WPS4358

POLICY RESEARCH WORKING PAPER 4358

A Micro-Decomposition Analysis of the Macroeconomic Determinants of Human Development

Sylvie Lambert
Martin Ravallion
Dominique van de Walle

The World Bank
Development Research Group
Poverty, Human Development and Public Services Teams
September 2007

Policy Research Working Paper 4358

Abstract

This paper shows how differences in aggregate human development outcomes over time and space can be additively decomposed into a pure economic-growth component, a component attributed to differences in the distribution of income, and components attributed to "non-income" factors and differences in the model linking outcomes to income or non-income characteristics. The income effect at the micro level is modeled non-parametrically, so as to flexibly reflect distributional changes. The paper illustrates the decomposition using data for Morocco and Vietnam, and the results offer some surprising insights into the observed aggregate gains in schooling attainments. A user friendly STATA program is available to implement the method in other settings.

This paper—a product of the Poverty and the Human Development and Public Services Teams, Development Research Group—is part of a larger effort in the department to understand the role played by economic growth and redistribution in human development. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The authors may be contacted at mravallion@worldbank.org and dvandewalle@worldbank.org.

A Micro-Decomposition Analysis of the Macroeconomic Determinants of Human Development

Sylvie Lambert, Martin Ravallion and Dominique van de Walle[1]

Keywords: Human development, growth, inequality, Morocco, Vietnam

JEL: D31, I21, O15

[1] Lambert is with LEA-INRA and Paris School of Economics; van de Walle and Ravallion are with the World Bank, Washington DC. The research assistance of Silvia Redaelli is also gratefully acknowledged. The findings, interpretations and conclusions of this paper are those of the authors and should not be attributed to the World Bank, its Executive Directors, or the countries they represent.

1. Introduction

The challenge of reaching the Millennium Development Goals (MDGs) has renewed interest among donors, development agencies and developing country governments in the question of how much economic growth affects aggregate human development (HD) outcomes, and what role is played by other factors, such as changes in income inequality.[2] Understanding the extent and nature of that linkage can help inform efforts to monitor and forecast progress in raising aggregate human development attainments.

A large literature has focused on cross-country empirical relationships between average incomes and aggregate HD indicators such as school enrollments, literacy, life expectancy and infant mortality.[3] Unsurprisingly, attainments in basic health and education tend to be higher in higher income countries and (less obviously) economic growth tends to be accompanied by improvements in social indicators. Cross-country comparisons have also been used to try to assess the extent of "social inefficiency" in human development at given mean macroeconomic and fiscal aggregates.[4] The deviations of education and health indicators from their expected values at given mean incomes (and/or social spending) have been used to infer differences in the efficiency of human development efforts within countries.

There is considerable uncertainty about how this empirical relationship between aggregate indicators of human development and mean incomes should be interpreted when

---

[2] The MDGs are a commitment by the United Nations to achieve a set of poverty and human development targets by 2015. For further details see http://www.un.org/millenniumgoals/ .

[3] A partial list of contributions to the large literature on the cross-country relationship between average incomes and average human development attainments includes Anand and Ravallion (1993), Aturupane et al., (1994), Bhalla and Glewwe (1986), Bidani and Ravallion (1997), Kakwani (1993), Moore et al., (1999), Pritchett and Summers (1996), Ranis et al., (2000), Sen (1981, 1988), UNDP (1996), World Bank (1993), WHO (1999, 2000).

[4] Examples include Evans et al (2000, Gupta and Verhoevan (2001), Jayasuriya and Wodon (2003), Moore et al (1999), UNDP (1996), World Bank (1993), WHO (1999, 2000), Wang et al (1999). Ravallion (2005) reviews the literature using cross-country comparisons to infer "social efficiency."

discussing human development policy, including progress toward the MDGs. Is it that higher average income allows a society to buy goods and services that promote health and schooling? Or does the empirical relationship found in cross-country comparisons stem from a correlation between average incomes and other country characteristics?[5] Can the cross-country relationship be relied upon in drawing inferences about the macroeconomics of human development in any specific country, or the performance of that country relative to another? The answers to these questions are left begging when the cross-country relationship between aggregate HD outcomes and mean income is used to predict the impacts of future growth (or the income growth needed to attain specific HD targets) or to assess country performance at a given mean income. Indeed, given the uncertainties about what "mean income" is really capturing in cross-country regressions for HD outcomes, and the high level of aggregation in the conditional means based on cross-country regressions, it can hardly be little more than a leap of faith to believe that this approach can tell us something useful about how economic growth in any specific country setting will impact on human development.

There is also a large body of work exploring some of these issues using micro data.[6] Typically household or individual level data on health or education attainments are regressed on a range of individual and household variables, including income or wealth indicators. This body of micro work has been a rich source of knowledge about the micro determinants of human development attainments. However, the specifications used and the analytics have not allowed this literature to effectively explore the implications for the aggregate relationship between human development attainments in a country and economic growth, the distribution of income,

[5] For example, Anand and Ravallion (1993) argue that what might really be driving the relationship is that richer countries tend to have lower income poverty and/or higher public spending on health and education, and it is these channels that hold the key lessons for policy.

and non-income factors. What is needed is a set of tools for consistently aggregating the empirical micro relationships to throw light on the macroeconomics of human development.

This paper aims to help bridge this gap, by developing and implementing a micro-based decomposition method for investigating the proximate determinants of aggregate human development outcomes. The aim is to measure the relative importance of growth in mean incomes versus changes in the distribution of income and "non-income" characteristics of the population, such as maternal schooling. In essence we provide a growth-redistribution decomposition method for HD indicators analogous to the widely used Datt-Ravallion (1992) decomposition for poverty measures. However, in the latter case there is a precise mathematical link between the measure of poverty and the mean and distribution. That is not the case with HD indicators, which makes the decomposition a more difficult task. In investigating income distributional impacts on human development we use non-parametric regression methods for the HD indicators. This allows a high degree of flexibility in representing the underlying non-linearity in the micro relationship between human development attainments and household incomes, so as to estimate the decomposition. The modeling and decomposition methods developed in this paper are available in a user-friendly STATA program.

As empirical applications, we use our decomposition method to study the proximate determinants of changes over time in schooling attainments and the inter-group disparities in schooling found in two developing countries. In the context of schooling, there are reasons to think that both mean income and its distribution will matter to aggregate outcomes given the likely nonlinearities involved (whereby marginal income effects on HD outcomes are likely to be lower the higher the level of income). However, past research on micro data has also pointed to

---

[6] For a survey see Strauss and Thomas (1995). Recent examples of micro approaches to studying HD outcomes include Bhargava (1999), Filmer and Pritchett (1999), Glewwe and Jacoby (1998).

the importance of a wide range of "non-income" characteristics, including characteristics of the household (such as parental education, number of siblings, demographics, ethnicity, household inputs), provider characteristics (such as their quality, distance, relevance of the curriculum, gender of teachers, availability of latrines etc) and geographic characteristics (such as average consumptions and consumption inequality within the area of residence and the provision of schooling facilities). Our proposed modeling method will allow for a potentially wide range of such non-income characteristics, all of which are potential correlates of incomes, which may well account in part at least for the "macroeconomic" income effect evident in aggregate data.

While a primary aim of the paper is to provide a new methodological tool that will allow a deeper micro-based understanding of the macroeconomic determinants of HD outcomes, the results of the case studies will be of interest in their own right. The specific case studies focus on school enrollments for boys and for girls in two rather different country settings, namely Morocco and Vietnam. These countries were chosen both because of the differences in their growth and HD performances over the 1990s and because suitable survey data are available for our purposes.

2. Empirical model

Our aim is to decompose differences in average schooling attainments between groups, which could be different regions or countries, different population groups such as gender or ethnicities or different dates. In setting up the decomposition we want to explicitly identify a component attributed to average consumption and one attributed to consumption inequality. To isolate the latter we need a suitably flexible nonlinear representation of how schooling varies with consumption.

The probability (S_{ij}) of being in school for child *i* in group *j* with characteristics x_{ij} and income y_{ij}, is given by the following model:

$$S_{ij} = \alpha_j + \phi_j(y_{ij}) + \pi_j x_{ij} + \nu_{ij} \tag{1}$$

where ν_{ij} is a zero-mean error term with variance σ_ν^2. All that we assume about the function ϕ is that it is smooth and single valued; in particular, its first derivatives are bounded by constants, $c \geq |\Delta\phi(y)|/|\Delta y|$. The function need not be monotonic, or take any parametric form. The vector x_{ij} includes both family and geographic characteristics, and the latter include both the mean consumption of the area of residence and the inequality of consumption in that area.

