AN ECONOMETRIC EVALUATION OF PAKISTAN'S NATIONAL EDUCATION POLICY 1998-2010

By

Sajjad Akhtar
M. Ajaz Rasheed

September 1999

SOCIAL POLICY AND DEVELOPMENT CENTRE

This paper has been prepared for presentation at the Fourth Annual Conference on Econometric Modelling for Africa, July 7-9, 1999, University of Witwatersrand, South Africa. This study is funded by the Canadian International Development Agency (CIDA) and the authors wish to thank the agency for providing financial support.

15 & 18, Maqbool Cooperative Housing Socieity, Block 7 & 8, P.O. Box 13037, Karachi-75350, Pakistan. Ph: (92-21) 111-113-113, Fax: (92-21) 453-4285

I. INTRODUCTION

Educational planning exercises and policy framework announcements in many developing countries are uni-dimensional in character, i.e., they mostly spell out qualitative and quantitative targets in relation to the underlying philosophy and approaches to the education of the society as envisaged by the political and economic ideology of the government in power [1]. Unfortunately they are not intimately integrated into the overall economic performance, investment priorities, domestic and foreign resource constraints and availability of human resources for management and implementation. In a recent survey of education sector policy documents of 4 African countries, i.e., Ethopia, Mozambique, Nambia and Zambia, Takala (1998) observed, "Analysis of the financial requirements that follow from the expansion targets and of funding prospects is not found in the main text of any of the four countries' current documents". Consequently qualitative and quantitative output targets remain frequently un-achievable even if backed by the best of intentions and administrative expertise. The characteristics of educational planning and implementation of various policy frameworks in Pakistan follow a similar pattern to the one outlined above.

The National Education Policy 1998-2010 announced in March 1998 is the third among the 6 announced in the last thirty years that contains a detailed annexure consisting of nine tables on physical output targets, input and financial requirements by education level/gender and by year 2003[2]. The anticipated financial expenditures are further broken down by development/recurring and by public and private sector outlays. This provides the researchers an opportunity to conduct a consistency exercise of inputs/outputs and financial outlays of the policy paper with respect to the growth performance of the economy and its capacity to generate resources and allocate them to the education sector in the country. We use a large econometric model developed by Social Policy and Development Centre (SPDC) to answer the following questions on the latest National Education Policy 1998-2010(NEP):- 1) The NEP document assumes a 6 percent growth rate of the economy for its financial outlays. Based on the historical performance of the economy, including allocations to the social sector via resources flowing through inter-provincial fiscal relationships, we compare policy document's targets (enrolments, schools and teachers) with those generated from our model. 2) Given the historical input/output relations embodied in various econometric specifications of the model we generate the financial and physical input requirements (teachers/schools) for given output targets. 3) A consistency exercise is conducted to verify whether a modified set of projected financial outlays based on the original NEP document generate the expected output levels, i.e., enrolment rates.

[1] In the last one decade these policies are also increasingly influenced by the international bi-lateral and multi-lateral funding agencies.

[2] The other two policy documents which contain rudimentary estimates are National Education Policy 1992-2002 and National Education Policy and Implementation Programme 1979. Besides the six policy frameworks there were 7)Report of the Commission on National Education (1959), and 8) & 9) Educational Conferences 1951, 1947 respectively.

Few words about the use of econometric models for policy evaluation. Lucas critique may render the use of econometric models questionable for policy evaluation as policy documents are a blueprint for structural shifts in approach, priorities and implementation. However historically in Pakistan, education policies and plans have remained exercises in rhetoric. Low priority to social development, resource and implementation constraints did not enable any of the previous policy documents to spearhead structural transformation in the education sector of the country. The possibility of structural shifts in the education sector during the time frame of the current NEP are remote as Pakistan faced economic sanctions in the first year (1998-99) of its implementation, and will continue to face fiscal and balance of payments constraints under a tough ESAF/EFF program and debt re- scheduling[3].

The structure of the rest of the paper is as follows:- Section II briefly outlines the main features of the National Education Policy. The Integrated Social Policy and Macro-Economic Planning (ISPM) Model for Pakistan developed by SPDC will be employed to assess the feasibility of physical and financial targets of the NEP document. In section III we summarily describe the ISPM model. We elaborate in this section on specifications estimating the input/output relationship of the education sector. These are part of Human Capital Index block of the ISPM model. The results obtained from simulating the above three variants of consistency checks through the ISPM model are presented and analyzed in section IV. The paper is summarized in section V.

II. EDUCATION POLICY: MAIN FEATURES AND TARGETS

The scope and aims of National Education Policy 1998-2010 are wide ranging and all encompassing in the field of education and training. Within the field of education the policy document covers core areas such as Islamic, elementary, secondary, technical and teachers education. It also has policy guidelines on use of information technology for education, library and documentation services and physical education and sports. The policy aims extend from integration of Qur'anic principles and Islamic practices into the existing curricula, universalization of primary education, popularization of information technology among children of all ages and raising the incentive and pay structure for school teachers. Some of the objectives relevant to the focus of this paper are as follows:-

1) In following the spirit of the last two education policies, the document reiterates the primary objective of Universal Primary Education (UPE) in Pakistan[4]. To attain this objective 5.5 million primary school age (5-9 year old) will be provided access through Non-Formal Basic Education

[3]As per author's calculations development expenditures on education as a percentage of yearly average NEP targets were 26 percent in 1998-99 and 29.3 percent are budgeted for the FY1999-2000. Percentages for the recurring expenditures for the corresponding years are 60 and 69 percent.

[4]NEP'92 states, "To ensure 100 percent participation of children in education at the primary level by the year 2000,...." (Pp.11). NEP'79 begins with the following policy statement, "Universal enrolment will be attained by 1986-87. In the case of girls, universalization will be attained by 1992" (Pp.5).

Program. A crash condensed course will be arranged for 10-14 year old primary school dropouts and with no education, to complete primary education cycle in 2-3 years time.

2) Upto 12,000 new formal primary schools and 3000 mosque schools will be added to the educational infrastructure during the period 1998-2003. Second shift will be introduced in 20,000 primary schools. Nearly 1/3rd of existing primary schools will be upgraded to the level of secondary schools.

3) About 21,000 new secondary schools will be added to the existing 27,000 secondary schools by the year 2003. This addition will raise the participation rates from 31% currently to 48% in the corresponding period.

4) To achieve the enrolment targets for year 2003, stock of primary teachers will increase by 36,000. Similarly 1,31,000 new secondary teachers will be hired during the period.

5) In order to conform to the WB funding strategy for the education sector in Pakistan through its Social Action Program II (1997-98 to 2002-03), primary (class 1-5) is merged with middle (class 6-8) level education to form elementary education. While the physical inputs and outputs are classified in the NEP document by primary, middle and high (class 9-10), financial outlays are allocated on the basis of elementary(class 1-8) and secondary (class 9-10) education. The total outlays in the elementary and secondary education sector during 1998-2003 are expected to be Rs.554 billion out of total outlay of Rs.710 billion. This includes Rs.112 billion expected from the involvement of the private sector in the delivery of primary and secondary education. Out of public sector expenditure of Rs.442 billion, development expenditure is Rs.88 billion, i.e., only 20 percent. Elementary education is expected to absorb 62 percent of public sector outlays on these two levels[5].

III. ISPM MODEL AND HUMAN CAPITAL BLOCK

The Integrated Social Policy and Macro (ISPM) Model for Pakistan developed by the Social Policy and Development Centre provides the basic framework for checking the three dimensional consistencies mentioned in Section I. One of the unique features of the model is that for the first time in Pakistan, it provides a planning tool wherein the social, public finance and macroeconomic dimensions of the economy have been integrated under one system. The model is capable of tracing and quantifying the impact of most common internal and external shocks on economic and social indicators, as well as linking the changes in these indicators to the short and long-run growth potential of the economy.

[5]The NEP document gives province, level-wise breakup of total development and recurring expenditures till the year 2003, but falls short in giving province, level, year-wise break-up of these expenditures.

Due to its highly dis-aggregated character, covering all three levels of government, the model is capable of predicting outcomes in greater detail even at the level of provision of individual social services. It should be noted that such a dis-aggregation of the model at the provincial level, in terms of revenue and expenditures on social services (e.g., schools, hospitals, doctors, teachers, enrollments, etc) is well suited for reconciling and verifying the economic and social targets within a general equilibrium macro framework.

