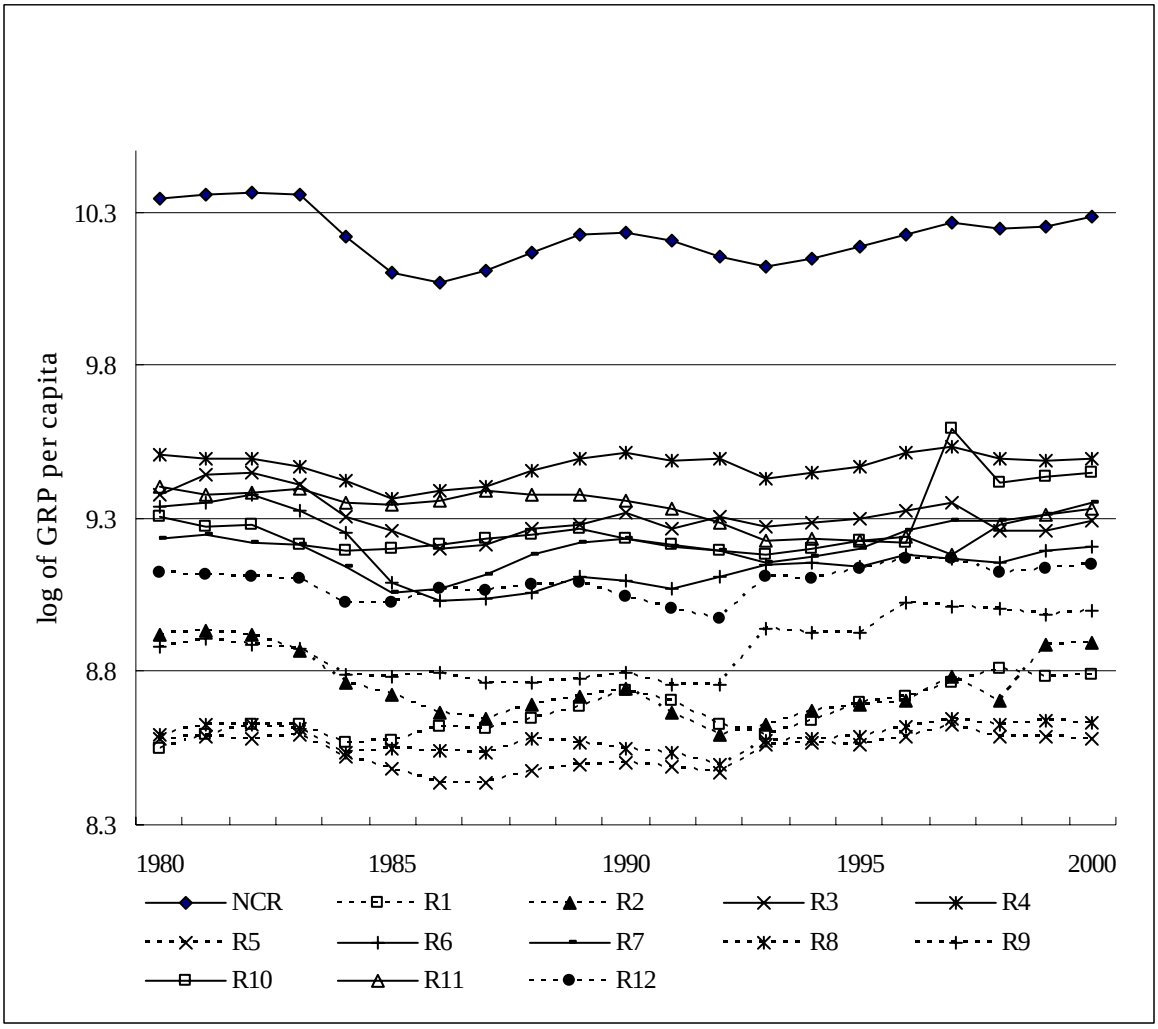


Figure 2

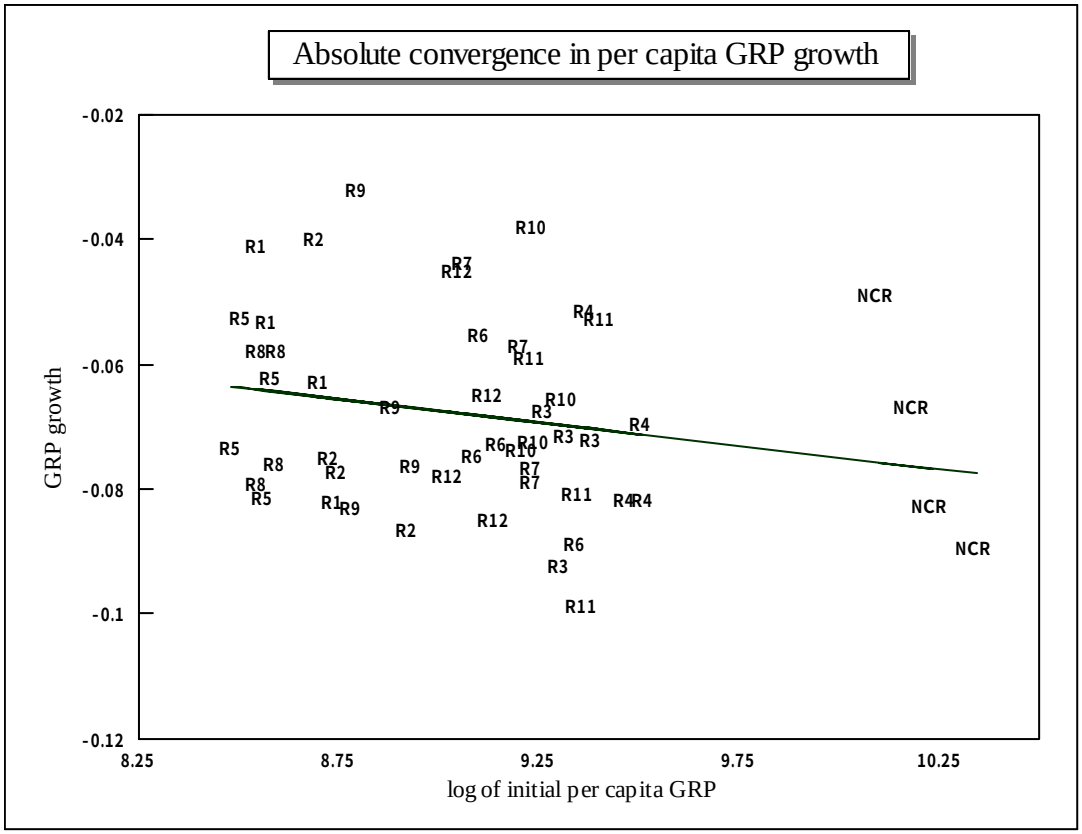

Absolute convergence in per capita GRP growth
GRP growth
-0.02
-0.04
-0.06
-0.08
-0.1
-0.12
8.25
8.75
9.25
9.75
10.25
log of initial per capita GRP
R9
R10
R1
R2
R7
R12
NCR
R5
R1
R4
R11
R6
R7
R8
R8
R11
R5
R1
R12
R10
R9
R3
NCR
R4
R5
R6
R10
R3
R3
R8
R2
R2
R9
R12
R7
R8
R7
R5
R1
R9
R11
R4
R4
NCR
R12
R2
R6
NCR
R3
R11