For large group sizes we can treat the consumption distribution as continuous, and let $F_j(y)$ denote the distribution function of consumption in group *j*. Let:

$$\bar{\phi}_{jk} \equiv \int_0^1 \phi_j(y) dF_k(y) \tag{2}$$

(So when *j*=*k* we get the mean of $\phi_j(y_{ij})$ across all *i*.) The expected value of the school enrollment rate for group *j* is:

$$\bar{S}_j = \alpha_j + \bar{\phi}_{jj} + \pi_j \bar{x}_j \tag{3}$$

The enrollment gap is $1 - \bar{S}_j$. The latter can be exactly decomposed as:

$$1 - \bar{S}_j \equiv 1 - \phi_j(\mu_j) + I_j - \alpha_j - \pi_j \bar{x}_j \tag{4}$$

where μ_j is the mean consumption of group *j* and

$$I_j \equiv \phi_j(\mu_j) - \int_0^1 \phi_j(y) dF_j(y) \tag{5}$$

is the contribution of consumption inequality to the aggregate enrollment gap.

To estimate the model in (1) we draw on the literature on partial linear models (as reviewed in Yatchew, 1998).[7] All observations are ordered in terms of their consumption values. Differences are taken between the data for successive ranked observations, giving the regression:

$$\Delta S_{ij} = \Delta\phi_j(y_{ij}) + \Delta x_{ij}\pi_j + \Delta\nu_{ij} \tag{6}$$

where Δx_{ij} is the difference between the values for the *i*'th observation and that for *i*-1 when ranked in ascending order of *y*. Under our assumption about the function ϕ, the first term on the RHS vanishes as the sample size goes to infinity ($\text{plim}[\phi_j(y_{ij}) - \phi_j(y_{i-1,j})] = 0$). So the following parametric regression can be estimated by least squares:

$$\Delta S_{ij} = \Delta x_{ij}\pi_j + \Delta\nu_{ij} \tag{7}$$

To estimate the functions $\phi_j(.)$, we can then estimate the non-parametric regression:

$$S_{ij} - (x_{ij} - \bar{x}_j)\hat{\pi}_j = \phi_j(y_{ij}) + \nu_{ij} \tag{8}$$

Finally, we estimate the constant terms in the usual way by forcing the estimate of (1) through the mean points, so $\hat{\alpha}_j = \bar{S}_j - \bar{\hat{\phi}}_{jj} - \bar{x}_j\hat{\pi}_j$ where $\bar{\hat{\phi}}_{jj}$ is the sample predicted value of $\phi_j(y_{ij})$.

Higher-order differencing allows efficiency gains in this method (Yatchew, 1998). We re-write (8) as:

$$\sum_{k=0}^{m} d_k S_{i-k,j} = (\sum_{k=0}^{m} d_k x_{i-k,j})\pi + \sum_{k=0}^{m} d_k \nu_{i-k} \tag{9}$$

where $\sum d_k = 0$ (which allows us to drop the non-parametric effect from equation 6) and the normalization condition $\sum d_k^2 = 1$ (which assures that the transformed residuals have variance σ_ν^2). Hall et al., (1990) provide the optimal weights up to *m*=10.

[7] We have used the PLREG program for STATA by Lokshin (2006).

3. Decomposition

Our purpose is to explain the difference in average schooling attainments between two groups, indexed *j* and *k*. As is typically the case in decompositions, the values taken by the components are measured in terms of some reference group *r*. In many applications, it will be natural to treat one of the groups *j* or *k* as the reference (or "base"). That is what one would normally do in assessing changes over time between two survey dates, in which case the base date is typically chosen as the reference. However, when there are more than two dates, or there is a third group that is of interest (for example, the reference group might be a sub-group of people at one date who have already attained the MDG), one can allow the reference group to be different to either comparator. In general, the values taken by each component will depend on the choice of reference; how much that choice matters is an empirical question.

The proposed decomposition for the difference in means between the two groups is:

$$\overline{S}_k - \overline{S}_j = G^r_{jk} + R^r_{jk} + N^r_{jk} + M_{jk} \tag{10}$$

The four components of the decomposition are defined as follows:

(1) Growth (G^r_{jk}) : the contribution of the difference in mean consumption between group *j* and group *k* using group *r* as the reference; this is given by:

$$G^r_{jk} \equiv \phi_r(\mu_k) - \phi_r(\mu_j) \tag{11}$$

For example, if the groups are two dates, *t* and *t*+1, and the reference is the base date (*t*) then:

$$G^t_{t,t+1} = \phi_t(\mu_{t+1}) - \phi_t(\mu_t) \tag{12}$$

Notice that $G^r_{jk} = 0$ if and only if $\mu_k = \mu_j$ and that (for $\phi'_r(.) > 0$) a positive (negative) value of G^r_{jk} implies growth (contraction) in mean consumption. While these properties hold for any

reference group, choice of the latter will affect the quantitative magnitude of G^r_{jk}. The growth component can be thought of as the "pure" effect of economic growth, holding distribution, non-income factors and the model's parameters constant.

(2) Redistribution (R^r_{jk}): the contribution of changes in the distribution of consumption using group *r* as the reference. Recall that the contribution of inequality to the level of mean schooling is measured by the difference between the expected value of the ϕ function and its value at the mean consumption. The redistribution component is then the inter-group difference in the contribution of inequality, namely:

$$R^r_{jk} \equiv \overline{\phi}_{rk} - \overline{\phi}_{rj} - [\phi_r(\mu_k) - \phi_r(\mu_j)] \tag{13}$$

The properties of this component depend on the curvature of the ϕ function and how the distribution of consumption changes. Suppose that distribution *k* is obtained from *j* by a mean-preserving redistributions in favor of the poor and that ϕ_r is strictly concave (convex); then by standard properties of concave functions, R^r_{jk} must be positive (negative).

(3) Non-income factors (N^r_{jk}): this is the contribution of differences in mean non-income characteristics:[8]

$$N^r_{jk} \equiv \pi_r(\overline{x}_k - \overline{x}_j) \tag{14}$$

This will be recognized as the "characteristics" component of the Blinder-Oaxaca decomposition (Blinder, 1973; Oaxaca, 1973), although strictly *N* as defined here is only that sub-component not attributed to incomes. Plainly, if $\overline{x}_k = \overline{x}_j$ then $N^r_{jk} = 0$.

[8] The vector *x* can include geographic effects of (*inter alia*) local-level average income and inequality.

(4) Structure (M^r_{jk}): this component arises from any structural differences in the model for outcomes between groups *j*, *k* and the reference *r*.[9] More precisely, the structure component is given by:

$$M^r_{jk} \equiv \bar{\phi}_{kk} - \bar{\phi}_{rk} - (\bar{\phi}_{jj} - \bar{\phi}_{rj}) + \alpha_k - \alpha_j + (\pi_k - \pi_r)\bar{x}_k - (\pi_j - \pi_r)\bar{x}_j \qquad (15)$$

The structural term can be thought of as the aggregate contribution of all group-specific attributes that determine the model's functional form (both parametric and non-parametric) for each group. When one is comparing different dates, economy-wide institutional changes will yield a structural component in the change in aggregate HD outcomes. When comparing different groups at one date, the structural term will reflect differences in how the economy and society as a whole at that date influence the group-specific functional form. For example, if there is factor-market discrimination against one group (an ethnic minority) then this will show up as model heterogeneity.

Notice that separately identifying *N* from *M* requires that the covariates are identical between the models for *j* and *k*. When the models are different (such as due to a comparability problem between the two surveys) one can only estimate *N*+*M*.

The "growth" and "redistribution" components we identified above can be thought of as "internal" effects at household level, meaning that they are derived from the direct household-level income effect. In principle, we can also allow for "external" effects operating through geographic effects on HD outcomes. For example, an internal effect would stem from the effect of a higher income on household-level purchases of inputs to schooling. Independently of this,

[9] This is a nonlinear generalization of the usual "structure" term in the Blinder-Oaxaca decomposition.

there may be an external effect such as when growth in the local region leads to better schools. In our decomposition, these external effects are here identified as "non-income" factors (*N*).

4. Case studies for Morocco and Vietnam

The 1990s in Morocco is an interesting period for implementing the decomposition and studying the proximate determinants of changes in enrollment outcomes. Morocco has long been singled out for its poor social indicators given its per capita income levels (about 1200 USD per capita in 1998 and1700 USD per capita in 2005 in nominal terms). Concerns have especially been expressed about Morocco's severely unequal education outcomes as reflected in large urban/rural differentials and a substantial gender gap. There were improvements during the 1990s, reflecting increased social spending and targeted special programs aimed at improving standards of living and redressing regional disparities. These efforts focused on education, but also on health, electrification and drinking water.