The model is based on a consistent national level data covering the period 1973-94 and is estimated by single equation regression techniques. It consists of 265 equations, of which 129 are behavioral and the rest are identities. These equations are subsumed into 22 inter-related blocks.

TABLE 1

	Equations	Identities
Macro-economy	33	44
Public Finances	47	41
Social Development	69	61

As the primary focus of the model is to assess the impact of various policies on social indicators, social development module has the largest number of behavioral equations and identities.

The 22 blocks are divided among the 3 modules as follows:-

MACRO ECONOMY: production, economic infrastructure, input demand and unemployment, macroeconomic expenditure (investment, consumption, etc.), international trade, monetary and price blocks

PUBLIC FINANCES: federal revenue, federal expenditure, federal deficit, provincial revenue, provincial expenditure, provincial and total budget deficit, local revenue, local expenditure and fiscal effort blocks.

SOCIAL DEVELOPMENT: human capital, public health, poverty, educated unemployment and gender inequality.

Sixty-four exogenous variables drive the model. Important ones are listed below:-

EXTERNAL ENVIRONMENT: foreign aid, external commercial borrowing, other private inflows, overseas labor migration, home remittances, world income, export prices (in $), import prices (in $).

POLICY VARIABLES: real effective exchange rate, interest rates, discretionary changes in taxes, cost recovery ratio in services, defense expenditure, grants, subsidies, inter- governmental fiscal relations,

federal non-tax revenues, development surcharges (gas, POL), development expenditure of autonomous bodies (WAPDA, etc), unit costs and wage rates in social services.

Although, the model is broadly Keynesian in spirit, the specification of individual blocks and equations are based on a pragmatic approach. It captures the reality and non-market clearing aspects of Pakistan's economy. Thus, the macroeconomic block is essentially supply driven. In addition the social sector indicators are also resource determined. The model is dynamic, and rich in specification. The nature of linkages across the model varies. In some cases, the linkage is simultaneous, in which equations in a block are not only determining equations in another block, but are also determined by them. Examples include the linkages between the macro production and input block, the production and macro expenditure blocks and the fiscal revenues and expenditure blocks. These simultaneous equations may be behaviorally determined or may just be identities.

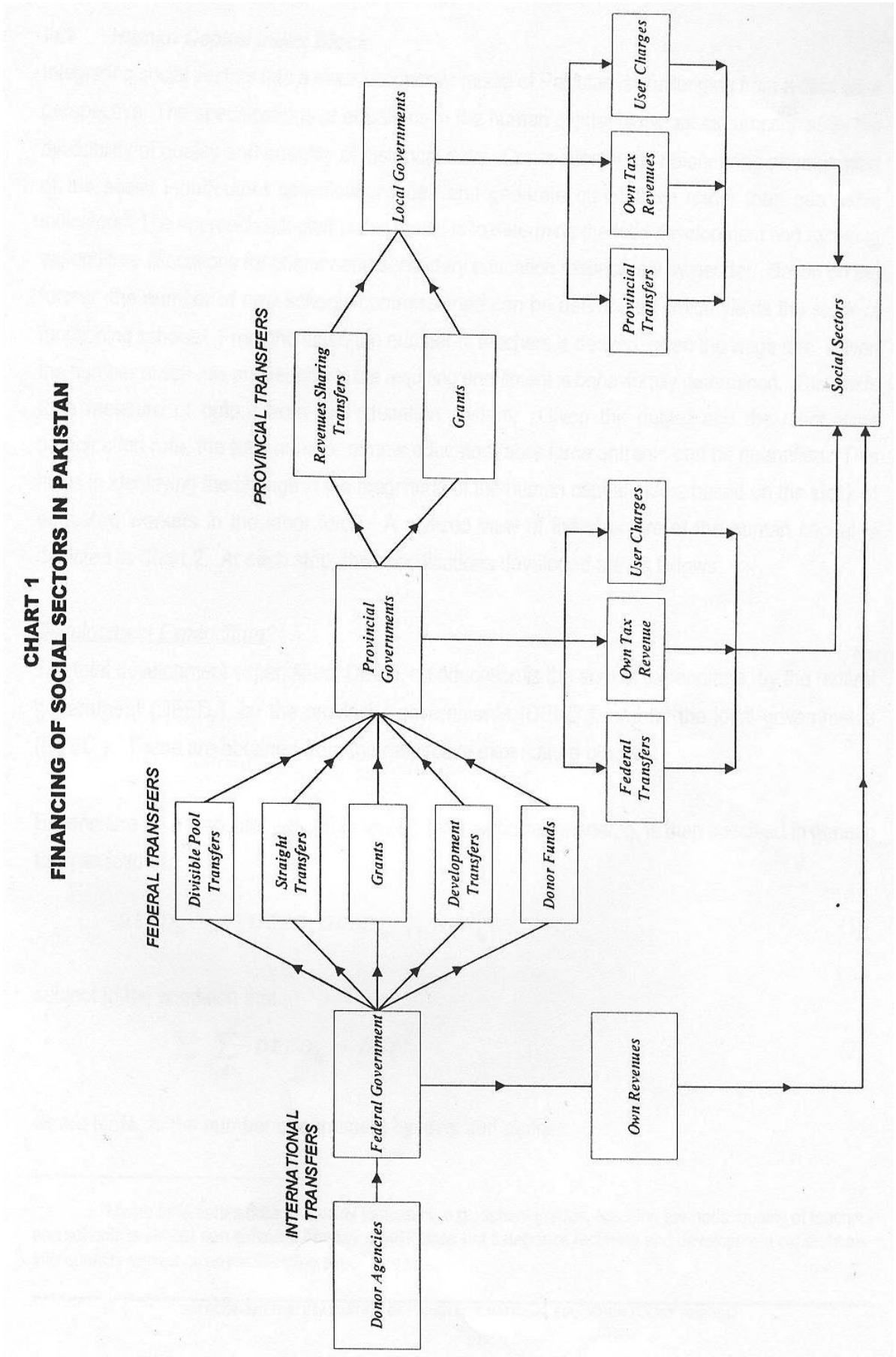
III.1 *Financing of Social Sector Expenditures*

As mentioned above, the process of financing and execution of social services is quite complex in Pakistan, with involvement by all three tiers of government. The principal responsibility of execution and maintenance of social sector projects rests with the provincial (state) and local governments. The role of the federal government is limited to the provision of social services in federally administered areas. Consequently, over 80 percent of the total expenditure on social sectors is incurred by the provincial and local governments, the share of the former being about 65 percent. However, the bulk of financing to the provincial governments for the implementation of these social sector programs is by transfers from the higher levels of government.

This is a consequence of the structural imbalance between the allocation of functional responsibilities and fiscal powers to different tiers of government which has necessitated the establishment of elaborate inter-governmental revenue-sharing arrangements, particularly between the federal and the four provincial governments. Provinces finance their expenditures from various tax and non-tax sources constitutionally under their fiscal powers, federal revenue sharing transfers (which includes divisible pool and straight transfers), grants and development transfers (including donor funds) received from the federal government. In 1997-98, for example, 18 percent of recurring provincial expenditure was financed by own sources (12 percent taxes and 6 percent user charges), 72 percent from revenue sharing transfers and 11 percent by grants from the federal government. In the same year 77 percent of the provincial development outlays were financed from the federal development transfers, largely consisting of loans, and donor funds. Clearly, the bulk of provincial income comes from the federal government and is outside the direct control of the provincial governments. As such, modeling of inter-governmental fiscal transfers is a crucial feature of the model (see Chart 1 for a stylized view of the inter-governmental fiscal relationships).

CHART 1

FINANCING OF SOCIAL SECTORS IN PAKISTAN



III.2 *Human Capital Index Block*

Integrating social sectors into a macro economic model of Pakistan is challenging from a data base perspective. The specifications of equations in the human capital block are circumscribed by the availability of quality and quantity of historical data. Consequently as a pioneering attempt most of the social input/output specifications use and generate quantitative rather than qualitative indicators[6]. The approach adopted in this model is to determine the total development and recurring expenditure allocations for primary and secondary education respectively by gender. Based on the former, the number of new schools commissioned can be determined which yields the stock of functioning schools. From the latter, the number of teachers is derived, given the wage rate. Given the number of schools and teachers, the resulting enrollment is behaviorally determined. This leads to a measure of output from the education system. Given the output and the labor force participation rate, the total number of new educated labor force entrants can be quantified. This helps in identifying the change in the magnitude of the human capital index, based on the stock of educated workers in the labor force. A stylized view of the structure of the human capital is depicted in Chart 2. At each step, the specifications developed are as follows:

Development Expenditure

The total development expenditure, DEED, on education is the sum of expenditure, by the federal government ($DEED_F$), by the provincial governments ($DEED_P$), and by the local governments ($DEED_L$). These are obtained from the respective expenditure blocks.

