# CHAPTER 5

# RESULTS OF THE EMPIRICAL ANALYSIS

This chapter presents the results of regression analysis. The results presented separately in tables from 5.1. to 5.6. according to the dependent variables and interpretation of these tables have done according to the dependent variables. However, each equation is interpreted separately. Table 5.7. summarizes the coefficient signs and their significance in order to show how our expectations are accepted in the model. /see each equation from the chapter 4/

## 5.1. Livestock per capita (LS)

Number of livestock head is used as a proxy of GDP. The correlation coefficient between GDP and number of livestock head was 0.35.

The coefficients associated with per capita livestock head in the IMR, U5MR and crude death rate regressions ( equations 4.8; 4.9; 4.12 and table 5.2; 5.3; 5.6)* has a negative sign as expected and statistically significant at the 1 per cent level.

The life expectancy regression (equation 4.7 and table 5.1) has the expected positive sign and is significantly different from zero at the 5 per cent level. However, one year lagged value of this coefficient is not statistically significant. The result implies that a 1 per cent increase in livestock per capita is associated with an increase in life expectancy of 0.09 years at the current period when all other explanatory variables remain constant. The coefficient of adjustment shows that only 24 per cent of this increase will happen in a year.

In the crude birth rate regression (equation 4.11 and table 5.5.), the net effect of the variable was positive and statistically different from zero at the 1 per cent level. It means that by holding other explanatory variables constant, crude birth rate on the average increased by 0.02 for every 1 per cent increase in livestock head per capita.

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* See equations from the chapter 4. Page: 42-3.

## 5.2. Poverty (POV)

In the U5MR regression (equation 4.9 and table 5.3.) the coefficient has the expected sign and is statistically significant at the 1 per cent level.

Also in the crude birth rate regressions (equation 4.12 and table 5.6.), the coefficient associated with poverty incidence has a positive sign and statistically significant at the 1 per cent level. One year lagged value of this variable also has the positive sign. This opposite sign can be partly explained by the implementation of family planning policy since 1980s and the decreasing trend of infant mortality over 1990s and. Also, poverty may have more lagged effect on the crude birth rate.

The coefficient associated with poverty in the life expectancy regression (equation 4.7 and table 5.1.)is negative and statistically different from zero at the 1 per cent level. It shows that increase in poverty by 1 per cent is associated with a decrease the life expectancy approximately by 0.1 years.

In the IMR and crude death rate regressions (equation 4.8; 4.12 and table 5.2; 5.6) the coefficients have the opposite sign and are also statistically not significant in both their current and one year lagged values.

## 5.3. Education (EDUC)

In the life expectancy, IMR, U5MR regressions (equation 4.7; 4.8; 4.9 and table 5.1; 5.2; 5.3), the coefficients associated with education have the expected sign and are statistically significant at the 1 per cent level. But all current values have the opposite sign.

In the regression of crude death rate (equation 4.12 and table 5.6) it has a negative sign or the opposite of the expected sign but statistically significant at the 5 per cent level. The coefficients of education in the crude birth rate regression (equation 4.11 and table 5.5.) have the expected sign and are statistically different from zero at the 1 per cent level. It means that crude birth rate increases by 0.21 for every 1 per cent decrease in basic education level.

## 5.4. Government expenditure on health (EXPEND)

In the U5MR regression (equation 4.9 and table 5.3) the one year lagged value has the expected sign and is statistically significant at the 1 per cent level. It shows that U5MR increased by 0.42 for every 1 per cent decrease in government expenditure on health in the next year.

In the crude death rate regression (equation 4.12 and table 6.1) the coefficient associated with its current value has the expected sign and is statistically different from zero at the 2.5 per cent level. When the one year lagged value is included in the model its effect is not significant, but it has the expected sign. It indicates that the per capita public health expenditure has a direct effect on the total mortality.

However, while this determinant has the expected sign, it is not valid in the IMR and crude birth rate regressions(equation 4.8; 4.11 and table 5.2; and 5.5.). Life expectancy and MMR regression's (equation 4.7; 4.10 and table 5.1 and 5.4) coefficients do not have expected sign, but also statistically not different from zero.