Statistics for the late 1990s indicate a rise in net primary enrollment rates from 58 percent in 1990 to 70 percent in 1998, and a rise in the gross enrollment rate from 63 to 85 percent over the same period. Some of the progress occurred for girls in rural Morocco as evidenced by a concomitant change in their net primary enrollment rate from 28 to 47 percent. And the most recent statistics indicate that Morocco achieved 92 percent net primary enrollment rates (89% for girls) for the school year 2002/03.

Improvements in primary enrollment and other social indicators coincided with a series of devastating droughts and poor economic conditions during the 1990s. Slow economic growth, especially in rural areas, resulted in a rise in income poverty from 13.1 percent of the population in 1990/91 to 19 percent in 1998 (and 18 to 27 % in rural areas). During the same period, consumption inequality remained stable at a fairly high level (a Gini of 0.39 is reported in World

Bank, 2001). Furthermore, despite recent amelioration in primary schooling and other social outcomes, Morocco's social indicators (including enrollments in post-primary schooling) still lag significantly behind that of other countries in the region with similar levels of income.

The generally poor past state of education outcomes and low school enrollments are variously explained by poverty, cultural attitudes towards women's roles, poor access and quality of educational facilities and parents' general pessimism about schooling's net rewards. A recent review of the education system shows that as recently as 1998, less than 45 percent of Douars (rural communes) had a primary school, for about 25% a facility existed only over 2 km away, while 6 percent provided no possibility of schooling at all. 80 percent of the rural primary school facilities did not have running water and 87 percent were without electricity (Commission Spéciale Education Formation 1999). Of course, access is even worse for higher levels of schooling.

The 1990s saw rapid urbanization in Morocco. In 1994, for example, the annual urban population growth rate was 3.6 percent compared to 0.7 percent in rural areas, where the fertility rate is nevertheless twice as high. 46 percent of the population remains rural. Urbanization is driven largely by rural migration. Many of these migrants are illiterate and enter low wage, low return informal sector activities. A new phenomenon in the Moroccan economy was a surge in women's labor force participation starting around 1993. This reflects migration of rural women who had previously worked on the family farm (and were thus not counted as participating in the labor market) caused by a series of severe droughts in 1992, 93 and 95 (World Bank 1997).

A study of the incidence of public education spending based on the 1998/99 Morocco Living Standards Survey (MLSS) (discussed in section 5) finds that spending on the first 6 years of primary schooling is relatively pro-poor, in that, with the exception of the poorest decile, the

next lowest five deciles receive the largest subsidy amounts when expressed on a per capita basis. The bottom decile gets around the same as the seventh. Given the less than universal enrollments and the lack of a private schooling option, these results would seem to be driven by the higher share of school aged children in the poorer groups.

Vietnam presents a very different situation. In stark contrast to Morocco, Vietnam experienced a dramatic reduction in income poverty in just 5 years during the 1990s from 58 percent of the population in 1993 to 37 percent in 1998 (Government- Donor –NGO Working Group, 1999). In rural areas, where 90 percent of the population lives, poverty fell from 66 to 48 percent during the same period. Rapid economic growth, accompanied by only a small increase in inequality — the Gini of consumption expenditures rose from 0.33 in 1993 to 0.35 in 1998 — underlies this trend. It should be noted that the rise in inequality is from a very low base and is primarily attributed to an increase in inequality between urban and rural areas (Glewwe et al. 2000).

Social indicators have also improved during this period. In the education area, primary school enrollment rates, already high as a result of the communist regime's emphasis on education, increased from 87% to 91% for girls and from 86% to 92% for boys. More dramatic gains were found for lower secondary enrolment rates, which doubled to 61% for girls and to 62% for boys. Upper secondary enrollment rates have likewise increased substantially. Yet, these high enrollment rates and the lack of a gender gap hide the fact that there are still regions — primarily mountainous and more isolated areas — and groups of people — primarily ethnic minorities — that are particularly disadvantaged in term of access and quality. Ethnic minority children account for half of the children not in school. Enrollments also tend to rise with household consumption expenditures, and increasingly so at higher schooling levels. Glewwe

and Jacoby (2004) have shown that there is a strong wealth effect in education. Households complain of high costs, low quality and low relevance of the curriculum. Existing policies such as fee exemptions for the poor and ethnic minority children have low coverage and have been found to account for only a small share of total household outlays on schooling (Behrman and Knowles 1999, Nguyen 1999 and van de Walle 2004).

5. Data

Both Morocco and Vietnam have living standards surveys that were implemented with World Bank assistance for two dates during the 1990s. These are nationally representative, household consumption expenditure surveys that also collect information on various other aspects of living standards including health, education, work and migration. We use the Morocco Living Standards Survey (MLSS) rounds of 1990/91 and 1998/99. 3323 households were interviewed in the first round and 5131 in the second. In the case of Vietnam, the data come from the Vietnam Living Standards Surveys (VLSS) of 1992/93 and 1997/98, covering about 4,800 and 6000 households respectively (World Bank 1995 and 2000). In both countries, the surveys are comparable across the two years and sufficient information on school attendance, household and community level variables is available. These are fairly comprehensive data sets, which will allow us to include a potentially wide range of controls.

Our aim is to keep the analyses as similar as possible for the two countries and yet allow for some fundamental institutional and circumstantial differences between them. In some cases, we are also limited by the differences in the datasets. We created two individual level files of children aged 6 through 11, and 12 through 18 for Vietnam (respectively containing 3328 and 3100 observations in 1993, and 3289 and 4042 observations for 1998). Six is the official primary school starting age and indeed, some 66 % of children were in school at that age in

1993, and 83 % in 1998. The first file is expected to cover primary school aged children pretty well. The second group covers all of secondary school and possibly vocational training. Given high enrollment rates and larger changes over time for this second group, we felt that it would be a good idea to look at this extended age group rather than limit it to lower or upper secondary school ages. But, this decision is somewhat arbitrary. The sample includes all children who live in the household (regardless of whether they are siblings or the children of the head), as well as children who do not reside in the household but whose parents do.

For Morocco, the size and cut-off points of the groups are different given the different schooling profile. The two sub-samples are for children aged 7 to 12 (containing 2576 observations in 1991 and 3637 in 1998) and 13 to 15 (1239 observations in 1991 and 1860 in 1998), the ages corresponding to the legal age ranges for attending primary and lower secondary school respectively. In 1991, no child below age 7 attends school in the data and in 1998, only 15 do. We drop them from the sample. In the Morocco database, we include only children of the head of household who also reside in the household as the questionnaire did not collect sufficient information on non-residents.

The schooling indicator we use as the dependent variable is enrollment defined as whether a child is currently in school or not. There are many other potential schooling indicators that could be used. We did repeat all the calculations using years of schooling as a proportion of the maximum possible years, calculated as the number of years of schooling divided by age minus 6 for Morocco, and minus 5 for Vietnam. Results were qualitatively very similar and hence, are not reported.

As noted in Section 2, the explanatory variables (which it will be recalled enter linearly) include individual, household and geographic (or community) characteristics. Child

characteristics include specific age dummies, gender, and birth order which is calculated over all children aged 18 and under in each household. For Vietnam we also include a dummy for whether the child is the head's child. At the household level we include log consumption per capita, log household size, demographic composition (shares by age group), the gender of the head and dummies for urban and regional location. For Vietnam we enter the father and mother's age, age squared and total years of education; for Morocco, we have age and age-squared only for the father, and education for both the father and mother is measured as dummy variables for various attainment levels rather than years. In addition, for Vietnam we include a dummy variable for whether the head is from an ethnic minority, a group that tends to be poorer and less likely to be schooled. In Morocco we bring in controls for migration (whether the father has lived somewhere else for the last 12 months, whether he was born in the current residence and number of years father has been living in the current residence). Geographic variables consist of the mean consumption and inequality (as measured by the mean log deviation of consumption per person) of the community of residence, as well as distance to school.

Consumption is believed to be measured well in the living standards surveys. It incorporates the value of own production and the imputed value of housing expenditures, and is expressed in real 1998 prices. The reference used is January of 1998 for Vietnam and 1998 for Morocco. We will also test a measure of predicted expenditures which we calculate using the parameters of a regression of actual consumption on a wide array of household level characteristics that are likely to influence household consumption.

Using these data we will calibrate the regression models described above and implement the decompositions. We begin by studying the change in school attainments over time, both in the aggregate and by gender. Next we present a cross-sectional comparison of the sources of the

differences in schooling between urban and rural areas. We then concentrate on other decompositions, specific to each country, namely ethnicity in Vietnam and parents' literacy in Morocco.

6. Results

Table 1 gives some descriptive statistics. School enrollment rates have risen over time in both countries, but are appreciably higher in Vietnam. Real consumption per person rose appreciably over the period in Vietnam (a growth rate of 5.8% per annum), but fell in Morocco. Inequality remained stable in Morocco while it rose in Vietnam, though the change in the Gini index appears to be small.

