Income Convergence among Districts of Nepal

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I. Introduction

We study absolute and conditional convergence of real income per capita in Nepal using cross-section data. Lack of detailed data precludes estimations based on long time series for districts, development zones or topographical regions. A similar constraint exists in estimating the σ-convergence which indicates if the dispersion of incomes is narrowing over time. Yet data available from Nepal over the last decade do permit investigation of some convergence issues. We use the results of the National Living Standard Survey (NLSS) I and II (Central Bureau of Statistics) to examine if the initially poorer districts have displayed a tendency to catch up with the initially richer districts.

This is simply β-convergence (Barro and Sala-i-Martin, 2004). While it indicates to some extent whether the catch-up process is operating in Nepal, there are other related issues that we could examine with sufficient data. One is polarization (Duclos, Esteban and Ray, 2004; Bandyopadhyay, 2006). An economy has likely become more polarized if several convergences occur among a limited number of regions within a country around levels of income that have grown further apart from each other. These multiple peaks in income distribution indicate different dynamics compared to a single-peaked distribution (Quah, 1996). This is of enormous interest in countries such as Nepal where an egalitarian distribution remains a highly important goal of development.

Finally, we study if some of the districts have shown a tendency to leapfrog to a higher income level by overtaking originally richer districts. This is an issue that is best analyzed separately from convergence.

We use cross-section econometrics to estimate our models. Since we are not aware of any studies on Nepal that examine economic convergence, our goal in this paper is primarily to understand first whether incomes are converging, diverging, or distributionally constant. Second, we would like to identify the determinants of convergence or the lack of it.

The neoclassical growth model emphasizes physical and human capital accumulation, and population growth as the prime determinants of the steady state of an economy (Mankiw, Romer and Weil, 1992; Islam, 1995). By controlling for similar factors, we focus on the coefficient of the initial income to see if convergence exists in the data. Some of these other factors important for convergence, particularly in the Nepali context, would be related to physical infrastructure such as road network, percentage of irrigated land, and access to electricity and telephones. Finally, an understanding of the degree of polarization among income classes would also be helpful in thinking about the importance of a broad-based policy for development.

Regional convergence literature documents two opposing views on convergence among regions. The first holds that an integrated market economy creates pressures that over time give rise to convergence of incomes among regions. A greater productivity of capital in regions where it has not been used much should attract more capital and help income grow faster as these regions proceed to attain a long-run equilibrium. Thus regional disparities should remain a short term phenomenon. A second approach says there is no compelling reason why regions should converge in either growth or income even in the long run (Myrdal 1957, and Kaldor 1970, 1981). Agglomeration and scale economies in more prosperous regions (Krugman, 1995) can indeed lead to greater concentration of capital and skilled labor. Spatial disequilibrium and significant divergence of incomes can thus result even in the long run.

II. Theoretical framework

To test the convergence of income, our baseline model looks at growth of regions conditional on initial incomes:

$$\frac{\Delta \log y_i}{T} = \alpha + \gamma \log y_{0i} + u_i \qquad (1)$$

where y is real income per capita, i is an index for regions, 0 refers to the initial value of a variable, and T is the number of periods in the sample. In equation 1, if γ is negative, we say that initially poorer regions grow faster than those initially richer. Hence the absolute convergence applies. However, if regions are different in some fundamental ways so that their long-run equilibrium incomes are different, then equation (1) is misspecified. Those differences must be accounted for explicitly in the regression according to the neoclassical growth theory. The modified version appears in equation (2):

$$\frac{\Delta \log y_i}{T} = \alpha + \gamma \log y_{0i} + \eta \log y_i^* + u_i \qquad (2)$$

where $\eta = -\gamma = \frac{1 - e^{-\beta T}}{T}$, a term that, given β, declines as T increases, and y_i^* is the steady-state level of income. Thus, the relevant concept for investigation is conditional convergence, i.e., convergence among regions conditional on the steady-state incomes. Growth theory requires the inclusion in the regression of a set of factors that determine the steady-state income. Most important of these factors are investment as a proportion of output, the rate of population growth, the rate of capital depreciation, and technological progress which raises the productivity of labor. In empirical models, a host of variables including institutional and policy-related variables are generally incorporated as controls.

In addition to absolute and conditional convergences, called β-convergence, we can test for sigma-convergence which looks for shrinking of the standard deviation of log per capita income over time. The presence of Σ-convergence implies the presence of β-convergence but its converse is not true because of the possibility of leapfrogging for some regions.

III. Data and summary statistics

Data availability has remained a serious problem with this project. Districtwise macro data for Nepal have been conspicuous by their near absence. Indeed, it was comforting to find the income data for 1995/96 from the Nepal Living Standards Survey as used in the Human Development Report Nepal (HDRN). The per capita income for districts from the more recent survey conducted in 2003/04 have not, however, been published yet. The HDRN does report income for all districts for 2000/01. We adjust these data for the subsequent national growth until 2004 for further analysis.

Among our control variables for which data collection eventually turned successful are roads and telephone lines. We work with population adjusted road length (population per kilometer of road) and population per phone line. More recent years have seen mobile phones become highly popular in some of the remote districts as well, but we did not have enough information on such phones. Data on education, health and sanitation were also unavailable.[*****]

[*****] These data are in the process of collection and will help in the extension of our model.