Figure 3

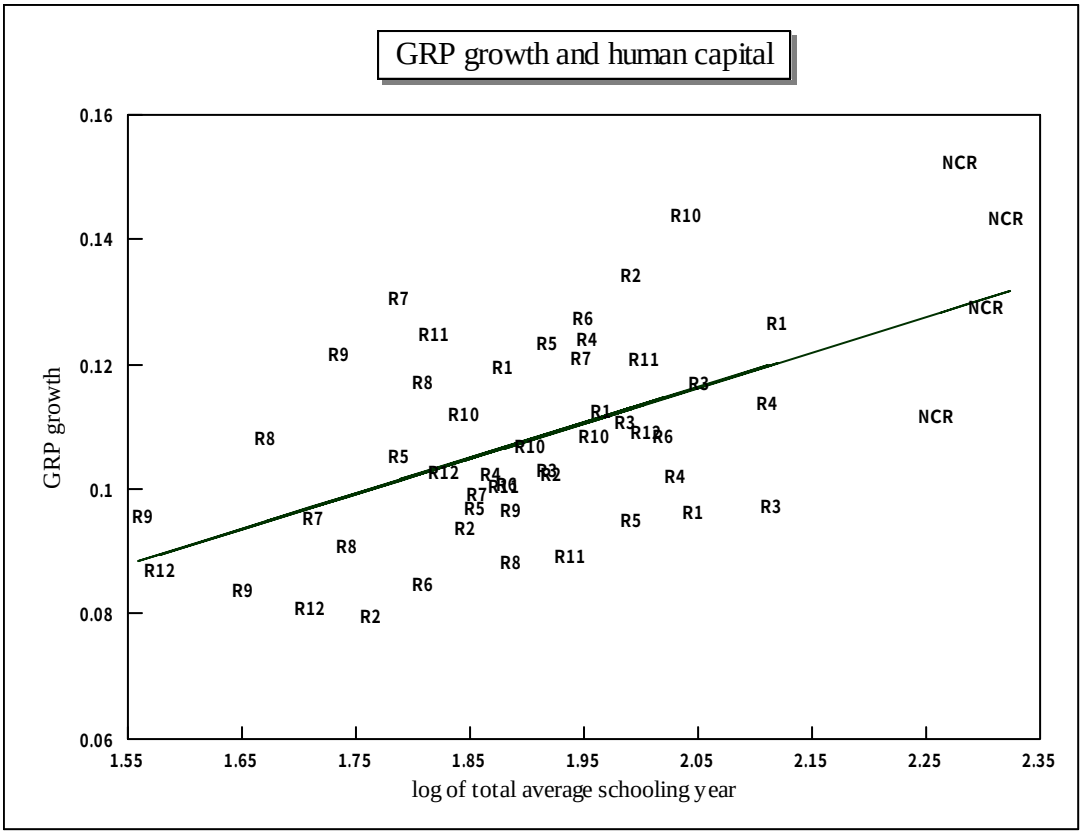

GRP growth and human capital
GRP growth
log of total average schooling year
0.16
0.14
0.12
0.1
0.08
0.06
1.55
1.65
1.75
1.85
1.95
2.05
2.15
2.25
2.35
NCR
NCR
NCR
R10
R2
R7
R6
R11
R5
R4
R1
R9
R7
R11
R1
R8
R3
R4
R10
R1
R3
R8
R10
R10
R12
R6
R5
R12
R4
R4
R7
R5
R9
R1
R3
R9
R7
R2
R5
R8
R8
R11
R12
R9
R6
R12
R2