Figure 1 gives the non-parametric regressions on log consumption per person for each country at both dates. We see that the expected concave relationship is generally evident.[10] In Vietnam in particular, there is notably more non-linearity for the primary school level so we expect distribution to matter more for the lower grades there. This is also true for Morocco, though less so. (The detailed regression results can be found in a Statistical Addendum available from the authors.)

We begin with the decomposition of changes over time in school enrollments for boys and girls, as can be found in Table 2. We give results for both primary and secondary school age groups (these are based on age groups rather than the actual level of school attended) and using both the initial and final years as the base. The choice of reference turns out to matter little in this case and we will focus the discussion on the results for the initial year. (Later we give an example where the choice of reference matters more.)

[10] Note that concavity of ϕ in y does not require that the non-parametric regression function is concave in $\ln y$.

In Morocco, we see that in 1991, 61% of children (53% of girls and 71% of boys) aged 7-12 were enrolled in school. By 1998 this had risen to 76%. Given that there was only modest change in mean income or their distribution, it is not too surprising that the bulk of the gain in enrolments in Morocco over this period is attributed to the structural and non-income factors. However, dominance of the structural component is striking. Of the 15% point increase in the enrollment rate, non-income factors account for 4% while the changes over time in the model's parameters — the structure component — accounted for11%. The "pure" effect of the (negative) growth in mean consumption was to reduce enrolments; in other words, a distribution-neutral growth process with no other changes (in inequality, other "non-income" covariates, or in the model's parameters) would have decreased the enrollment rate to 60% in 1998 (down from 61% in 1991), as compared to the actual figure in 1998 of 76%. Changes in distribution account for almost none of the increase in the enrollment rate.

The quantitative importance of the structural component is evident in Table 2 in all the decompositions, for both countries. The (large) increase of 37% points in the school enrollment rate for Morocco in the 13-15 age group is nearly entirely due to this component. It is worth noting that some children in this age group are likely to be enrolled in primary school despite being of secondary school age. In fact, given that children frequently enter school after age 6, many may remain in primary school past the theoretical age. While the attribution of the structural component is unclear, its pronounced effect on schooling is at least consistent with the policy effort made by Morocco towards education during this period. These efforts, which included the provision of new school infrastructure are likely to have played a major role (as discussed in Section 4).

In Vietnam, economic growth naturally played a more important role, but even here too

the structural component turns out to be the dominant factor (Table 2). The importance of the structural component suggests behavioral changes that could be a sign of the success of the efforts to promote education made in both countries during this decade.

Urban-rural comparisons naturally figure prominently in a developing country context. We provide two sets of such decompositions. In Table 3 we decompose the change over time in the school enrollment rate separately for urban and rural areas of both countries. At the primary-school age, there was only a small increase in the enrollment rate in urban areas of either country, which reflects the high initial base. Here again structure plays the main role. It also played an important role in accounting for the (much larger) gains seen in the primary-school enrollment rate for rural areas, notably in Morocco where it dwarfs the strong negative effect of the growth component, which reflects the sharp decline in real consumption witnessed by rural areas. While our cautionary note on attribution remains, the structural component is at least consistent with the policy emphasis put on increasing access to schooling in rural areas during the 1990s (for example through rural school construction, and also programs targeted towards rural girls). At the secondary level, economic growth accounted for a large share (about two-thirds) of the increase in the enrollment rate in urban Vietnam, but was secondary to the structural component in rural areas.

As is evident in Table 3, there are large urban-rural disparities in schooling in both countries, though more so in Morocco. Figure 2 gives the non-parametric regressions on log consumption per person separately for the urban and rural areas in 1998. Here non-linearities are also more pronounced for the lower grades in the rural areas of both Morocco and Vietnam, but only for the urban areas of Vietnam in the case of enrollments beyond the primary level.

Table 4(a) decomposes the urban-rural differences found in 1998, using rural areas as the

reference. The large disparity in primary school enrollment rates between urban and rural areas of Morocco — an urban enrollment rate of almost 91% as compared to 60% in rural areas — is largely attributed to the role of non-income factors. The (non-negligible) differences in mean consumption between urban and rural areas are clearly not the reason for the difference in schooling outcomes in Morocco. Indeed, the growth component turns out to be negative (though small); this is because the function ϕ for rural areas (the reference) turns out to be negatively sloped in the relevant interval (between the urban and rural means), see figure 2. By contrast, for urban areas, the function is positively sloped in the relevant interval. So this illustrates the potential sensitivity to the choice of reference.

To illustrate more precisely, Table 4(b)[11] gives the results using urban areas as the reference. Now we see that the higher mean consumption in urban areas contributes to the (now negative) difference in school enrollments between urban and rural areas of Morocco, but now the structural component is dominant. In this case the apportionment of the total difference between the non-income and the structural factors is found to be highly sensitive to the choice of reference, although the aggregate of these two components (N+M) is affected rather little. This reversal might be due to the fact that the linear regression on non-income factors explains as little as 4% of the variance in school enrollment in 1998 for urban areas, while it explains 15% of the variance in rural areas (see Addendum, table A12). Hence, when urban areas are used as the reference, the decomposition hardly captures any of the changes due to non-income factors, while everything is captured by the structural component that plays a residual role here. In Vietnam, at the secondary school level, the growth component is by far the most important component of the decomposition, and this remains true when we change the reference.

[11] To render results directly comparable between the two panels of Table 4, results in panel (b) have been multiplied by -1.

In Table 5 we apply the decomposition method to the (sizeable) ethnic group disparities in schooling found in Vietnam, while in Table 6 we give the corresponding decompositions over time for each ethnic group. In 1993, the primary-level school enrollment rate for minorities was 23% points lower than for the majority ("Kinh") group.[12] The enrollment rates for both groups rose over time, and the gap narrowed appreciably to about 15% points (Table 5). At the earlier date we find that over half of the gap in the primary-school rate is accountable to the difference in mean consumption between the Kinh and the (poorer) minorities; the proportion is higher for boys than for girls. The difference in distribution tended to narrow the gap. Non-income factors accounted for as high a share as the difference in mean consumption. This pattern changed noticeably by 1998. The non-income differences between the two ethnic groups continue to play an important role, but the difference in mean income is no longer an important factor in accounting for the difference in school enrollment rates at the primary level. However, this has switched to the higher ("secondary") age group. For this group, the non-income factors work in the opposite direction — reducing the enrollment gap. From Table 6 it can be noted that the share of the growth component in explaining changes over time for each group is larger at the primary level in the case of the minority group than for the majority, while the reverse is true for the secondary level. This suggests that the positive impact of growth benefited all groups, but that since the Kinh were already close to full primary enrollment, for them all of the improvement is concentrated on the secondary level.

Finally, in Tables 7 and 8, we give the results for a decomposition of the disparities in

[12] The majority ethnic group comprises the Kinh and the Han Chinese. In 1993, our data includes 2833 and 2711 majority group 11 to 16 and 12 to 18 year olds, respectively, while the numbers for 1998 are 2729 and 3473. The ethnic minorities represent all 52 other ethnic groups and account for 486 and 380 observations in 1993, and 551 and 560 observations in 1998 for the primary and secondary aged groups respectively.

enrollments between children whose father is literate and those whose father is not in Morocco. In 1991, the enrollment rate of primary school aged children with illiterate fathers was 25 percentage points below the enrollment rate for the other children. Table 7 shows that the role of the difference in average income between these two groups is quite important, notably for boys for whom it accounts for two-thirds of the difference at the primary school level in 1991. Interestingly, the weight of the growth component is vastly reduced in 1998 at the primary level, but not at the secondary level. This could well reflect the fact that the aforementioned policy efforts were mainly concentrated on bridging the enrollment gap at the primary level. The large increase in the difference in school enrollments for children of secondary school age[13] between the two years suggests that children of literate fathers were better able to reap the benefits of increases in secondary schooling opportunities. Here, the weight of the difference in average income in accounting for this result is fairly important. The role of policy changes is reflected in Table 8 by the consistently dominant role played by structural factors in accounting for the change in enrollments over time for the two groups separately. Girls from literate parents seem to have particularly benefited from the structural changes over the 1990s.

We also tested the sensitivity of the decompositions in the above results to using predicted consumption per person, using x as a vector of instrumental variables, using the nonlinearity for identification.[14] The basic pattern of the results in Table 2 was affected little by this change. Table 9 gives examples, comparing selected decompositions for Vietnam from the previous tables with those based on predicted consumptions.

[13] The negative difference between the enrollment of secondary school age children having a literate father and those whose father is illiterate in 1991 is explained by the fact that the latter take more time to finish primary school (or enter school at an older age). This is still true in 1998 but it is massively compensated by the actual increase in secondary level enrollments of children with a literate father.