Expenditure on a particular education level, l, for a particular gender, g, is then specified in generic form as follows:

$$DEED_{lg} = f\left[DEED, DEED_{lg\,\&\,1}, NEN_{lg}\right] \qquad (1)$$

subject to the condition that

$$\sum_{l}\sum_{g} DEED_{lg} = DEED \qquad (2)$$

where NEN_{lg} is the number of enrolment by level and gender.

[6]Macro time series data on quality indicators, e.g., school grades, teaching methods, quality of teachers and schools is almost non-existent. The latest NEP does not categorize recurring and development expenditure into quantity versus quality enhancing expenditures.

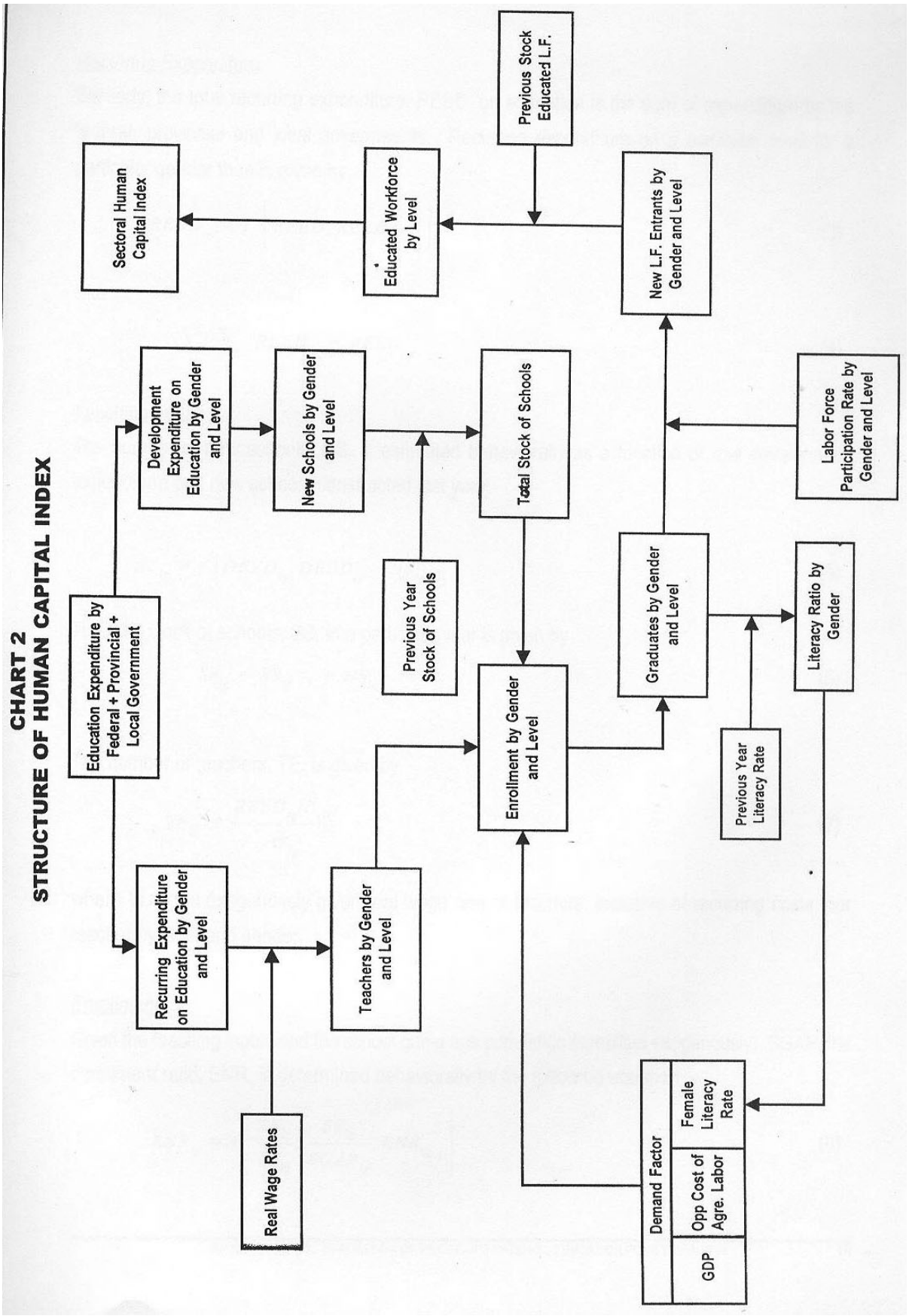


CHART 2
STRUCTURE OF HUMAN CAPITAL INDEX
Sectoral Human Capital Index
Educated Workforce by Level
Previous Stock Educated L.F.
New L.F. Entrants by Gender and Level
Development Expenditure on Education by Gender and Level
New Schools by Gender and Level
Total Stock of Schools
Labor Force Participation Rate by Gender and Level
Education Expenditure by Federal + Provincial + Local Government
Previous Year Stock of Schools
Graduates by Gender and Level
Literacy Ratio by Gender
Recurring Expenditure on Education by Gender and Level
Teachers by Gender and Level
Enrollment by Gender and Level
Previous Year Literacy Rate
Real Wage Rates
Demand Factor
GDP
Opp Cost of Agre. Labor
Female Literacy Rate

Recurring Expenditure

Similarly, the total recurring expenditure, REED, on education is the sum of expenditure by the federal, provincial and local governments. Recurring expenditure on a particular level for a particular gender then is given by

$$REED_{lg} = f\left[REED, REED_{lg\,\&\,1}\right] \tag{3}$$

with

$$REED_{lg} = REED \tag{4}$$

$l \quad g$

Teaching Inputs

The number of new schools, NS, is estimated behaviorally as a function of real development expenditure and new schools constructed last year:-

$$NS_{lg} = f\left[DEED_{lg}, DEED_{lg\&1}, NS_{lg\&1}\right] \tag{5}$$

The total stock of schools, SS, in a particular year is given by

$$SS_{lg} = SS_{lg\,\&\,1} + NS_{lg} \tag{6}$$

The number of teachers, TE, is given by

$$TE_{lg} = \frac{REED_{lg}/\bar{P}_{GC}}{\bar{W}_{lg}} \tag{7}$$

where $\bar{W}$ is the exogenously given real wage rate of teachers, inclusive of recurring costs, per teacher by level and gender.

Enrollments

Given the teaching inputs and the school-going age population (specified exogenously), SGAP, the enrollment ratio, ENR, is determined behaviorally by the following equation

$$ENR_{lg} = f\left[\frac{TE_{lg}}{SS_{lg}}, \frac{SS_{lg}}{SGAP_{lg}}, ENR_{lg_{\&1}}\right] \tag{8}$$

Where SS_{lg} is the total number of schools by level and gender. This specification has been extended by including various demand level indicators in three out of four specifications:- a) Male enrolment in primary school is also determined by literacy ratio of female, b) Female enrolment in primary school is

also a function of per capita income of population above 10 years of age c) Male enrolment in secondary schools is related to labor income in services sectors of the economy.

Based on this, the number of students enrolled, NEN, is given by

$$NEN_{lg} = ENR_{lg} \; x \; SGAP_{lg} \tag{9}$$

Output

The output, OUT, of newly educated persons is derived as

$$OUT_{lg} = \bar{S}_{lg} \; x \; NEN_{lg} \tag{10}$$

where $\bar{S}_{lg}$ is the exogenously specified rate of completion (after allowing for dropouts) of a particular level of education and gender.

Educated Labor Force Participants

The number of new educated labor force participants, NW, depends upon the output of educated persons, enrollment by gender and level and opportunity cost in terms of wages.

$$NW_{lg} \; ' \; f\left[OUT_{lg}, NW_{lg\&1}, NEN_{lg}, W\right] \tag{11}$$

Human Capital Index

We are finally in the position to quantify, HCI, the human capital index for a particular sector in the following manner:

$$HCI_{\varepsilon} = f\left[NW_{lg}, \overline{EXPIND} \right] \tag{12}$$

where $\overline{EXPIND}$ is the experience index.