Figure 4

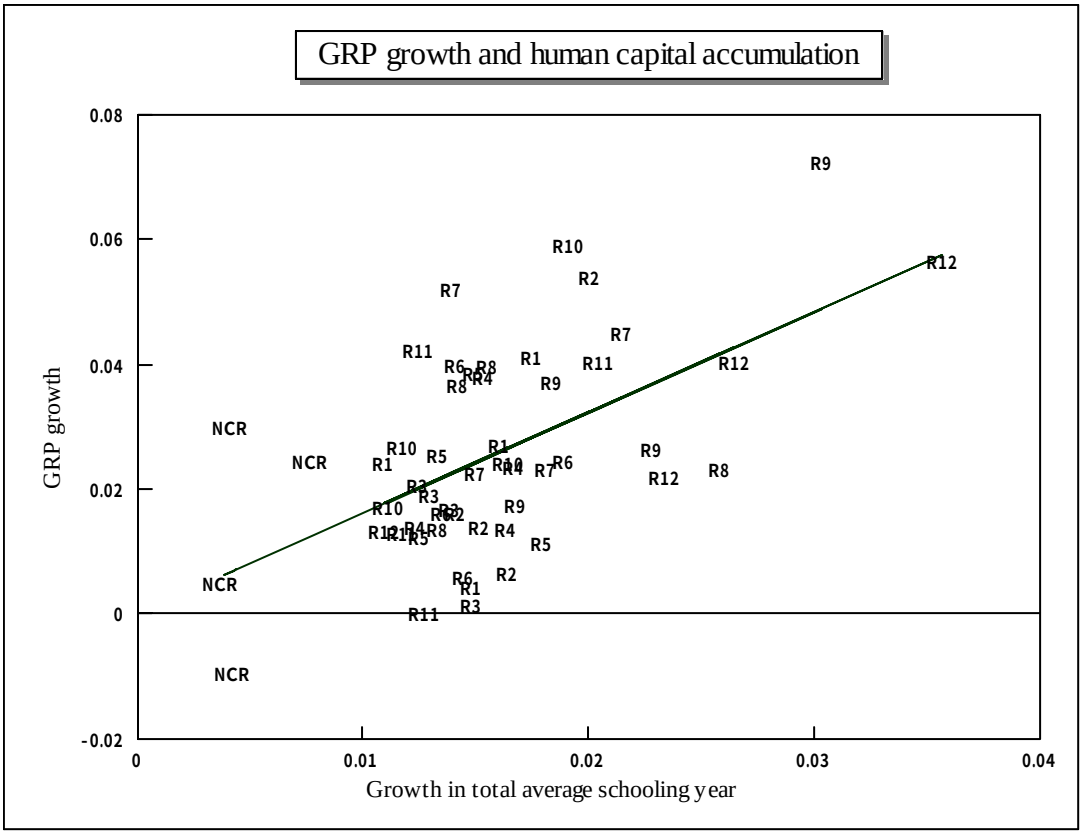

GRP growth and human capital accumulation
GRP growth
Growth in total average schooling year
0.08
0.06
0.04
0.02
0
-0.02
0
0.01
0.02
0.03
0.04
NCR
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12