7. Conclusions

Changes in aggregate human development outcomes can be additively decomposed into four components: (i) a pure "growth" effect associated with differences in mean income; (ii) a redistribution effect attributed to differences in the distribution of income; (iii) "non-income" factors and (iv) a structural component reflecting any differences in the model parameters — the "human development returns" to income or non-income characteristics. The analytical complication over other decompositions (in the Blinder-Oaxaca tradition) is that to convincingly estimate the decomposition we have to use a flexible, non-parametric, representation of the economic gradient in human development outcomes across households. Non-parametric regression methods allow us to implement the decomposition proposed here, and we have programmed it in STATA.

In applying this decomposition tool to data for Morocco and Vietnam, we find that growth and distributional change have played only a modest role in the changes in school enrollments over time observed in both countries. There are a couple of notable exceptions to this generalization; in particular, growth emerges as the most important factor in the changes in higher level school enrollments in urban Vietnam and also for ethnic minority primary school enrollments. However, taken as a whole, our results for these two countries do not suggest that aggregate economic growth or changes in the distribution of income have played an important role. Nor did improvements in relevant non-income factors (such as parental education) account for much of the aggregate gains over time. Rather, the bulk of the changes observed over time are accountable to changes in the structure of the model linking these variables to schooling

[14] Since the model is inherently nonlinear the standard identification conditions for linear models do not strictly apply, although many researchers would probably prefer not to have to rely on the nonlinearity for identification.

attainments. As a generalization, structure is the dominant factor in the gains observed in school enrollment rates over time in both countries. This is generally the case nationally as well as within urban and rural areas, for each of the ethnic groups in Vietnam and the literate, illiterate groups in Morocco. Our decomposition cannot tell us what drives these structural changes, since they are economy-wide factors, but it is at least suggestive that there were substantial public policy efforts at increasing enrollments and that they were successful; increases in the overall economic returns to schooling may also have played a role, possibly helped by more widely-shared knowledge about those returns.

Possibly it is not too surprising that the distributional effect is so small in our case studies, since there wasn't much change in distribution in either country. Also, given the lack of growth in Morocco, it is not surprising that growth had so little impact. What is far more telling is the Vietnam case where there was considerable economic growth over the study period, and yet structure was still the dominant factor in the gains over time.

The results look very different when we use our decomposition tool to study the cross-sectional disparities in schooling between socio-economic or geographical groups. Then we find many cases in which structure becomes secondary to both differences in mean incomes and non-income factors and (though less often) to inter-group differences in the distribution of incomes. Differences in higher level enrollments between Vietnam's urban and rural areas are due largely to differences in mean consumption in 1998. In Morocco, on the other hand, non-income factors are dominant in explaining the urban-rural educational differences at both the primary and secondary levels. The disparity in mean consumption between Vietnam's ethnic minority and majority groups is a major factor in educational inequality, though the role of this economic inequality has shifted over time from primary to secondary schooling. Non-income factors also

play a big role here, increasing the gap for primary school enrollments at both dates, but reducing ethnic group differences in secondary enrollments in 1998. Finally, income differences also explain a large part of the enrollment gap between children with and without literate fathers in Morocco, although here too, non-income factors explain the largest part.

References

Anand, Sudhir and Martin Ravallion (1993). "Human Development in Poor Countries: On the Role of Private Incomes and Public Services," *Journal of Economic Perspectives,* 7, 133-150.

Aturupane, Harsha, Paul Glewwe and Paul Isenman (1994). "Poverty, Human Development and Growth: An Emerging Consensus?" *American Economic Review, Papers and Proceedings,* 84(2), 244-249.

Behrman, Jere and James Knowles, (1999). "Household Income and Child Schooling in Viet Nam," *World Bank Economic Review*, 13(2): 211-256

Bhalla, Surjit S., and Paul Glewwe (1986). "Growth and Equity in Developing Countries: A Reinterpretation of the Sri Lankan Experience," *World Bank Economic Review,* 1, 35-63.

Bhargava, Alok (1999). "Modeling the Effects of Nutritional and Socioeconomic Factors on the Growth and Morbidity of Kenyan School Children," *American Journal of Human Biology* 11, 317-326.

Bidani, Benu and Martin Ravallion (1997). "Decomposing Social Indicators using Distributional Data," *Journal of Econometrics,* 77(1), 125-140.

Blinder, Alan (1973). "Wage Discrimination: Reduced Form and Structural Estimates," *Journal of Human Resources* 8: 436-435.

Commission Spéciale Education Formation, (1999). "Regards sur le Système Education-Formation au Maroc: Réalisations, Problématiques, Dysfonctionnements," Rabat, Maroc.

Datt, Gaurav and Martin Ravallion. 1992. "Growth and Redistribution Components of Changes in Poverty Measures: A Decomposition with Applications to Brazil and India in the 1980s." *Journal of Development Economics*, 38: 275-295.

Evans, David B., Ajay Tandon, Christopher J.L. Murray and Jeremy A. Lauer (2000). *The Comparative Efficiency of National Health Systems in Producing Health: An Analysis of 191 Countries*. GPE Discussion Paper 29, World Health Organization, Geneva.

Filmer, Deon and Lant Pritchett (1999). "The Effect of Household Wealth on Educational Attainment: Evidence from 35 Countries," *Population and Development Review*, 25(1):85-120.

Glewwe, Paul, Michele Gragnolati, Hassan Zaman (2000). "Who Gained from Vietnam's Boom

in the 1990s? An Analysis of Poverty and Inequality Trends," Policy Research Working Paper 2275, World Bank, Washington, D.C.

Glewwe, Paul and Hanan Jacoby, (1998). "School Enrollment and Completion in Viet Nam: An Investigation of Recent Trends," in: D. Dollar, P. Glewwe and J. Litvack (eds) *Household Welfare and Vietnam's Transition*, World Bank Regional and Sectoral Studies, World Bank, Washington, D.C.

Glewwe, Paul and Hanan Jacoby, (2004). "Economic Growth and the Demand for Education: Is there a Wealth Effect?" *Journal of Development Economics*, 74: 33-51.

Glewwe, Paul and Jennie Litvack, (1998). "Provision of Health Care and Education in Transitional Asia: Key Issues and Lessons from Vietnam," WIDER Working Paper No. 147, WIDER, Helsinki, Finland.

Government of Viet Nam-Donor Working Group, (2000). "Annex C: Commune-Level Fees and Contributions," in *Viet Nam, Managing Resources Better: Public Expenditure Review 2000*, Joint Report on Public Expenditure Review, Volume 2, Hanoi.

Government- Donor –NGO Working Group, (1999). "Vietnam: Attacking Poverty," Vietnam Development Report 2000, Hanoi, Vietnam

Gupta, Sanjeev and Martijn Verhoeven (2001). "The Efficiency of Government Expenditure: Experience from Africa," *Journal of Policy Modeling* 23, 433-467.

Jayasuriya, Ruwan and Quentin Wodon (2003). *Efficiency in Reaching the Millennium Development Goals*, World Bank Working Paper No.9, World Bank, Washington DC.

Lokshin, Michael (2006). "Difference-Based Semiparametric Estimation of Partial Linear Regression Models," *STATA Journal* 6(3): 377-384.

Moore, Mick, Jennifer Leavy, Peter Houtzager and Howard White (1999). *Polity Qualities: How Governance Affects Poverty*, Poverty Research Programme, Institute of Development Studies, University of Sussex.

Nguyen, Nguyet Nga (1999). "Trends in the Education Sector during 1993-98." Background paper for the *Vietnam Development Report* 2000, World Bank.

Oaxaca, Ronald (1973). "Male-Female Wage Differentials in Urban Labor Markets," *International Economic Review* 9: 693-709.

Pritchett, Lant and Lawrence H. Summers (1996), "Wealthier is Healthier," *Journal of Human Resources* 28(2), 197-220.

Ranis, Gustav, Frances Stewart and Alejandro Ramirez (2000). "Economic Growth and Human Development", *World Development,* 28(2), 197-220.

Ravallion, Martin (2005) "On Measuring Aggregate 'Social Efficiency'," *Economic Development and Cultural Change*, 53(2):.273-92.

Sen, Amartya K., (1981). "Public Action and the Quality of Life in Developing Countries," *Oxford Bulletin of Economics and Statistics*, 43, 287-319.

_____, (1988). "Sri Lanka's Achievements: When and How?," in Srinivasan, T.N., and P.K. Bardhan (eds) *Rural Poverty in South Asia*, New York: Columbia University Press, pp. 549-56.