IV. RESULTS OF SIMULATIONS

Before we discuss the results of the simulation exercise, it will be useful to spell out the scope of the analysis and minor modifications introduced in the exercise to ensure comparability with the NEP targets. These limitations though mainly arise from the specifications of the model but also

exist from lack of comparable data given in the NEP document. A) The analysis will only focus on the primary and secondary level component of NEP. As mentioned above nearly 80% of total government outlays is at these two levels. Moreover inputs/outputs of these two levels are modeled in greater detail than higher levels and types of education. Beyond secondary level, all higher levels are aggregated in the model as higher education and other education. B) In keeping with the spirit of SAP II, the NEP document distinguishes the financial outlays between elementary and secondary education. The input/output relations estimated in the model are based on the categorization of primary (class 1-5) and secondary (class 6-10). Consequently based on non-documented departmental information financial outlays of NEP document for elementary education are split as follows:- i) Development expenditure (which mainly determines the addition to stock of schools) on elementary education is split into middle and primary level in the ratio of 68 and 32 percent. The share of expenditure on middle level education is added to NEP's targets for secondary level in order to make it consistent with the model's definition of secondary level expenditures. ii) Similarly recurring expenditure on elementary education is split into middle and primary level in the ratio of 24:76 respectively[7]. The middle level share is added to the NEP's secondary level recurring expenditures targets to ensure consistency with the model's definition of recurring expenditure. Table 2 compares the break-up of recurring and development expenditure by level as given in the original NEP document and our modified NEP estimates.

TABLE 2
NATIONAL EDUCATION POLICY AND MODIFIED NATIONAL EDUCATION POLICY
BENCHMARKS FOR THE YEAR 2003

	NEP ESTIMATES				MODIFIED NEP ESTIMATES	
	Total Elementary	Primary	Middle	Secondary	Primary	Secondary
Recurring Expenditure	218796	165793 (75.77)	53003 (24.23)	134560	165793	187563
Development Expenditure	54698	17093 (31.25)	37605 (68.75)	33640	17093	71245

Spliting Shares in parenthesis

IV.1 *Growth Rate Scenario*

We begin the consistency exercise by running the ISPM under the assumption of 6% annual growth rate of the economy adopted by the NEP document till the year 2003 for all its input requirements and output

[7]Indirectly NEP data does provide support for the ratios applied in case of recurring and development expenditures. Middle level enrolment as a proportion of total enrolment in class I-VIII is expected to reach 27 percent by 2003. Middle level teachers as a proportion of total teachers in class I-VIII is expected to be 31 percent by 2003. New middle schools will constitute 47.5 percent of new primary plus middle level schools proposed to be built by 2003.

targets[8]. The question of interest is whether the input and output targets are consistent with the assumed growth rate of the economy? Total stock of teachers as specified in equation 7 above is determined by the interaction of real recurring expenditure and exogenously given real wage rates. For this simulation we assume that real wages of teachers increase by 3 percent annually[9]. National Finance (NFC) Awards announced periodically determine the inter-provincial fiscal transfers among the four provinces. We incorporate in the simulation the most recent 1997 NFC Award structure which will determine Divisible Pool Transfers till the year 2002.[10] Column 1 in Table 3 generates from our model the extent (in terms of percentages) to which the specified targets in NEP will be achieved with the assumed growth rate[11]. Under the historical dynamics of growth and its capacity to generate and allocate resources gender and level wise only 76 percent of NEP enrolment targets for females will be met at the primary level. In comparison to our model estimates the NEP estimates for boys enrolment at the primary level are understated by 7 percent. Starting from a low base the model predicts approximately 90 percent achievement of NEP targets in case of secondary education. Except for male teachers in primary education, the NEP targets for stock of teachers by the year 2003 closely match those generated by the model. Low female participation and retention in labor force and male bias in hiring practices historically has lead our model to overestimate the stock of male primary teachers by the year 2003. Model predictions of additions in stock of schools reflect historical expenditure pattern and priorities which improved access to primary education. If past patterns of public expenditure continue, only 31 percent or approximately 7000 secondary schools will be added against the NEP target of 21000 schools. Interestingly our model predicts that only 31 percent of NEP target in new secondary schools will achieve close to 90 percent of corresponding NEP targets in enrolment. This partly reflects the higher contribution of new schools at the margin as compared to additional teachers in raising enrolment[12]. Do large deviations between NEP targets and model estimates in new schools and financial outlays vindicate the Lucas Critique? If the purpose of the evaluation is to claim the superiority of the model or accuracy of modified NEP targets, the deviations can be narrowed by altering the value of intercepts terms of the specifications, introducing structural shifts through dichotomous

[8]For deterministic simulation we used the procedure as outlined in Fair(1994), Pp262-263. Theoretically for a non-linear model such as used in this paper, stochastic simulation are recommended. However Fair(1994) observed that, "this does not, however, seem to be an important problem in practice, since deterministic predictions are generally quite close to the mean values from stochastic simulations, and so if one were only interested in estimation of the changes, it seems unlikely that stochastic simulation would be needed."

[9]No such assumptions are specified in the NEP documents.

[10]While the estimation of the model is based on a NFC awards of 1974 and 1990, the present simulation is based on the NFC award 1997. In contrast to the previous Awards, all taxes are now included in the divisible pool net. Provinces which under the old Award received 80 percent share of the fast growing taxes i.e., sales and direct taxes will now receive 33 percent.

[11]The corresponding actual numbers are in Table 4.

[12]In Appendix A the production function of enrolment, i.e., O-28 to O-31, has higher coefficients attached to schools per school going age population compared to teachers per school for each level and gender.

variables and or modifying slope parameters. The subjectivity involved in such modifications of the specifications will not be a meaningful extrapolation of the past. Moreover these deviations themselves embody the following messages for the policy makers. A) Any downward revision from the average 6 percent economic growth rate will further lower the actual enrolment rates. B) Hiring practices and incentive structure for primary teachers need to be tilted in favor of female as opposed to the male teachers. Holding the total stock of male primary teachers at the NEP target may be difficult administratively given large scale male unemployment, clout of rural polity and low participation rate of females in the country. Similarly raising the stock of female primary teachers to NEP targets of 176500 against the 144384 implied by our model calls for structural break from conventional approaches of hiring and retaining female teachers.. C) Combined with a development outlay of 26 percent and addition of 31 percent of proposed NEP targets of secondary schools our model predicts an enrolment close to 90 percent of NEP target. This deviation seriously questions the cost effectiveness of development expenditures in the construction of new secondary schools or up gradation of primary to secondary schools.

TABLE 3
ACHIEVEMENT OF TARGETS BY THE YEAR 2003 (%)

	NEP[i]	C1	C2	C3
Enrolment Rate (Primary)				
Boys	99.58	107	-	124
Girls	79.60	76	-	74
Enrolment Rate (Secondary)				
Boys	71.58	84	-	342
Girls	43.77	88	-	436
Stock of Teachers (Primary)				
Male	205700	126	121	138
Female	176500	82	152	90
Stock of Teachers (Secondary)				
Male	254800	80	108	196
Female	137000	83	89	210
New Schools				
Primary	12000	235	214	312
Secondary	21000	31	32	121
Financial Outlays (Primary Education)				
Development	17093	154	110	-
Recurring	165793	107	119	-
Financial Outlays (Secondary Education)				
Development	71245	26	27	-
Recurring	187563	51	67	-

[i] NEP targets in absolute numbers.
NEP Financial outlays aggregated over the five years in million rupees.

TABLE4
RESULTS OF ALTERNATE EVALUATION EXPERIMENTS
YEAR 2003

	NEP Document	C1	C2	C3
Enrolment Rate (Primary)				
Boys	99.58	107.61	)	123.42
Girls	79.60	60.44	)	58.71
Enrolment Rate (Secondary)				
Boys	71.58	60.14	)	244.61
Girls	43.77	38.38	)	190.86
Stock of Teachers (Primary)				
Male	205700	259878	249600	284551
Female	176500	144384	268842	159586
Stock ofTeachers (Secondary)				
Male	254800	204774	274975	499595
Female	137000	113180	123049	287420
New Schools				
Primary	12000	28264	25692	37394
Secondary	21100	6542	6781	25614
Financial Outlays (Primary Education)				
Development	17093	26285	18767	-
Recurring	165793	177231	196952	-)
Financial Outlays (Secondary Education)				
Development	71245	18542	19019	)
Recurring	187563	96177	126084	)

The above comparison provides a quantitative dimension on the divergence between NEP targets and the ones generated in a general equilibrium historical framework. Looking at important ratios can give us qualitative dimension to the differences between the two set of targets. Table 5 compares few selected ratios between the two scenarios.