Table 5.1. Dependent variable: Life expectancy (Result of the equation 4.7)

| Variable | Note | Coefficient | Std.error | P- value |
|---|---|---|---|---|
| Constant | C | 0.8880 | 0.2051 | 0.0000 |
| Life expectancy | $Log(LIFE_{t-1})$ | 0.7636 | 0.0493 | 0.0000 |
| Number of livestock | Log(LS) | 0.0703 | 0.0256 | 0.0484 |
| | $Log(LS_{t-1})$ | 0.0363 | 0.0255 | 0.0949 |
| Poverty | Log(POV) | -0.0467 | 0.0038 | 0.0000 |
| | $Log(POV_{t-1})$ | -0.0250 | 0.0036 | 0.0000 |
| Number of 8-years secondary school graduates | Log(EDUC) | 0.0293 | 0.0067 | 0.0000 |
| | $Log(EDUC_{t-1})$ | -0.0307 | 0.0070 | 0.0000 |
| Budget expenditure on health | Log(EXPEND) | 0.0043 | 0.0119 | 0.7161 |
| | $Log(EXPEND_{t-1})$ | 0.0103 | 0.0084 | 0.2270 |
| $R^2$ : 0.778303<br>Adj. $R^2$ : 0.758351<br>F-statistic: 39.00740<br>Prob(F-statistic): 0.000000<br>Observation:132 | | | | |

Table 5.2. Dependent variable: Infant mortality rate (Result of the equation 4.8)

| Variable | Note | Coefficient | Std. Error | P- value |
|---|---|---|---|---|
| Constant | C | 1.2576 | 0.7313 | 0.0886 |
| Infant mortality rate | Log(U5MR $_{t-1}$) | 0.4877 | 0.0911 | 0.0000 |
| Livestock | Log(LS) | -1.1124 | 0.3346 | 0.0012 |
| | Log(LS $_{t-1}$) | 1.0930 | 0.3323 | 0.0014 |
| Poverty | Log(POV) | 0.0111 | 0.0507 | 0.8276 |
| | Log(POV $_{t-1}$) | - 0.0380 | 0.0465 | 0.4159 |
| Number of 8-years secondary school graduates | Log(EDUC) | -0.2132 | 0.0925 | 0.0233 |
| | Log(EDUC $_{t-1}$) | 0.2215 | 0.0981 | 0.0262 |
| Government budget expenditure on health | Log(EXPEND) | 0.0082 | 0.1556 | 0.9581 |
| | Log(EXPEND $_{t-1}$) | 0.2342 | 0.1133 | 0.0413 |
| $R^2$: 0.498095<br>Adj. $R^2$: 0.452923<br>F-statistic: 11.02675<br>Prob(F-statistic): 0.000000<br>Observation: 132 | | | | |

Table 5.3. Dependent variable: Underfive mortality rate (Result of the equation 4.9)

| Variable | Note | Coefficient | Std. Error | P- value |
|---|---|---|---|---|
| Constant | C | 2.9972 | 0.8247 | 0.0004 |
| Underfive mortality rate | Log(U5MR $_{t-1}$) | 0.1066 | 0.0646 | 0.1020 |
| Livestock | Log(LS) | -1.0678 | 0.3358 | 0.0020 |
| | Log(LS $_{t-1}$) | 1.0550 | 0.3332 | 0.0020 |
| Poverty | Log(POV) | 0.5849 | 0.0508 | 0.0000 |
| | Log(POV$_{t-1}$) | -0.2063 | 0.0468 | 0.0005 |
| Number of 8-years secondary school graduates | Log(EDUC) | -0.3996 | 0.0909 | 0.0000 |
| | Log(EDUC $_{t-1}$) | 0.4048 | 0.0942 | 0.0000 |
| Government budget expenditure on health | Log(EXPEND) | -0.1578 | 0.1611 | 0.3297 |
| | Log(EXPEND $_{t-1}$) | 0.4197 | 0.1375 | 0.0029 |
| $R^2$: 0.386667<br>Adj. $R^2$: 0.331467<br>F-statistic: 7.004836<br>Prob(F-statistic): 0.000000<br>Observation: 132 | | | | |

Table 5.4. Dependent variable: Maternal mortality rate (Result of the equation 4.10)

| Variable | Note | Coefficient | Std. Error | P- value |
|---|---|---|---|---|
| Constant | C | 3.1013 | 2.8699 | 0.2825 |
| Maternal mortality rate | $Log(MMR_{t-1})$ | 0.3063 | 0.0982 | 0.0024 |
| Livestock | Log(LS) | -0.8139 | 1.3653 | 0.5524 |
| | $Log(LS_{t-1})$ | 0.7427 | 1.3577 | 0.5856 |
| Poverty | Log(POV) | 0.0806 | 0.2066 | 0.6970 |
| | $Log(POV_{t-1})$ | 0.1032 | 0.1923 | 0.5926 |
| Number of 8-years secondary school graduates | Log(EDUC) | -0.1191 | 0.3630 | 0.7435 |
| | $Log(EDUC_{t-1})$ | 0.4001 | 0.3760 | 0.2899 |
| Government budget expenditure on health | Log(EXPEND) | -0.7412 | 0.6472 | 0.2548 |
| | $Log(EXPEND_{t-1})$ | -0.1201 | 0.4606 | 0.7948 |
| $R^2$: 0.190683<br>Adj. $R^2$: 0.117844<br>F-statistic: 2.617878<br>Prob(F-statistic): 0.009276<br>Observation: 132 | | | | |