Strauss, John, and Duncan Thomas, 1995, "Human Resources: Empirical Modeling of Household and Family Decisions," in: J. Behrman and T.N. Srinivasan, eds., *Handbook of Development Economics*, Vol. 3 (North-Holland, Amsterdam).

United Nations Development Programme (UNDP) (1996). *Human Development Report.* New York: Oxford University Press.

van de Walle, Dominique, (2004). "The Static and Dynamic Incidence of Vietnam's Public Safety Net," chapter 6 in Glewwe, Agrawal and Dollar (eds) *Economic Growth, Poverty and Household Welfare: Policy Lessons from Vietnam*, World Bank Regional and Sectoral Studies, World Bank, Washington, DC., forthcoming.

van de Walle, Dominique and Dileni Gunewardena, (2001). "Sources of Ethnic Inequality in Vietnam," *Journal of Development Economics* 65: 177-207.

Wang, Jia, Dean T. Jamison, Eduard Bos, Alexander Preker, John Peabody (1999). "Measuring Country Performance on Health: Selected Indicators for 115 Countries," Health, Nutrition and Population Series, World Bank.

World Bank (1993). *World Development Report: Investing in Health*, New York: Oxford University Press.

World Bank, (1997). "Kingdom of Morocco: Growth and Labor Markets: An agenda." Report No. 16598-MOR. Volumes I and II: Main Report and Annexes, Washington, DC

World Bank (1995). "Vietnam Living Standards Survey (VLSS), 1992-93: Basic Information," mimeo, Research Development Group, World Bank, Washington, D.C.

World Bank, (2001). "Kingdom of Morocco: Poverty Update" Washington, DC.

World Bank, (2000). "Viet Nam Living Standards Survey (VNLSS), 1997-98: Basic

Information," mimeo, Research Development Group, World Bank, Washington, DC.

World Bank (2003). *World Development Indicators*, World Bank, Washington DC.

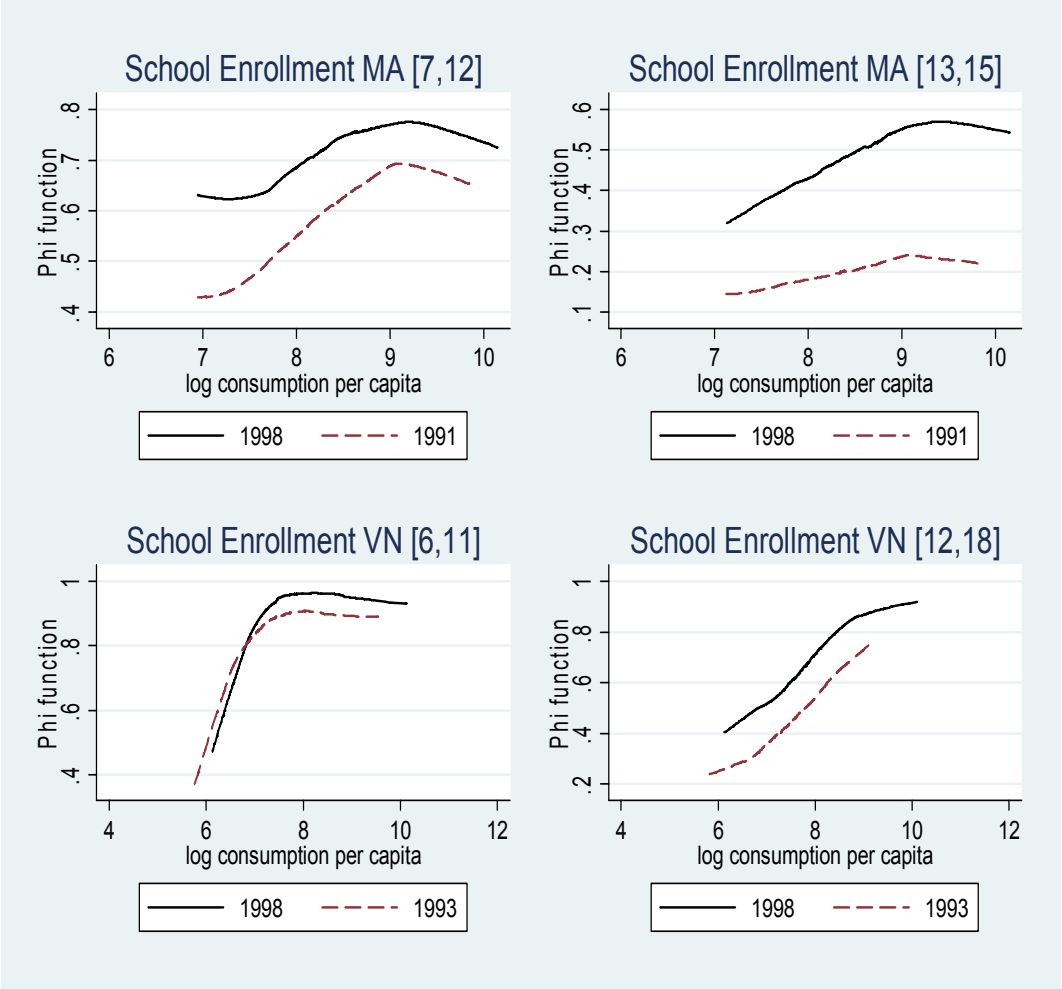
World Health Organization (1999). *The World Health Report: Making a Difference.* Geneva: World Health Organization.

_____ (2000). *The World Health Report: Health Systems. Improving Performance.* Geneva: World Health Organization.

Yatchew A., (1997). "An Elementary Estimator of the Partial Linear Model," *Economics Letters* 57: 135-143.

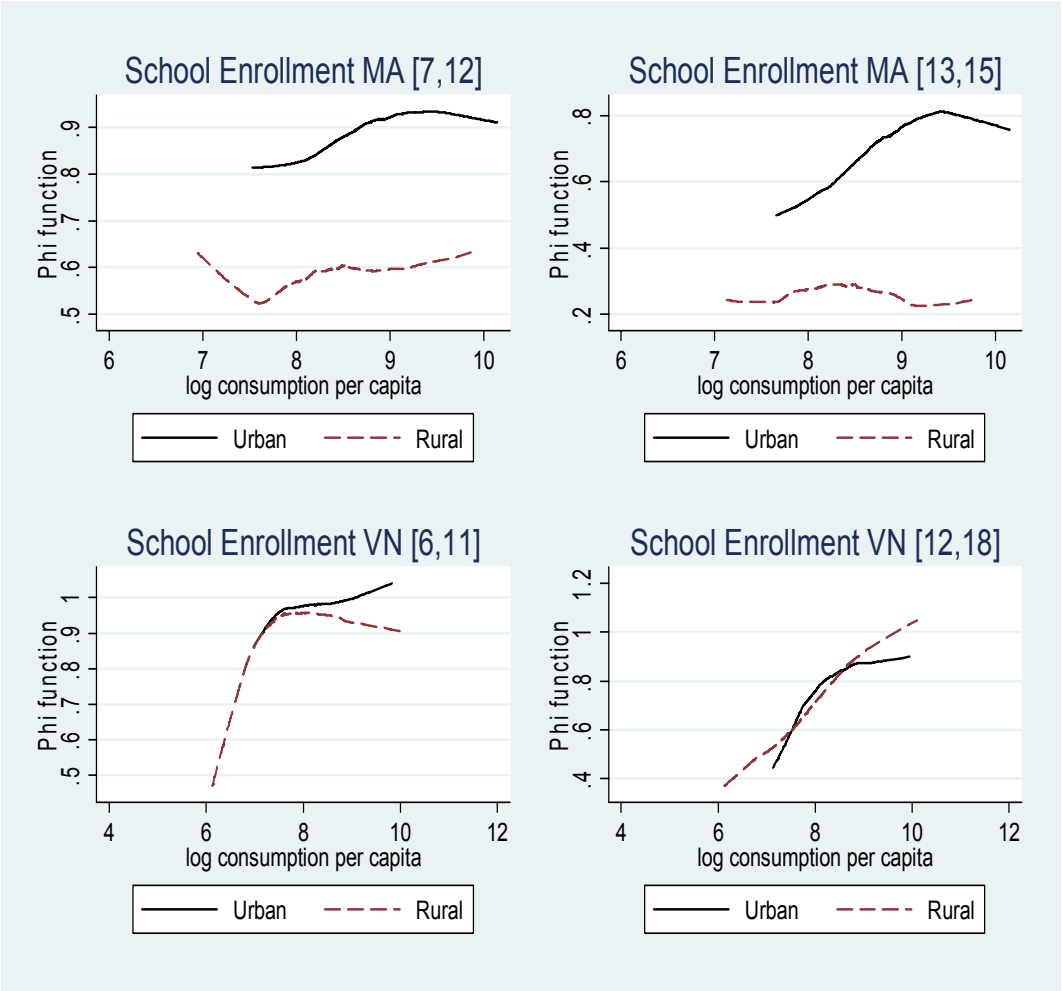
_____ (1998). "Nonparametric Regression Techniques in Economics," *Journal of Economic Literature* 36(June): 669-721.