TABLE 5
SELECTED QUALITY RATIOS
NEP TARGETS AND MODEL ESTIMATES FOR YEAR 2003

	NEP Document	Model Estimates
Recurring Expenditure/Primary School	Rs.1.02 million	Rs. 0.99 million
Development Expnd/Primary School	Rs.1.00 million	Rs. 0.93 million
Recurring Expnd/Secondary School	Rs.3.91 million	Rs. 2.86 million
Development Expnd/Secondary School	Rs.3.24 million	Rs. 2.83 million
Primary Teachers/School	2.35	2.26
Secondary Teachers/School	8.16	9.47
Student/Teacher (Primary)	53	52
Student/Teacher (secondary)	29	28

In case of primary schools the financial outlays are fairly robust in the two estimates. However there is divergence in the range of 30-40% in recurring expenditure per secondary school or NEP estimates are higher by Rs.1.00 million per secondary school. The quality ratios in terms of teachers per school and student teacher ratio are remarkably close to each other for both levels except the teacher school ratio in secondary schools. The model numbers predict a better ratio than allowed by the policy document.

IV.2 *Enrolment Based Scenario*

In this section we look at the evaluation exercise from another angle. Given level and gender-wise enrolment targets are the input requirements (teachers, schools and financial outlays) predicted by our model consistent with those of the NEP document? To elaborate while the previous scenario was based on the growth dynamics of the macro economy, this scenario is driven by the output targets. Column 2 in Table 3 gives the results of the simulation. To achieve the primary enrolment targets the model predicts need of nearly 50 and 20 percent more than NEP estimates for females and males respectively. Economies of scale/non-linearities in the enrolment production function are indicated by 10 percent less addition in primary schools leading to higher female enrolment. Automaticity in the allocation of resources through the growth process may have led historically to excess capacity in boy's primary education. Secondary school enrolment can be achieved by increasing the stock of teachers

close to the modified NEP targets. Financial outlays under the primary enrolment scenario are close to the development expenditure estimates of NEP while 20 percent higher for the recurring expenditure estimates. Prediction of greater need for female primary teachers by the model calls for bigger recurring expenditure allocations. Interestingly the inputs i.e., teachers, schools, financial outlays, required for secondary enrolment target are fairly robust across the two scenarios. Apparently the over estimation in proposed development outlays for secondary education in NEP is not supported by the historical expenditure patterns as well cost-effective strategy.

Table 6 gives the estimates for selected surrogate ratios for quality. Except for outlays on new primary and secondary schools the financial ratios of modified NEP and the model are fairly close. Apparently to achieve the enrolment targets of the policy, expenditure on new school buildings is overstated to reflect expected cost overruns. The model predicts a better teacher school ratio for secondary schools of about 12 teachers per school with a recurring outlay of an almost Rs.0.17 million less than the modified NEP financial estimates.

TABLE 6
SELECTED QUALITY RATIOS
NEP TARGETS AND MODEL ESTIMATES FOR YEAR 2003
(*Enrolment Based Scenario*)

	NEP Document	Model Estimates
Recurring Expenditure/Primary School	Rs.1.02 million	Rs. 1.07 million
Development Expnd/Primary School	Rs.1.00 million	Rs. 0.73 million
Recurring Expnd/Secondary School	Rs.3.91 million	Rs. 3.74 million
Development Expnd/Secondary School	Rs.3.24 million	Rs. 2.80 million
Primary Teachers/School	2.35	2.95
Secondary Teachers/School	8.16	11.97

IV.3 *Financial Outlay Scenario*

The Government proposes to raise the expenditure on education from 2.1 percent in 1997-98 to 4 percent of GDP by year 2003[13]. This implies substantial diversion of resources to this sector. Historically expenditure targets of none of the previous education policies were met in letter and spirit. Given the expected slow down in economic activity and tough WB/IMF conditionalities accompanying debt re-scheduling signed in Jan 1999, it is fair to assume that government will once again fail to meet these

[13]Based on historical allocations, the growth rate scenario of the model in section iv.1 predicts that total expenditure on education will go up to 2.7 percent of GDP by the year 2003.

ambitious targets[14]. However we still project from our model, the profile of inputs and outputs under this likely *counterfactual* scenario?. Column 3 of Table 3 gives the extent of achievement possible as predicted by our model. Although our model overestimates the stock of new primary schools at the end of 2003 by 212 percent, in terms of actual additions these allocations will add 37,000 schools as per our model against 12,000 allowed for by the policy document. Similarly proposed allocation of recurring expenditure at primary level can finance nearly 40 percent more male teachers as compared to the targets in the policy document. At secondary level the proposed allocations in development expenditure will add 25,000 new schools as per our model estimates against 21,000 projected by the NEP[15]. The allocations in recurring expenditure at secondary level can finance roughly twice the numbers of teachers compared to the estimates of the policy document. The ambitious allocations at the secondary level clear leads our model to overshoot with respect to enrolment targets.

V. CONCLUSIONS AND SUMMARY

Most of the education policies in developing countries are well set out in terms of aims, objectives and targets. They also portray a judicious blend of politico-economic ideology of the rulers and/or political party in power and the human resource needs of the society for development. However the targets usually lack internal consistency with the performance of the economy and capacity to generate internal and external funds. The purpose of this paper was to evaluate the consistency of input and output targets spelled out in the Pakistan's National Education Policy 1998-2010. The instrument used for three dimensional consistency checks was the Integrated Social Policy and Macro (ISPM) model developed by Social Policy and Development Centre. From a policy perspective, the deviations between NEP targets and model predictions under each of the 3 consistency checks can be interpreted as call for policy shifts in allocation and hiring priorities, elimination of cost over runs and cost effective expenditures by the government in the education sector. The main findings of each consistency check are summarized as follows:- A) Under the 6 percent annual growth rate scenario, most of the model estimates for physical input and outputs were close to the policy document. The policy makers would need to weaken the historical dynamics of building more primary schools (partly politically motivated) and instead strictly adhere to the efficient utilization of the physical targets set in NEP. Secondly there is an imperative to scrutinize and monitor the cost estimates of building new secondary schools or middle componet of elementary education under the SAP II framework. The deviation between the NEP and model estimates suggest that the former are grossly 'padded'. The deviations in terms of students/teacher and teacher/school ratios between the two estimates were even less than observed

[14]As per author calculations the total expenditure on education was 1.97 percent of GDP in 1998-99. The budgeted figures for 1999-2000 are 2.04 percent of GDP under an 11 percent growth assumed in nominal GDP.

[15]It is unclear from the NEP document whether the costs of up-gradation of schools are included in the development outlays. Treating the entire development outlay by level as expenditure on new schools leads to overshooting of model estimates.

in the absolute numbers. B) A simulation was performed to assess the inputs (physical, financial) required for given enrolment targets. The model estimated that nearly 52 percent more primary school teachers would be required than estimated by the NEP document to attain these proposed targets. This deviation underscores the need to adopt radically different approach to hiring and retention of female primary school teachers. The overstatement in NEP expenditures on secondary education in the enrolment based consistency check were remarkably similar to the growth rate scenario. Except financial outlays the estimates of other targets matched well with the NEP targets. C) A likely *counterfactual* simulation based on the given modified financial allocation was performed. In this scenario the estimated achievements were far above the estimates projected by the NEP document specifically in the case of secondary education.

REFERENCES

Fair, Ray.C.(1994) *Testing Macro-econometric Models,* Harvard University Press, Cambridge, Massachusetts.

Takala, Tuomas (1998) Making educational policies under influence of external assistance and national politics-a comparative analysis of the education sector policy documents of Ethopia, Mozambique, Nambia and Zambia; *International Journal of Educational Development,* Vol.18, No.4, July.

Government of Pakistan, Ministry of Education, *National Education Policy: 1998-2010,* 1998.

Government of Pakistan, Ministry of Education, *National Education Policy,*1992.

Government of Pakistan, Ministry of Education, *National Education Policy and Implmentation Programme,* 1979.