Figure 5

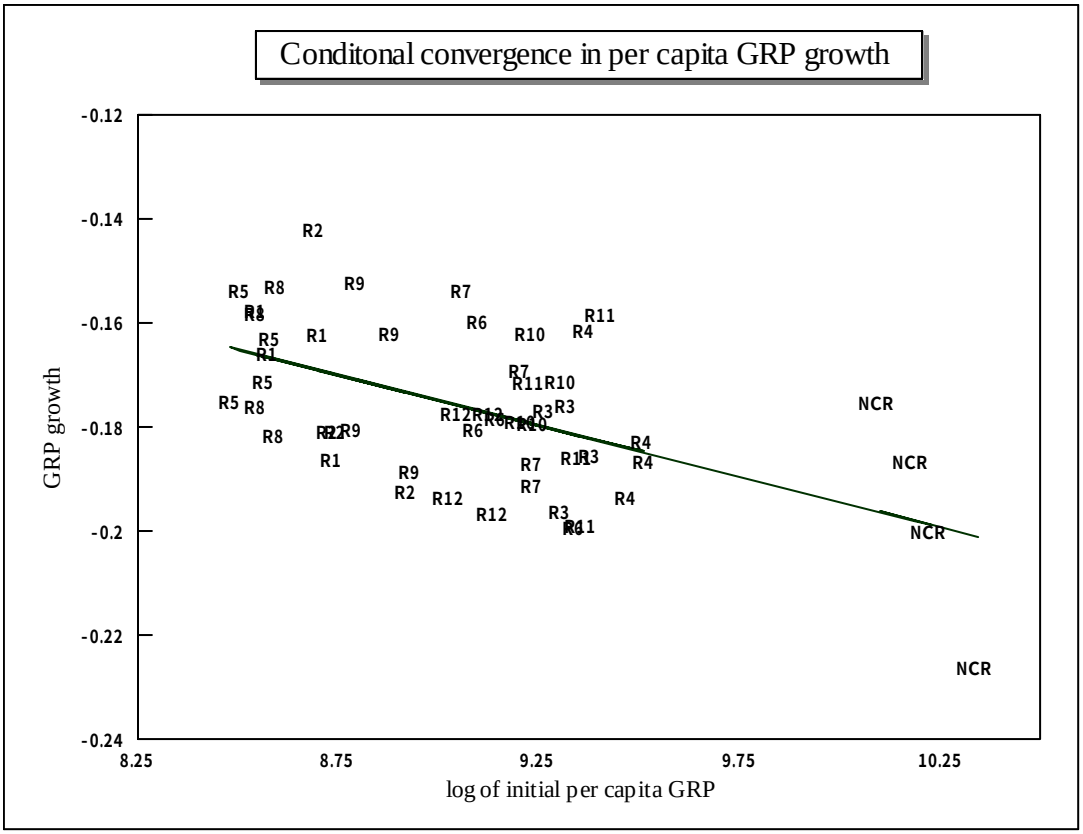

Conditonal convergence in per capita GRP growth
GRP growth
-0.12
-0.14
-0.16
-0.18
-0.2
-0.22
-0.24
8.25
8.75
9.25
9.75
10.25
log of initial per capita GRP
NCR
NCR
NCR