Figure 1: Non-parametric regression functions in partial linear models for school enrollments in Morocco (1991 to 1998) and Vietnam (1993 to 1998) over time



Note: MA=Morocco; VN=Vietnam

Figure 2: Non-parametric regression functions in partial linear models for school enrollments in urban and rural areas for 1998



Note: MA=Morocco; VN=Vietnam

Table 1: Summary statistics for children and households with children

		Morocco			Vietnam		
		obs	Mean	St.dev.	obs	Mean	St.dev.
Enrollment rate ("primary" age group)	Date 2	3637	0.73	0.44	3289	0.93	0.25
	Date 1	2576	0.61	0.49	3328	0.87	0.34
Enrollment rate ("secondary" age group)	Date 2	1860	0.52	0.50	4042	0.65	0.48
	Date 1	1239	0.16	0.37	3100	0.43	0.50
Real household consumption per person, whole sample	Date 2	30457	8070.65	7627.93	39035	3027.52	2510.35
	Date 1	16741	8708.18	9780.29	26526	1960.07	1388.50
Real household consumption per person (urban areas),whole sample	Date 2	16715	10537.4	9118.98	9827	4993.45	3675.77
	Date 1	7181	12237.8	13020.7	5180	3041.86	2149.76
Real h'hold consumption per person (rural areas), whole sample	Date 2	13742	5070.28	3378.16	29208	2366.08	1462.43
	Date 1	9524	5959.78	4232.15	21346	1697.56	959.99
Real h'hold consumption per person, school age children sample	Date 2	5497	6324.90	4696.63	7331	2319.59	1682.77
	Date 1	3815	6905.48	5096.53	6428	1736.18	1079.07
Real h'hold consumption per person (urban areas), school age children sample	Date 2	2766	8292.99	5511.94	974	3918.05	2467.48
	Date 1	1563	9306.09	6077.86	925	2740.3	1574.73
Real h'hold consumption per person (rural areas), school age children sample	Date 2	2731	4331.58	2395.29	6339	2093.69	1395.74
	Date 1	2252	5239.34	3405.59	5485	1577.87	875.51
Gini index of real h'hold consumption per person, whole sample	Date 2	30463	0.40		39035	0.36	
	Date 1	16741	0.41		26526	0.31	
Gini index of real h'hold consumption per person (urban areas), whole sample	Date 2	16721	0,382		9827	0.35	
	Date 1	7181	0,413		5180	0.33	
Gini index of real h'hold consumption per person (rural) areas), whole sample	Date 2	13742	0,316		29208	0.29	
	Date 1	9524	0,316		21346	0.27	
Gini index of real h'hold consumption per person, school age children sample.	Date 2	5497	0.36		7331	0.31	
	Date 1	3815	0.36		6428	0.29	
Gini index of real h'hold consumption per person (urban areas), school age children sample	Date 2	2766	0.33		974	0.32	
	Date 1	1563	0.34		925	0.30	
Gini index of real h'hold consumption per person (rural areas), school age children sample	Date 2	2731	0.29		6339	0.28	
	Date 1	2252	0.30		5485	0.25	
CV of real household consumption per person	Date 2	5497	0.74		7331	0.73	
	Date 1	3815	0.74		6428	0.62	
Father's age	Date 2	5497	42.25	16.91	7331	39.44	7.55
	Date 1	3815	42.63	18.09	6428	39.01	7.70
Mother's age	Date 2	5497	39.89	8.16	7331	36.69	6.38
	Date 1	3815	39.78	8.68	6428	36.33	6.40
Father's education*	Date 2	5497	0.69	0.46	7331	7.23	3.47
	Date 1	3815	0.74	0.44	6428	6.20	3.72
Mother's education*	Date 2	5497	0.84	0.37	7331	6.23	3.63
	Date 1	3815	0.88	0.33	6428	5.81	3.78
Log household size	Date 2	5497	1.97	0.32	7331	1.75	0.28
	Date 1	3815	2.00	0.33	6428	1.81	0.29

Note: "Primary"=children 7-12 in Morocco and 6-11 in Vietnam; **: "Secondary"=children 13-15 in Morocco and 12-18 in Vietnam. First date is 1991 in Morocco and 1993 in Vietnam; second date is 1998 in both cases. Parent's education is measured by the share of mothers and fathers without any education in Morocco and by years of education in Vietnam. Consumption is expressed in thousands of real 1998 Vietnamese dongs for Vietnam and in real 1998 Dirhams for Morocco.

Table 2: Decompositions for school enrollment changes over time for boys and girls

	Primary school enrollment rate* (%)			Secondary school enrollment rate** (%)		
	Girls + boys	Girls only	Boys only	Girls + boys	Girls only	Boys only
Morocco						
Baseline value (1991)	61.48	52.99	70.29	16.02	10.58	21.59
Total increase 1991-1998	14.77	15.62	13.06	37.48	36.23	38.65
Decomposition using initial year as reference						
Growth	-1.21	-1.18	-1.43	-0.05	-1.32	0.73
Redistribution	0.33	-0.05	1.1	0.03	0.98	-0.52
Non-income factors	4.24	5.75	2.09	1.40	-0.17	3.13
Structure	11.39	11.27	11.16	35.95	36.52	35.01
Decomposition using final year as reference (times -1)						
Growth	-0.39	-0.35	-0.28	-0.9	-1.65	-0.83
Redistribution	-0.05	-0.23	-0.22	0.31	1.12	0.02
Non-income factors	3.55	4.95	1.46	5.73	8.17	3.33
Structure	11.66	11.42	11.96	32.18	28.37	35.83
Vietnam						
Baseline value (1993)	86.54	86.86	86.52	43.29	36.61	50.10
Total increase 1993-1998	6.65	5.28	7.98	21.63	23.10	20.10
Decomposition using initial year as reference						
Growth	1.37	1.40	1.61	5.78	4.78	6.30
Redistribution	0.73	0.30	1.00	-0.69	-0.36	-0.99
Non-income factors	-0.10	0.28	-1.44	0.63	3.12	-1.85
Structure	4.54	3.16	6.64	15.72	15.10	16.84
Decomposition using final year as reference (times -1)						
Growth	1.63	2.12	1.09	6.59	6.31	6.88
Redistribution	1.39	0.47	2.37	-1.40	-1.26	-1.51
Non-income factors	0.67	1.85	0.08	2.61	4.55	0.54
Structure	2.84	0.71	4.27	13.65	13.05	14.40

Note: 1=enrolled, 0=not *: “Primary”=children 7-12 in Morocco and 6-11 in Vietnam; **: “Secondary”=children 13-15 in Morocco and 12-18 in Vietnam

Table 3: Decompositions for urban-rural differences over time for Morocco and Vietnam

	Primary school enrollment rate* (%)		Secondary school enrollment rate** (%)	
	Urban	Rural	Urban	Rural
Morocco				
Baseline value (1991)	87.87	43.31	18.25	14.50
Total increase 1991-1998	3.40	17.29	55.9	14.64
Decomposition (initial year as reference)				
Growth	-0.9	-2.94	0.42	0.45
Redistribution	-0.15	1.28	-0.52	-0.35
Non-income factors	1.75	-0.84	3.7	2.33
Structure	2.9	19.95	51.70	11.4
Vietnam				
Baseline value (1993)	95.22	85.10	60.43	40.29
Total increase 1993-1998	2.12	7.58	17.29	22.67
Decomposition (initial year as reference)				
Growth	1.10	1.86	11.17	4.15
Redistribution	0.66	0.63	-0.71	-0.17
Non-income factors	-1.13	0.21	0.08	1.77
Structure	1.57	4.81	5.97	17.06

Note: 1=enrolled, 0=not *: "Primary"=children 7-12 in Morocco and 6-11 in Vietnam; **: "Secondary"= children 13-15 in Morocco and 12-18 in Vietnam.