APPENDIX A

LIST OF EXOGENOUS POLICY VARIABLES

E

$\overline{EXPIND}$	Experience Index

P

$\overline{PI}_{GI}$	Price Index for Government Investment
$\overline{PI}_{GC}$	Price Index of Government Consumption
$\overline{POP10}_{F}$	Female Population above 10 Year of Age
$\overline{POP10}_{M}$	Male Population above 10 Year of Age

S

$\overline{SGAPR}_{M}$	School Going Age Male Primary
$\overline{SGAPR}_{F}$	School Going Age Female Primary
$\overline{SGASE}_{M}$	School Going Age Male Secondary
$\overline{SGASE}_{F}$	School Going Age Female Secondary
$\overline{SGAHEI}$	School Going Age in Higher Education Institutes
$\overline{SHPR}_{F}$	Female Share of Primary
$\overline{SHPR}_{M}$	Male Share of Primary
$\overline{SHSE}_{F}$	Female Share of Secondary
$\overline{SHSE}_{M}$	Male Share of Secondary
$\overline{SHHEI}$	Share of Higher Education Institutes

W

$\overline{WPS}_{F}$	Wages Female Primary School
$\overline{WPS}_{M}$	Wages Male Primary School
$\overline{WSS}_{F}$	Wages Female Secondary School
$\overline{WSS}_{M}$	Wages Male Secondary School
$\overline{WHEI}$	Wages Higher Education
$\overline{WW}$	Average Wages

Y

$\overline{Y}^{r}$	Gross Domestic Product in Real Terms
$\overline{Y}^{r}_{S}$	Supply-Side Gross Domestic Product in Real Terms
$\overline{Y}^{r}_{OT}$	Value-added in Other Sectors in Real Terms

** All the variables are expressed in constant 1980-81 million rupees unless otherwise states.

APPENDIX A

LIST OF ENDOGENOUS VARIABLES

D

DEED	Total Development Expenditure on Education
DEEDHEI	Development Expenditure on Higher Education
$DEED_F$	Federal Social Development Expenditure on Education
$DEED_L$	Local Social Development Expenditure on Education
$DEED_P$	Provincial Social Development Expenditure on Education
$DEEDPR_F$	Development Expenditure on Education Female Primary
$DEEDPR_M$	Development Expenditure on Education Male Primary
$DEEDSE_F$	Development Expenditure on Education Female Secondary
$DEEDSE_M$	Development Expenditure on Education Male Secondary
DEEDOTEI	Development Expenditure on Other Education Institutes

H

HEIENR	Enrollment Ratio at Higher Education Institutes
HCI_A	Human Capital Index in Agriculture Sector
HCI_M	Human Capital Index in Manufacturing Sector
HCI_{OT}	Human Capital Index in Other Sectors

L

LR_F	Female Literacy Ratio
LR_M	Male Literacy Ratio

N

$NENPR_F$	Number of Female Enrollment at Primary Level
$NENPR_M$	Number of Male Enrollment at Primary Level
$NENSE_F$	Number of Female Enrollment at Secondary Level
$NENSE_M$	Number of Male Enrollment at Secondary Level
NENHEI	Number of Enrollment at Higher Education Institute
NLR_F	Total Female Literate
NLR_M	Total Male Literate
NPS_F	New Female Primary School
NPS_M	New Male Primary School
NSS_F	New Female Secondary School
NSS_M	New Male Secondary School
$NWPR_F$	Number of Female Workers with Primary Education
$NWPR_M$	Number of Male Workers with Primary Education
$NWSE_F$	Number of Female Workers with Secondary Education
$NWSE_M$	Number of Male Workers with Secondary Education
NWHEI	Number of Workers with Higher Education

O

$OUTPR_F$	Output of Female from Primary Level
$OUTPR_M$	Output of Male from Primary Level
$OUTSE_F$	Output of Female from Secondary Level
$OUTSE_M$	Output of Male from Secondary Level
OUTHEI	Output of Higher Education Level

P

$PRENR_F$	Female Primary Enrollment
$PRENR_M$	Male Primary Enrollment

R

REED	Total Recurring Expenditure on Education
REEDHEI	Recurring Expenditure on Higher Education
REEDOTI	Recurring Expenditure on Other Education
$REED_F$	Federal Recurring Expenditure on Education
$REED_L$	Local Recurring Expenditure on Education
$REED_P$	Provincial Recurring Expenditure on Education
$REEDPR_F$	Recurring Expenditure on Education Female Primary
$REEDPR_M$	Recurring Expenditure on Education Male Primary
$REEDSE_F$	Recurring Expenditure on Education Female Secondary
$REEDSE_M$	Recurring Expenditure on Education Male Secondary

S

$SEENR_M$	Male Secondary Enrollment Ratio
$SEENR_F$	Female Secondary Enrollment Ratio
SPS_F	Total Female Primary School
SPS_M	Total Male Primary School
SSS_F	Total Female in Secondary School
SSS_M	Total Male in Secondary School

T

$TEPS_F$	Teacher Female Primary School
$TEPS_M$	Teacher Male Primary School
TEHEI	Total Higher Education Institute Teachers
$TESS_F$	Teacher Female Secondary School
$TESS_M$	Teacher Male Secondary School

Value of the Parameters

δ_4	Male Death Rate over Ten Years
δ_6	Female Death Rate over Ten Years

** All the variables are expressed in constant 1980-81 million rupees unless otherwise states

EQUATION NUMBER	$\overline{R}^2$	SER	DW	F-Ratio

O. HUMAN CAPITAL INDEX BLOCK

O-1 Total Development Expenditure on Education

$$DEED = DEED_F + DEED_P + DEED_L$$

O-2 Development Expenditure on Male Primary Education

$$DEEDPR_M = \underset{(\&3.06)}{\&\ 60.00} \underset{(28.1)}{\%\ 0.191\ DEED} \underset{(2.21)}{\%\ 0.00001\ NENPR_M} \underset{(\&5.57)}{\&\ 147.0\ DO2_{86}} \underset{(10.8)}{\%\ 399.2\ DO2_{90}}$$

0.99 | 32.70 | 1.29 | 830.83

O-3 Development Expenditure on Female Primary Education

$$DEEDPR_F = \underset{(\&3.86)}{\&\ 34.98} \underset{(30.9)}{\%\ 0.103\ DEED} \underset{(3.24)}{\%\ 0.00002\ NENPR_F} \underset{(\&7.68)}{\&\ 103.8\ DO3_{89}} \underset{(13.4)}{\%\ 223.0\ DO3_{90}}$$

0.99 | 14.79 | 1.48 | 1261.98

O-4 Development Expenditure on Male Secondary Education

$$DEEDSE_M = \underset{(\&9.91)}{\&\ 187.9} \underset{(21.9)}{\%\ 0.120\ DEED} \underset{(9.95)}{\%\ 0.0001\ NENSE_M} \underset{(14.7)}{\%\ 178.7\ DO4_{87}}$$

0.99 | 24.30 | 1.74 | 1444.71

O-5 Development Expenditure on Female Secondary Education

$$DEEDSE_F = \underset{(\&8.04)}{\&\ 42.95} \underset{(24.2)}{\%\ 0.061\ DEED} \underset{(9.95)}{\%\ 0.0001\ NENSE_F} \underset{(15.1)}{\%\ 92.05\ DO5_{87}}$$

0.99 | 11.95 | 1.69 | 1454.41

O-6 Development Expenditure on Higher Education

$$DEEDHEI = \underset{(7.46)}{\%\ 88.04} \underset{(46.5)}{\%\ 0.359\ DEED} \underset{(0.16)}{\%\ 0.003\ DEEDHEI_{\&1}} \underset{(11.5)}{\%\ 381.8\ DO6_{87}} \underset{(\&14.3)}{\&\ 486.1\ DO6_{89}}$$

0.99 | 31.28 | 1.50 | 2385.14

O-7 Development Expenditure on Other Education

$$DEEDOTEI = DEED - DEEDPR_M - DEEDPR_F - DEEDSE_M - DEEDSE_F - DEEDHEI$$

O-8 Total Recurring Expenditure on Education

$$REED = REED_F + REED_P + REED_L$$

O-9 Recurring Expenditure on Male Primary Education

$$REEDPR_M = \underset{(\&0.72)}{\&\ 24.40} \underset{(7.09)}{\%\ 0.249\ REED} \underset{(1.02)}{\%\ 0.147\ REEDPR_{M\&1}} \underset{(4.20)}{\%\ 513.1\ DO9_{90}}$$