Figure 6

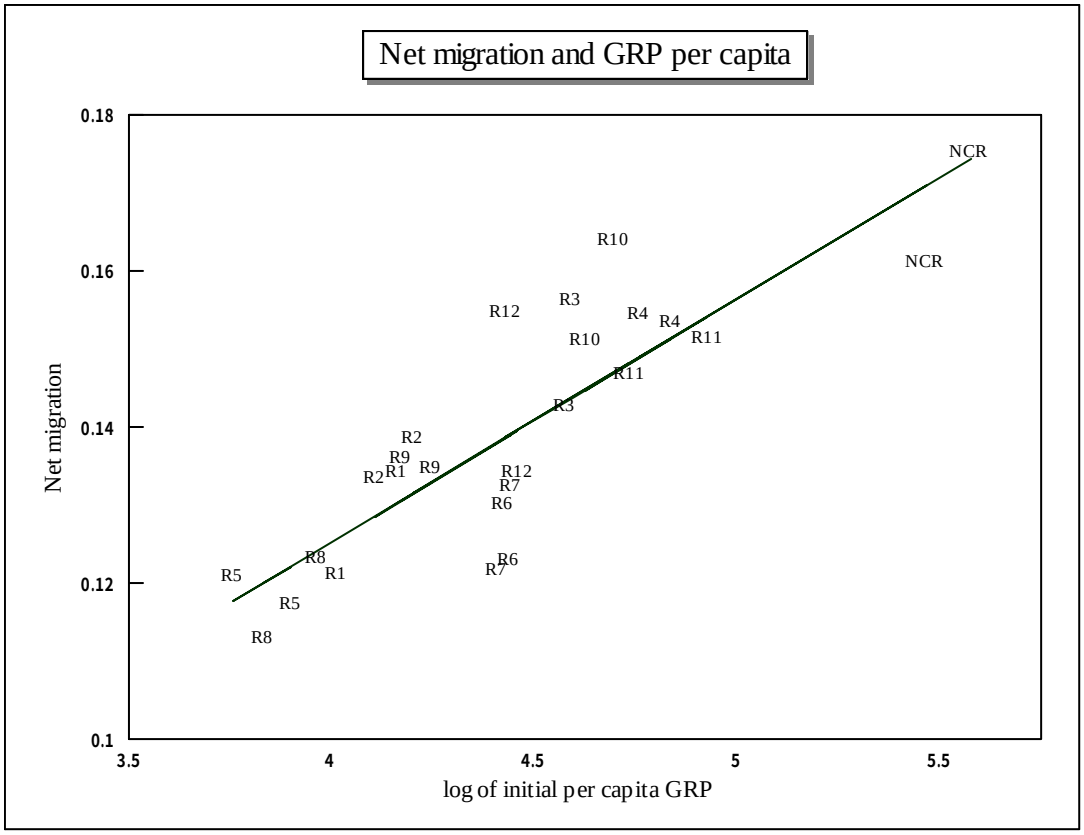

Net migration and GRP per capita
0.18
0.16
0.14
0.12
0.1
Net migration
3.5
4
4.5
5
5.5
log of initial per capita GRP
NCR
NCR
R10
R10
R3
R12
R4
R4
R11
R10
R11
R3
R2
R9
R2
R1
R9
R12
R7
R6
R8
R5
R1
R7
R6
R5
R8