Table 5.5. Dependent variable: Crude birth rate (Result of the equation 4.11)

| Variable | Note | Coefficient | Std.error | P- value |
|---|---|---|---|---|
| Constant | C | 0.3389 | 0.2931 | 0.2504 |
| Crude birth rate | $Log(CBR_{t-1})$ | 0.6467 | 0.0552 | 0.0000 |
| Livestock | Log(LS) | 0.4783 | 0.1393 | 0.0009 |
| | $Log(LS_{t-1})$ | -0.4550 | 0.1387 | 0.0014 |
| Poverty | Log(POV) | 0.3419 | 0.0811 | 0.0007 |
| | $Log(POV_{t-1})$ | 0.4119 | 0.0797 | 0.0001 |
| Number of 8-years secondary school graduates | Log(EDUC) | 0.1066 | 0.0382 | 0.0054 |
| | $Log(EDUC_{t-1})$ | -0.1028 | 0.0402 | 0.0021 |
| Government budget expenditure on health | Log(EXPEND) | 0.0258 | 0.0660 | 0.6965 |
| | $Log(EXPEND_{t-1})$ | 0.0833 | 0.0501 | 0.1000 |
| $R^2$: 0.755613<br>Adj. $R^2$: 0.733618<br>F-statistic: 34.35415<br>Prob(F-statistic): 0.000000<br>Observation: 132 | | | | |

Table 5.6. Dependent variable: Crude death rate (Result of the equation 4.12)

| Variable | Note | Coefficient | Std.error | P- value |
|---|---|---|---|---|
| Constant | C | -0.20226 | 0.3552 | 0.5097 |
| Crude death rate | $Log(CDR_{t-1})$ | 0.6079 | 0.0682 | 0.0000 |
| Livestock | Log(LS) | -0.4595 | 0.1704 | 0.0133 |
| | $Log(LS_{t-1})$ | 0.4337 | 0.1702 | 0.0124 |
| Poverty | Log(POV) | 0.0224 | 0.0262 | 0.3949 |
| | $Log(POV_{t-1})$ | -0.0323 | 0.0238 | 0.1796 |
| Number of 8-years secondary school graduates | Log(EDUC) | -0.0819 | 0.0454 | 0.0742 |
| | $Log(EDUC_{t-1})$ | 0.0725 | 0.0480 | 0.1345 |
| Government budget expenditure on health | Log(EXPEND) | 0.1726 | 0.0793 | 0.0319 |
| | $Log(EXPEND_{t-1})$ | 0.0392 | 0.0607 | 0.5192 |
| $R^2$: 0.668597<br>Adj. $R^2$: 0.638770<br>F-statistic: 22.41635<br>Prob(F-statistic): 0.000000<br>Observation: 132 | | | | |

Table 5.7. Summary table for signs and significance of partial regression coefficients

| Independent Variable / Regression | Livestock per capita | Poverty incidence | Education | Government expenditure on health |
|---|---|---|---|---|
| 1.Life expectancy regression | Expected | Expected | Expected | Expected (not significant) |
| 2. IMR regression | Expected | Opposite (not significant) | Expected | Expected (not significant) |
| 3. U5MR regression | Expected | Expected | Expected | Expected |
| 4. MMR regression | Expected (not significant) | Expected (not significant) | Expected (not significant) | Opposite (not significant) |
| 5. Crude birth rate regression | Expected | Opposite | Expected | Not significant |
| 6. Crude death rate regression | Expected | Opposite (not significant) | Opposite | Expected |

Table 5.8. Total distributed lag multiplier for each dependent variable

| Independent Variable / Regression | Livestock per capita | Poverty incidence | Education | Government expenditure on health |
|---|---|---|---|---|
| 1.Life expectancy regression | 0.1066 | -0.0717 | -0.0014 | Not significant |
| 2. IMR regression | -1.0194 | Not significant | 0.0083 | Not significant |
| 3. U5MR regression | -0.0128 | 0.3786 | 0.0052 | 0.2619 |
| 4. MMR regression | Not significant | Not significant | Not significant | Not significant |
| 5. Crude birth rate regression | 0.0233 | 0.7538 | 0.0038 | Not significant |
| 6. Crude death rate regression | -0.0258 | Not significant | -0.0094 | 0.2118 |