0.99 | 103.36 | 1.23 | 4248.63

O-10 Recurring Expenditure on Female Primary Education

$$REEDPR_F = \underset{(\&2.76)}{\&\ 104.8} \underset{(5.63)}{\%\ 0.129\ REED} \underset{(3.32)}{\%\ 0.437\ REEDPR_{F\&1}} \underset{(4.65)}{\%\ 520.6\ DO10_{90}}$$

0.99 | 100.26 | 1.48 | 2362.54

O-11 Recurring Expenditure on Male Secondary Education

$$REEDSE_M = \underset{(1.64)}{\%\ 16.82} \underset{(184.9)}{\%\ 0.174\ REED} \underset{(4.97)}{\%\ 167.9\ DO11_{87}} \underset{(\&26.1)}{\&\ 620.2\ DO11_{90}}$$

0.99 | 32.69 | 1.24 | 14093.96

O-12 Recurring Expenditure on Female Secondary Education

$$REEDSE_F = \underset{(1.18)}{\%\ 18.09} \underset{(10.7)}{\%\ 0.055\ REED} \underset{(2.52)}{\%\ 0.199\ REEDSE_{F\&1}} \underset{(4.59)}{\%\ 0.554\ DEEDSE_{F\&1}} \underset{(\&9.91)}{\&\ 504.7\ DO12_{90}}$$

0.99 | 45.38 | 2.23 | 1136.20

O-13 Recurring Expenditure on Higher Education

$$REEDHEI = \underset{(1.01)}{\%\ 37.29} \underset{(91.3)}{\%\ 0.263\ REED}$$

0.99 | 119.63 | 2.11 | 8342.99

O-14 Recurring Expenditure on Other Education

$$REEDOTEI = REED - REEDPR_M - REEDPR_F - REEDSE_M - REEDSE_F - REEDHEI$$

EQUATION NUMBER	$\overline{R}^2$	SER	DW	F-Ratio

O-15 New Male Primary Schools

$$NPS_M = \underset{(\&1.84)(((}{\&\ 615.7} \ \% \ \underset{(2.50)((}{3.646}\left[\frac{DEEDPR_M}{\overline{PI}_{GI}\ /\ 100}\right] \% \ \underset{(1.84)(((}{2.927}\left[\frac{DEEDPR_{M\&1}}{\overline{PI}_{GI\&1}\ /\ 100}\right] \% \ \underset{(1.91)(((}{2.201}\left[\frac{DEEDPR_{M\&2}}{\overline{PI}_{GI\&2}\ /\ 100}\right]$$

$$\% \ \underset{(2.05)(((}{0.112}\ NPS_{M\&1} \ \% \ \underset{(15.5)(}{7324}\ DO15_{83} \ \&\ \underset{(\&11.9)(}{8354}\ DO15_{89}$$

0.98 | 724.37 | 1.50 | 157.85

O-16 New Female Primary Schools

$$NPS_F = \underset{(5.27)}{1577.79} \ \% \ \underset{(1.92)((}{1.880}\left[\frac{DEEDPR_F}{\overline{PI}_{GI}\ /\ 100}\right] \% \ \underset{(2.67)}{2.620}\left[\frac{DEEDPR_{F\&1}}{\overline{PI}_{GI\&1}\ /\ 100}\right]$$

$$\&\ \underset{(\&4.91)(}{589.288}\left[DO16_{92}\ (\ \ln\ TIME\ \right] \% \ \underset{(7.77)(}{3981.184}\ DO16_{93}$$

0.94 | 438.61 | 1.98 | 58.16

O-17 New Male Secondary Schools

$$NSS_M = \underset{(\&4.35)(}{\&\ 55.16} \ \% \ \underset{(1.91)(((}{0.249}\left[\frac{DEEDSE_{M\&2}}{\overline{PI}_{GI\&2}\ /\ 100}\right] \% \ \underset{(2.38)((}{0.527}\left[\frac{DEEDSE_{M\&3}}{\overline{PI}_{GI\&3}\ /\ 100}\right]$$

$$\% \ \underset{(3.79)(}{0.486}\ NSS_{M\&1} \ \% \ \underset{(5.66)(}{504.3}\ DO17_{84} \ \&\ \underset{(\&3.79)(}{0.783}\ AR(1) \ \&\ \underset{(\&17.8)(}{0.928}\ MA(1)$$

0.94 | 110.46 | 1.76 | 34.13

O-18 New Female Secondary Schools

$$NSS_F = \underset{(\&2.76)(}{\&\ 74.15} \ \% \ \underset{(2.93)(}{0.979}\left[\frac{DEEDSE_{F\&2}}{\overline{PI}_{GI\&2}\ /\ 100}\right] \% \ \underset{(2.52)((}{0.797}\left[\frac{DEEDSE_{F\&3}}{\overline{PI}_{GI\&3}\ /\ 100}\right]$$

$$\% \ \underset{(4.56)(}{0.166}\ NSS_{F\&1} \ \&\ \underset{(\&5.34)(}{306.1}\ DO18_{88} \ \% \ \underset{(23.9)(}{1579}\ DO18_{93}$$

0.98 | 62.27 | 2.09 | 179.45

O-19 Total Stock of Male Primary Schools

$$SPS_M = SPS_{M-1} + NPS_M$$

O-20 Total Stock of Female Primary Schools

$$SPS_F = SPS_{F-1} + NPS_F$$

O-21 Total Stock of Male Secondary Schools

$$SSS_M = SSS_{M-1} + NSS_M$$

O-22 Total Stock of Female Secondary Schools

$$SSS_F = SSS_{F-1} + NSS_F$$

O-23 Total Male Primary Teacher

$$TEPS_M = [REEDPR_M / \overline{PT}_{GC} * 100] / \overline{WPS}_M$$

O-24 Total Female Primary Teacher

$$TEPS_F = [REEDPR_F / \overline{PT}_{GC} * 100] / \overline{WPS}_F$$

O-25 Total Male Secondary Teacher

$$TESS_M = [REEDSE_M / \overline{PT}_{GC} * 100] / \overline{WSS}_M$$

O-26 Total Female Secondary Teacher

$$TESS_F = [REEDSE_F / \overline{PT}_{GC} * 100] / \overline{WSS}_F$$

O-27 Total Higher Education Institute Teachers

$$TEHEI = [REEDHEI / \overline{PT}_{GC} * 100] / \overline{WHEI}$$

EQUATION NUMBER	$\overline{R}^2$	SER	DW	F-Ratio

O-28 Enrollment Ratio for Males at Primary Level

$$\ln PRENR_M = \%\ 4.634 \%\ 0.583 \ln\left[\frac{SPS_M}{\overline{SGAPR}_M}\right] \%\ 0.518 \ln\left[\frac{TEPS_M}{SPS_M}\right] \%\ 0.322 \ln PRENR_{M\&1}$$
$$(8.81)\quad (7.28)\quad (8.41)\quad (6.29)$$
$$\%\ 0.028\ LR_F \%\ 0.171\ D028_{74} \&\ 0.033\ DO28_{92}$$
$$(4.18)\quad (10.7)\quad (\&1.81)$$

$\overline{R}^2$	SER	DW	F-Ratio
0.99	0.015	2.15	501.12

O-29 Enrollment Ratio for Females at Primary Level

$$\ln PRENR_F = \%\ 5.830 \%\ 0.239 \ln\left[\frac{TEPS_F}{SPS_F}\right] \%\ 0.610 \ln\left[\frac{SPS_F}{\overline{SGAPR}_F}\right] \%\ 0.551 \ln PRENR_{F\&1}$$
$$(12.97)\quad (7.95)\quad (12.15)\quad (13.02)$$
$$\%\ 0.204 \ln\left[\frac{Y^r}{\overline{POP10}_M \%\ \overline{POP10}_F}\right] \%\ 0.026\ DO29_{74} - 0.048\ DO29_{90}$$
$$(11.85)\quad (5.36)\quad (\&8.60)$$

$\overline{R}^2$	SER	DW	F-Ratio
0.99	0.006	1.88	2599.24

O-30 Enrollment Ratio for Males at Secondary Level

$$\ln SEENR_M = \%\ 6.403 \%\ 0.511 \ln\left[\frac{SSS_M}{\overline{SGASE}_M}\right] \%\ 0.145 \ln\left[\frac{Y^r_{OT}}{L_{OT}}\right] \%\ (1 \&\ 0.511 = 0.489) \ln\left[\frac{TESS_M}{SSS_M}\right]$$
$$(14.5)\quad (10.3)\quad (8.41)$$
$$\%\ 0.233 \ln\left[\frac{NENPR_{M\&1}}{\overline{SGASE}_M}\right] \%\ 0.073\ DO30_{75} \%\ 0.070\ DO30_{84}$$
$$(6.36)\quad (10.1)\quad (13.1)$$