Table 4: Decompositions for school enrollment disparities between urban and rural areas in Morocco and Vietnam in 1998

(a) Rural areas as reference	Primary school enrolment rate* (%)			Secondary school enrolment rate** (%)		
	Girls + boys	Girls only	Boys only	Girls + boys	Girls only	Boys only
Morocco 1998						
Rural rate	60.59	48.47	72.55	29.15	17.53	40.39
Total difference (urban-rural)	30.68	40.91	20.49	45.00	54.08	37.04
Decomposition:						
Growth	0.37	-3.49	2.22	-2.85	-3.35	-4.72
Redistribution	1.73	2.81	1.31	2.49	3.15	4.07
Non-income factors	31.56	44.22	22.49	32.43	37.19	35.13
Structure	-3.34	-2.82	-5.70	12.70	16.92	2.15
Vietnam 1998						
Rural rate	92.68	91.41	94.23	62.96	56.68	69.27
Total difference (urban-rural)	4.66	6.52	3.39	14.76	22.09	8.47
Decomposition:						
Growth	0.13	-1.10	1.29	14.04	12.85	15.48
Redistribution	2.62	2.97	1.89	-1.83	-1.47	-2.18
Non-income factors	7.53	10.31	5.59	-5.54	6.96	-16.58
Structure	-4.83	-5.56	-4.37	6.79	2.42	10.56
(b) Urban areas as reference						
Morocco 1998						
Decomposition (times-1)						
Growth	5.29	6.08	5.40	12.89	12.90	14.16
Redistribution	-1.51	-1.68	-2.16	-5.34	-6.65	-6.63
Non-income factors	1.45	0.59	1.69	3.21	3.61	3.40
Structure	25.08	35.71	15.39	34.00	44.05	25.71
Vietnam 1998						
Decomposition (times-1)						
Growth	0.97	4.87	-1.14	12.26	15.10	12.00
Redistribution	1.22	-0.20	-0.36	-1.88	-3.53	-0.97
Non-income factors	3.54	-47.60	5.10	-2.81	-3.63	-4.71
Structure	-0.29	49.53	0.81	5.88	12.83	0.95

Note: 1=enrolled, 0=not *: “Primary”=children 7-12 in Morocco and 6-11in Vietnam; **: “Secondary”=children 13-15 in Morocco and12-18 in Vietnam.

Table 5: Decompositions for school enrollment disparities between ethnic majority and minority groups in Vietnam

	Primary school enrollment rate* (%)			Secondary school enrollment rate** (%)		
	Girls + boys	Girls only	Boys only	Girls + boys	Girls only	Boys only
Vietnam 1993						
Minority rate	66.87	68.44	66.67	34.74	29.21	40.93
Total difference (majority-minority)	23.14	21.62	23.58	9.82	8.53	10.67
Decomposition:						
Growth	12.85	10.60	14.56	2.07	-2.34	6.50
Redistribution	-6.38	-6.67	-5.09	3.00	4.91	-0.71
Non-income factors	12.41	12.75	15.25	1.57	2.22	0.04
Structure	4.53	4.76	-0.80	3.69	5.13	4.99
Vietnam 1998						
Minority rate	80.58	78.60	84.50	61.43	54.85	68.90
Total difference (majority-minority)	15.21	16.51	12.17	4.13	5.87	1.52
Decomposition:						
Growth	0.72	4.07	-3.99	11.58	13.40	10.17
Redistribution	3.98	0.05	5.13	-2.44	-5.44	-4.01
Non-income factors	15.89	26.91	6.51	-13.45	-14.49	-13.04
Structure	-4.76	-14.61	5.38	8.05	11.81	7.96

Note: 1=enrolled, 0=not. The ethnic majority group includes Kinh and Han; the minority group includes all remaining ethnic groups. *: "Primary"=children 6-11; **: "Secondary"=children 12-18.

Table 6: Decompositions for school enrollment changes over time for ethnic majority and minority in Vietnam

	Primary school enrollment rate* (%)			Secondary school enrollment rate** (%)		
	Girls + boys	Girls only	Boys only	Girls + boys	Girls only	Boys only
Vietnam 1993-1998 Ethnic majority						
Baseline value	90.01	90.07	90.24	44.56	37.75	51.60
Total difference (1998-1993)	5.78	5.05	6.43	21.00	22.97	18.82
Decomposition:						
Growth	2.06	1.93	1.98	6.02	4.99	6.56
Redistribution	-0.38	-0.19	-0.26	-0.65	-0.60	-0.97
Non-income factors	-1.30	-0.65	-2.90	0.23	4.31	-3.60
Structure	5.30	4.09	7.32	14.94	13.50	16.59
Vietnam 1993-1998 Ethnic minority						
Baseline value	66.87	68.44	66.67	34.74	29.21	40.93
Total difference (1998-1993)	13.71	10.15	17.84	26.69	25.64	27.97
Decomposition:						
Growth	6.80	6.23	5.73	0.96	0.11	2.21
Redistribution	-2.93	-4.53	1.16	1.75	1.25	0.84
Non-income factors	4.99	5.88	6.97	7.51	1.49	11.71
Structure	4.41	2.63	3.17	16.92	23.99	13.56

Note: 1=enrolled, 0=not *: “Primary”=children 6-11; **: “Secondary”=children 12-18.

Table 7: Decompositions for school enrollment disparities between children with a literate versus an illiterate father in Morocco

	Primary school enrolment rate* (%)			Secondary school enrolment rate** (%)		
	Girls + boys	Girls only	Boys only	Girls + boys	Girls only	Boys only
Morocco 1991						
Illiterate rate	54,59	44,80	64,73	17,01	11,42	22,82
Total difference (literate-illiterate)	25,52	31,72	20,70	-4,17	-3,29	-6,02
Decomposition:						
Growth	10,52	7,98	13,50	0,92	1,41	2,04
Redistribution	-0,93	-4,05	-0,81	-2,27	1,12	-7,33
Non-income factors	7,04	11,00	-1,37	-9,84	-18,87	9,64
Structure	7,91	16,70	7,90	7,20	13,34	-10,84
Morocco 1998						
Illiterate rate	70,85	62,45	78,74	47,29	39,75	54,95
Total difference (literate-illiterate)	16,69	19,63	14,11	22,09	26,14	19,66
Decomposition:						
Growth	1,98	3,29	2,21	7,00	3,59	8,28
Redistribution	0,13	0,15	0,22	-2,21	0,61	-2,91
Non-income factors	8,24	11,34	1,96	15,13	16,17	14,60
Structure	5,86	4,39	9,58	0,95	4,94	-1,86

Note: 1=enrolled, 0=not *: "Primary"=children 7-12; **: "Secondary"=children 13-15.
Reference= father is literate.

Table 8: Decompositions for school enrollment changes over time for children with a literate versus an illiterate father in Morocco

	Primary school enrolment rate* (%)			Secondary school enrolment rate** (%)		
	Girls + boys	Girls only	Boys only	Girls + boys	Girls only	Boys only
Morocco 1991-1998 literate father						
Baseline value	80.11	76.52	85.43	12.84	8.13	16.80
Total increase (1991-1998)	7.43	5.55	7.42	56.54	57.75	57.80
Decomposition:						
Growth	-1.39	-1.21	-0.95	-0.02	-0.70	1.26
Redistribution	-1.20	-0.42	-1.68	0.48	-0.47	0.18
Non-income factors	0.76	3.19	0.59	0.13	-1.09	2.67
Structure	9.60	3.77	10.42	54.53	58.74	52.60
Morocco 1991-1998 illiterate father						
Baseline value	54.59	44.80	64.73	17.01	11.42	22.82
Total increase (1991-1998)	16.26	17.64	14.01	30.28	28.33	32.12
Decomposition:						
Growth	-0.27	-0.27	-0.04	0.16	-0.52	1.39
Redistribution	-0.28	-0.59	-0.11	-0.28	0.08	-1.12
Non-income factors	6.53	9.51	4.16	2.68	2.34	4.58
Structure	10.13	9.13	9.62	27.70	26.27	27.26

Note: 1=enrolled, 0=not *: “Primary”=children 7-12 **: “Secondary”=children 13-15.

Table 9: Sensitivity test using predicted expenditures for Vietnam

	Primary school enrollment rate* (%)				Secondary school enrollment rate** (%)			
	Girls + boys		Rural		Girls + boys		Rural	
	Actual expenditure	Predicted expenditure	Actual expenditure	Predicted expenditure	Actual expenditure	Predicted expenditure	Actual expenditure	Predicted expenditure
Baseline value (1993)	86.54	88.32	85.10	87.06	43.29	44.45	40.29	41.44
Total increase 1993-1998	6.65	5.33	7.58	5.83	21.63	26.62	22.67	27.94
Decomposition (initial year as reference)								
Growth	1.37	0.56	1.86	1.41	5.78	3.15	4.15	6.54
Redistribution	0.73	-0.25	0.63	-0.76	-0.69	-0.25	-0.17	-1.25
Non-income factors	-0.10	2.30	0.21	3.05	0.63	0.42	1.77	3.71
Structure	4.54	3.06	4.81	2.20	15.72	22.14	17.06	17.97

Note: 1=enrolled, 0=not *: “Primary”=children 6-11 ; **: “Secondary”=children 12-18.