The above table (table5.8) presents the long-run or total, distributed lag multiplier, which is provided by the sum β exists. It can be obtained after k periods by as the following:

$$\sum_{i=0}^{k} \beta_I = \beta_0 + \beta_1 + \beta_2 + \ldots\ldots\ldots + \beta_k = \beta$$

Table 5.9. Correlation coefficients between independent variables.

| | LS | POV | EXPEND | EDUC |
|---|---|---|---|---|
| LS | 1.000000 | | | |
| POV | 0.308812 | 1.000000 | | |
| EXPEND | 0.330492 | -0.354560 | 1.000000 | |
| EDUC | 0.648566 | -0.190031 | 0.409155 | 1.000000 |

The table 5.9 presents the result of correlation analysis between independent variables. It shows there is no multicollinearity among the explanatory variables.

Table 5.10. Coefficients of adjustment

| | LE | IMR | MMR | U5MR | CBR | CDR |
|---|---|---|---|---|---|---|
| Coefficient of adjustment | 0.24 | 0.51 | 0.69 | 0.89 | 0.35 | 0.39 |

The table 5.10 shows that the coefficient of adjustment of the each equation. For instance, In the life expectancy equation, the coefficient of adjustment is δ = 1 - 0.76 =

0.24, implying that about 24 per cent of a changes in life expectancy will happen in a year.

The following table /table 5.11/ shows the results of regression analysis when dependent variable was per capita livestock head. When one year lagged values of explanatory variables are included in the model, the overall significance of the regression equation decreases until 0.2632 and all variables are not significant except crude birth rate, may be because of the decreased degree of freedom. Therefore, lagged values of explanatory variables are excluded from the model. However, lagged values of an explanatory variables can be substituted by the lagged value of the dependent variable which is included in the model.

Table 5.11. Dependent variable: Per capita livestock head (Result of the equation 4.13)

| Variable | Note | Coefficient | Std.error | P- value |
|---|---|---|---|---|
| Constant | C | -0.5751 | 0.2069 | 0.0065 |
| Per capita livestock head | $Log(LS_{t-1})$ | 0.9877 | 0.0073 | 0.0000 |
| Infant mortality rate | Log(IMR) | -0.0707 | 0.0434 | 0.1063 |
| Underfive mortality rate | Log(U5MR) | -0.0321 | 0.0458 | 0.4839 |
| Maternal mortality rate | Log(MMR) | -0.0021 | 0.0072 | 0.7819 |
| Life expectancy | Log(LIFE) | -0.2331 | 0.1209 | 0.0912 |
| Crude birth rate | Log(CBR) | 0.1523 | 0.0441 | 0.0008 |
| Crude death rate | Log(CDR) | -0.0561 | 0.0448 | 0.2124 |
| $R^2$: 0.855425<br>Adj. $R^2$: 0.848770<br>DW stat: 1.676647<br>F-statistic: 1022.416<br>Prob(F-statistic): 0.000000<br>Observation: 132 | | | | |

The coefficients associated with infant mortality has negative sign and is statistically significant at the 10 per cent level. If we compare the sign of the coefficient with the trend of infant mortality, this result does not indicate the statistical relationship between per capita livestock head and infant mortality. It means that infant mortality does not have direct impact on the economic growth in the short run. Also, infant mortality indicator includes both neonatal and post-natal deaths. Neonatal deaths (within 28 days of birth) are usually related to the congenital anomalies, prematurity, and complications of delivery. Post-natal deaths (after 28 days, but within one year) are frequently result of infectious diseases or accidents. Therefore, it is may not valid indicator..

Life expectancy is significantly linked to the per capita livestock head at the 10 per cent level. The coefficient –0.2331 implies that a decrease in life expectancy of per cent is associated with decline in economic growth of 0.23 per cent.

The crude birth rate coefficient has the positive sign and also statistically significant at the 1 per cent level. It implies that per capita livestock head increase by one for every one per cent decrease in the crude birth rate.

The coefficients associated with the determinants maternal mortality, underfive mortality and death rate have the negative signs and are not statistically significant. It shows that these indicators do not have relationship with the economic growth in the short run. Also, for instance, crude death rate indicator is not age and sex specific, and all of these indicators do not reflect economic burden of diseases.