$\overline{R}^2$	SER	DW	F-Ratio
0.99	0.008	2.58	1432.54

O-31 Enrollment Ratio for Females at Secondary Level

$$\ln SEENR_F = \%\ 8.204 \%\ 0.961 \ln\left[\frac{SSS_F}{\overline{SGASE}_F}\right] \%\ 0.467 \ln\left[\frac{TESS_F}{SSS_F}\right] \%\ 0.041\ LR_{F\&1}$$
$$(10.3)\quad (8.34)\quad (3.04)\quad (3.50)$$

$\overline{R}^2$	SER	DW	F-Ratio
0.98	0.038	1.79	430.23

O-32 Enrollment Ratio at Higher Education Institutes

$$\ln HEIENR = 3.832 \%\ 0.011 \ln\left[\frac{DEEDHEI}{\overline{SGAHEI}}\right] \%\ 0.274 \ln\left[\frac{NENSE_{M\&2} \%\ NENSE_{F\&2}}{\overline{SGAHEI}}\right]$$
$$(26.14)\quad (0.81)\quad (4.62)$$
$$\%\ 0.487 \ln\left[\frac{Y_S^r}{\overline{POP10}_M \%\ \overline{POP10}_F}\right] \%\ 0.072\ DO32_{90} \%\ 0.065\ DO32_{84}$$
$$(6.75)\quad (5.70)\quad (5.48)$$

$\overline{R}^2$	SER	DW	F-Ratio
0.99	0.015	2.27	301.45

O-33 Number of Male Enrollment at Primary Level

$$NENPR_M = PRENR_M * \overline{SGAPR}_M$$

O-34 Number of Female Enrollment at Primary Level

$$NENPR_F = PRENR_F * \overline{SGAPR}_F$$

O-35 Number of Male Enrollment at Secondary Level

$$NENSE_M = SEENR_M * \overline{SGASE}_M$$

O-36 Number of Female Enrollment at Secondary Level

$$NENSE_F = SEENR_F * \overline{SGASE}_F$$

O-37 Number of Enrollment at Higher Education Level

$$NENHEI = HEIENR * \overline{SGAHEI}$$

O-38 Output of Male From Primary Level

$$OUTPR_M = \overline{SHPR}_M * NENPR_M$$

O-39 Output of Female From Primary Level

$$OUTPR_F = \overline{SHPR}_F * NENPR_F$$

EQUATION NUMBER	$\overline{R}^2$	SER	DW	F-Ratio

O-40 Output of Male From Secondary Level

$$OUTSE_M = \overline{SHSE}_M * NENSE_M$$

O-41 Output of Female From Secondary Level

$$OUTSE_F = \overline{SHSE}_F * NENSE_F$$

O-42 Output of Higher Education Level

$$OUTHEI = \overline{SHHEI} * NENHEI$$

O-43 Male Literate

$$NLR_M = NLR_{M-1}\ (1 - \delta_4) + OUTPR_M$$

O-44 Male Literacy Ratio

$$LR_M = \frac{NLR_M}{\overline{POP10}_M} \ (\ 100$$

O-45 Female Literate

$$NLR_F = NLR_{F-1}\ (1 - \delta_6) + OUTPR_F$$

O-46 Female Literacy Ratio

$$LR_F = \frac{NLR_F}{\overline{POP10}_F} \ (\ 100$$

O-47 Number of Male Workers with Primary Education

$$\ln NWPR_M = \underset{(7.45)(}{\% 2.056} \ \underset{(\&2.21)((}{\& 0.193 \ln NENSE_M} \ \underset{(20.1)(}{\% 0.951 \ln NWPR_{M\&1}} \ \underset{(2.03)(((}{\% 0.111 \ln OUTPR_{M\&1}}$$
$$\underset{(1.95)(((}{\% 0.230 \ln \left[\frac{WW}{WW_{\&1}}\right]} \ \underset{(\&2.50)((}{\& 0.048\ DO47_{74}} \ \underset{(3.32)(}{\% 0.057\ DO47_{88}}$$

0.99	0.018	2.57	601.18

O-48 Number of Female Workers with Primary Education

$$\ln NWPR_F = \underset{(\&6.27)(}{\& 4.924} \ \underset{(24.0)(}{\% 1.427 \ln OUTPR_F} \ \underset{(0.53)}{\% 0.253 \ln \left[\frac{WW}{WW_{\&1}}\right]}$$
$$\underset{(11.3)(}{\% 0.654\ DO48_{85}}$$

0.97	0.088	1.93	219.75

O-49 Number of Male Workers with Secondary Education

$$\ln NWSE_M = \underset{(10.2)(}{\% 2.691} \ \underset{(31.9)(}{\% 0.801 \ln NWSE_{M\&1}} \ \underset{(1.19)}{\% 0.014 \ln OUTSE_M}$$
$$\underset{(\&8.14)(}{\& 0.072\ DO49_{82}} \ \underset{(5.59)(}{\% 0.065\ DO49_{88}}$$

0.99	0.014	2.28	972.38

O-50 Number of Female Workers with Secondary Education

$$\ln NWSE_F = \underset{(4.09)(}{\% 0.752} \ \underset{(33.4)(}{\% 0.898 \ln NWSE_{F\&1}} \ \underset{(1.22)}{\% 0.045 \ln OUTSE_F}$$
$$\underset{(11.8)(}{\% 0.273\ DO50_{78}} \ \underset{(\&9.99)(}{\& 0.220\ DO50_{85}} \ \underset{(13.1)(}{\% 0.204\ DO50_{91}}$$

0.99	0.022	2.59	1846.58

O-51 Number of Workers with Higher Education

$$\ln NWHEI = \underset{(27.6)(}{\% 3.678} \ \underset{(6.29)(}{\% 0.100 \ln OUTHEI} \ \underset{(36.4)(}{\% 0.638 \ln NWHEI_{\&1}}$$
$$\underset{(10.6)(}{\% 0.476\ DO51_{73}} \ \underset{(\&2.92)(}{\& 0.060\ DO51_{84}} \ \underset{(4.19)(}{\% 0.067\ DO51_{93}}$$

0.99	0.0198	2.17	2314.02

EQUATION NUMBER	$\overline{R}^2$	SER	DW	F-Ratio

O-52 Human Capital Index in Agriculture Sector

$$HCI_A = \underset{(84.2)}{-85.03} - \underset{(3.88)}{0.026}\left[\frac{NWPR_M}{1000000}\left(\overline{EXPIND}\right)\right] - \underset{(3.43)}{0.037}\left[\frac{NWPR_F}{1000000}\left(\overline{EXPIND}\right)\right] - \underset{(4.89)}{0.091}\left[\frac{(NWSE_M - NWSE_F)}{1000000}\left(\overline{EXPIND}\right)\right] - \underset{(1.86)}{2.108}\, DO52_{82}$$

0.99	1.07	1.76	1180.40

O-53 Human Capital Index in Manufacturing Sector

$$\ln HCI_M = \underset{(28.4)}{-1.823} - \underset{(5.43)}{0.144}\ln\left[\frac{NWPR_M - NWPR_F}{1000000}\left(\overline{EXPIND}\right)\right] - \underset{(7.31)}{0.249}\ln\left[\frac{NWSE_F - NWSE_M}{1000000}\left(\overline{EXPIND}\right)\right] - \underset{(1.97)}{0.016}\, DO53_{88} - \underset{(3.48)}{0.043}\, D($$

0.99	0.11	0.79	1214.25

O-54 Human Capital Index in Other Sector

$$\ln HCI_{OT} = \underset{(15.7)}{-2.354} - \underset{(3.17)}{0.222}\ln\left[\frac{NWPR_M - NWPR_F}{1000000}\left(\overline{EXPIND}\right)\right] - \underset{(3.74)}{0.230}\ln\left[\frac{NWSE_F - NWSE_M}{1000000}\left(\overline{EXPIND}\right)\right] - \underset{(0.35)}{0.011}\ln\left[NWHEI\left(\overline{EXPIND}\right)\right] - \underset{(6.57)}{0.099}\, DO54_{87} - \underset{(3.86)}{0.053}\, DO54_{88}$$

0.99	0.019	1.92	493.71