Among the basic properties of our income variables, the mean income in 1996 was about Rs 6800 (just above $100 per person). Income grew in real terms at 3.1 percent per year on average during the eight year period. The mean-median difference widened somewhat with time; as a result income distribution became somewhat more positively skewed in 2004 than it was in 1996. Kavre, Lalitpur, and Kathmandu were the three positive outliers in 1996 with income greater than Rs 11656 per person and there were no negative outliers (less than Rs 694). After eight years, six districts had pulled away with incomes in 2004 greater than the upper quartile by over 1.5 times the interquartile range. These districts are Bhaktapur, Bara, Lalitpur, Mustang, Makwanpur, and Kavre where Kavre's average income of Rs 25298 is well above the cutoff for even the extreme outlier (Rs 17131). The basic statistics for the natural logarithms of income for 1996 and 2004 show distributions much closer to normal with an insignificant difference between the mean and the median, a smaller skewness, and thinner tails.

Income statistics by topographical regions reveal that while Hills are at the bottom of the income ladder in both 1996 and 2004, the mean for the Terai also stays within 10 percent of the Hills. Only the Kathmandu Valley outperforms the rest of the country on average income by wide margins. Finally, in terms of the five development regions in the country, the Central region is by far the richest but it also has the largest variance.

IV. Convergence results:

The results of the estimation of equation (1) are as follows:

$$\widehat{growth} = 0.567 - 0.061 y_{96}$$
$$(5.73)\ (-5.42) \qquad (3)$$
$$N = 75,\ R^2 = 0.287,\ F_{1,73} = 29.34$$

The coefficient of y96 (-.061) implies a high rate of absolute convergence of 7.9 percent per year. At this rate it only takes 11 years to close 50 percent of the gap and 31 years to close 95 percent. This is obviously too high a rate for convergence. In any case, as stated earlier, this model excludes the determinants of income in the steady state, such as investment in real capital. Investment data on districts could not be obtained despite serious efforts. Searching for proxies, we settled on the density of roads and telephones. These variables are measured as the

length of roads per 100,000 population and the number of phone lines per 100,000 population. Both are respective averages of data in the initial and final years. Including these variables in the model, we obtain the following results:

$$\widehat{growth_i} = 0.642 - 0.075\, y_{i,96} - 0.003 road_i + .010\, phon_i$$
$$(6.40)\ (-6.30) \quad (-0.69) \qquad (3.16) \tag{4}$$
$$N = 64, \quad R^2 = .403, \quad F_{3,60} = 13.48$$

The overall fit of the regression in equation (4) shows improvement over the result for equation (3). The road variable does not, however, provide a positive impact on income growth, nor is its coefficient statistically significant. Note that roads are only one of the constraints in development. For the given sample period of eight years, the Maoist rebellion, for instance, may have played a larger role in growth slowdown by raising uncertainty in return to investment, and placing physical barriers on the movement of goods and services. The phone access performs better with the expected positive sign and high statistical significance for its coefficient. Since the phon variable is measured in logarithms of the number of phone lines per hundred thousand population, its estimated coefficient indicates that a doubling of phone lines increases the overall growth by one percentage point above the mean growth. This seems to be a significant result given enormous potential for growth of telephone network in Nepal.

Dropping the insignificant road variable does not change our results substantially as shown in equation (5):

$$\widehat{growth_i} = 0.646 - 0.076\, y_{i,96} + .0096\, phon_i$$
$$(6.52)\ (-6.42) \qquad (3.34) \tag{5}$$
$$N = 69, \quad R^2 = .388, \quad F_{2,66} = 20.93$$

We note that neither the White nor the Bruce-Pagan test rejected the null of no heteroscedasticity. For the last specification (equation 5), for example, the White test showed the probability greater than $\chi 2$ to be 0.21. A plot of the residuals against the estimated growth also failed to show a clear picture of changing residual variances.

A common problem with all the estimated equations (3)-(5) is the high speed of convergence. It seems implausible that poorer districts are closing the gap between their current and steady state incomes at a rate of

7 to 10 percent a year. Our data show that development of infrastructure, particularly roads, has occurred faster in districts with slower income growth (also see Mahat, 2005). The correlation between income and road growth rates is negative although not very high (−0.11) in the 80 percent of the districts for which we have data for both rates. The question that remains unresolved at this point is whether, despite some progress in infrastructure development, the determinants of the steady state income in many districts are too poor to allow a catch up with income in richer districts. In other words, while poorer districts may be moving closer to their own steady states at a relatively rapid pace, their steady state incomes are themselves too low to permit absolute convergence with richer districts.

We test to see if Hills and Tarai display income divergence or differing significance of the infrastructure variables. The national results of convergence, however, go through for topographical regions as well. The initial income remains highly significant and negative and the speed of convergence continues to stay high and similar for the two regions. On the other hand, the phone variable fails to attain statistical significance at conventional levels for the Tarai. Among the development regions, the West and the Midwest display the most rapid rate of convergence while the Farwest stays below the national trend. It is important to point out that the rate of convergence for the Central region is closer to that of the Farwest than to the rate for the West. It is likely that higher prevailing per capita income in the Central region places it closer to its steady state income than are others to their own incomes, and hence its convergence is slower. On the contrary, the Farwest may be closer to its steady state because of relatively poor indicators for the determinants of its long-run income.

V. Conclusion

We study whether per capita incomes in the districts of Nepal are converging. That is, whether districts that were poorer in the mid-1990s have shown a tendency to grow faster subsequently than districts that were initially richer. We test for absolute β-convergence and conditional convergence. Incomes pass both the tests. However, there are some dissimilarities across topographical regions (Hills and Tarai) and across development regions.

Our study indicates problems that must be resolved before proceeding with attempts to obtain a clear picture about the convergence process in Nepal. The first and major limitation is the short-term nature of

our data, for eight years, while convergence is best studied on long-term data. Second, more data on factors that determine the income in the long run, particularly human capital, would be important for a more complete test of convergence. Our data on education and health variables remained incomplete for most districts which precluded a study of another dimension to the process of convergence. Using these data, we hope to perform in the near future a better and more complete analysis of the income convergence issues in Nepal.

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