Figure 7

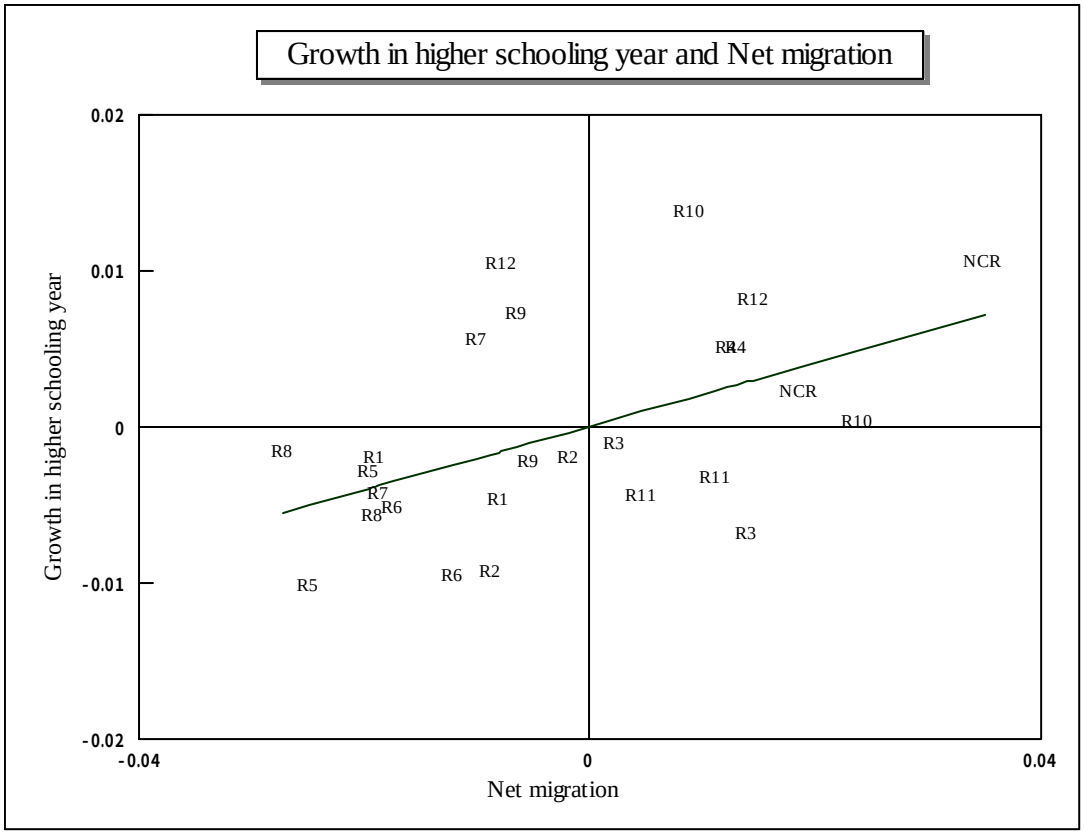
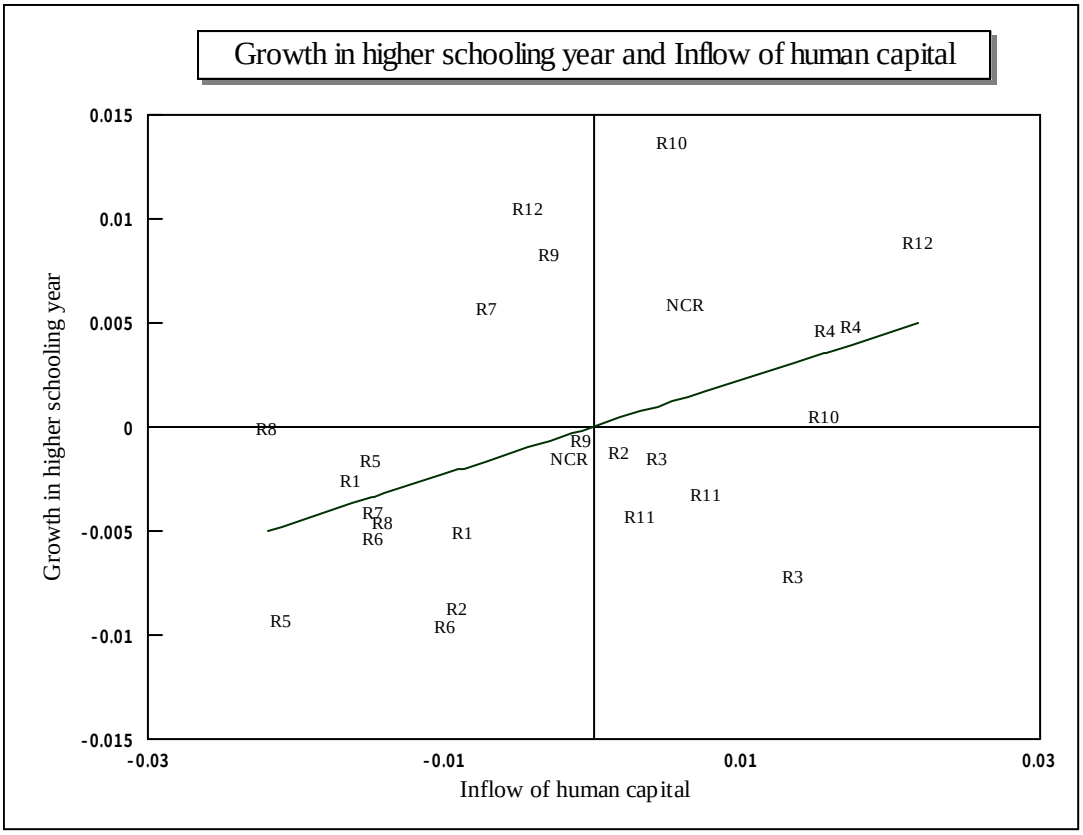

Growth in higher schooling year and Net migration
Growth in higher schooling year
Net migration
0.02
0.01
0
-0.01
-0.02
-0.04
0
0.04
R10
R12
NCR
R9
R12
R7
R4
NCR
R10
R8
R1
R3
R5
R9
R2
R11
R7
R6
R1
R11
R8
R3
R6
R2
R5

Figure 8


Growth in higher schooling year and Inflow of human capital
Growth in higher schooling year
Inflow of human capital
0.015
0.01
0.005
0
-0.005
-0.01
-0.015
-0.03
-0.01
0.01
0.03
R10
R12
R9
R7
R12
NCR
R4
R4
R10
R8
R9
NCR
R2
R3
R5
R1
R11
R7
R8
R6
R1
R11
R3
R2
R5
R6