# Phase 3: First Draft

Group No.: 25

Mukul Nayak (1906323), Ajit Singh Yadav (180030001), Shivam Tiwari (180030029)

**Abstract:**

This paper aims to examine the effect of secondary/high school education (IX-XII) on poverty. The Gross Enrolment Ratio for Classes IX-XII is the education variable. The poverty Rate during 2011-12 is the dependent variable. Other explanatory variables used include the literacy rate, unemployment rate, percentage of the population living in urban areas, per capita net state domestic product and labor force participation rate. We gathered data for this study from 2011 to 2012.

To begin, we created a simple regression model with only a primary independent variable and a dependent variable to estimate the impact of education on poverty in the absence of other variables. Then we created a multiple regression model that included all other explanatory variables and discussed their effects and significance. Then we created model 3 by removing statistically insignificant variables from model 2. We used F-statistics and t-statistics to determine whether or not the variables were statistically significant.

We discovered a significant negative relationship between education and poverty through this study.

**Topic:** The Effect of Education on Poverty

## Introduction & Motivation

The importance of education is acknowledged as the great equalizer, as it can provide a family with the necessary skills and resources to succeed. Access to high-quality education is also known to reduce poverty. Various factors such as economic development, maternal and newborn mortality, and HIV/AIDS can also be linked to education. People have long relied on education to get more excellent pay in the market. It allows us to expand our knowledge, develop new talents, progress as a person, and obtain helpful experience.

This study will use cross-sectional data to develop simple and multiple linear regression models to show the relationship between education and poverty.

## Literature Review

Citak and Duffy (2020) studied the effects of education on poverty in Turkey. They used a cross-sectional study to analyze the two-way causality between the household head's education level and poverty in Turkey. The researchers used an Instrumental Variable (IV) estimation technique, two-stage least squares (2SLS) regression to analyze the effects of education on poverty in Turkey. They then compared the effects of two education reforms in

1961 and 1997. They then identified the causal relationship between education and poverty. The researchers found that the educational reforms in 1961 and 1997 increased the number of years of schooling by about 20 percent and 9 percent, respectively. They also found that these reforms led to an increase in household income by about 7%. They concluded that the number of schooling years increased due to the reforms, which resulted in a higher household income.

Thabita Lameck Lupeja and Qi Gubo (2017) examined the contribution of knowledge and skills acquired from secondary education to self-employment among graduates in the Mvomeero District of Tanzania. Through a quantitative method, 400 individuals were interviewed. The study was conducted through a systematic interviewing process. A self-administered questionnaire was then used to collect opinions on the effects of knowledge and skills acquired from secondary education on poverty reduction. The results indicated that secondary education could contribute to reducing poverty.

Pervez Zamurrad Janjua and Usman Ahmed Kamal (2011) analyzed the data collected from 40 developing countries from 1999 to 2007. It estimated the coefficients by applying the random effect generalized least squares (GLS) technique. It found that income growth is associated with a positive effect on reducing poverty but does not play a significant role in reducing poverty. The study led to three conclusions, i.e., during the observed period, per capita income growth played a moderate role in poverty reduction in the selected countries; only in nations with higher per capita incomes did income inequality have a more significant influence on poverty alleviation. Finally, secondary education has emerged as the most significant contribution to poverty reduction.

Aloysius Mom Njong (2010) analyzed the effects of different levels of education on employed individuals as determinants of poverty in Cameroon. The data for this research came from a 2001 household survey in Cameroon. A sample-selectivity adjusted logistic regression model was used to analyze the data. The results indicated that the probability of being poor was related to the employed individual's level of education and experience. The results show that improving experience and education reduces the probability of being poor of the employed individual. Regarding gender, the study concludes that men's education levels help reduce poverty more than women's.

The literature review leads us to various conclusions like education may increase an individual's income by increasing productivity hence significantly reducing poverty. Aside from being beneficial to the individual, education also has a wide range of externalities that can improve the lives of poor people. For instance, it can help lower infant mortality, improve parental education, reduce health risks, reduced stunting, and reduced violence at home and in society. The effects of education on poverty can vary depending on the region and the level of education. This suggests that studying the link between education and poverty is essential. There is also a need to study the various factors that affect education development in different regions. It is evident that we must first understand what causes it to reduce poverty effectively. This study plans to do the same.

**Research Question:** What is the Effect of Education on Poverty?

This paper will discuss the effect education has on poverty. As education increases, people acquire various skills that help them land a good job, and their income sources increase; hence poverty decreases. Hence there is a causal relationship between education and poverty.

The hypothesis is that education has a negative impact on poverty rates; therefore, as education rates increase poverty decreases. In this study, we develop a regression model with education level as our independent variable and examine its causality upon poverty rate. This study is to research on the education-poverty relationship and try to check whether the hypothesis is correct or not.

**Methodology**

***Data***

Cross Section type data of 32 States and UTs of India is taken for the year 2011-12. The dependent variable used is the Poverty Rate (*pov*) in each state. The primary independent variable used is the Gross Enrolment Ratio (*ger*) for classes IX-XII.

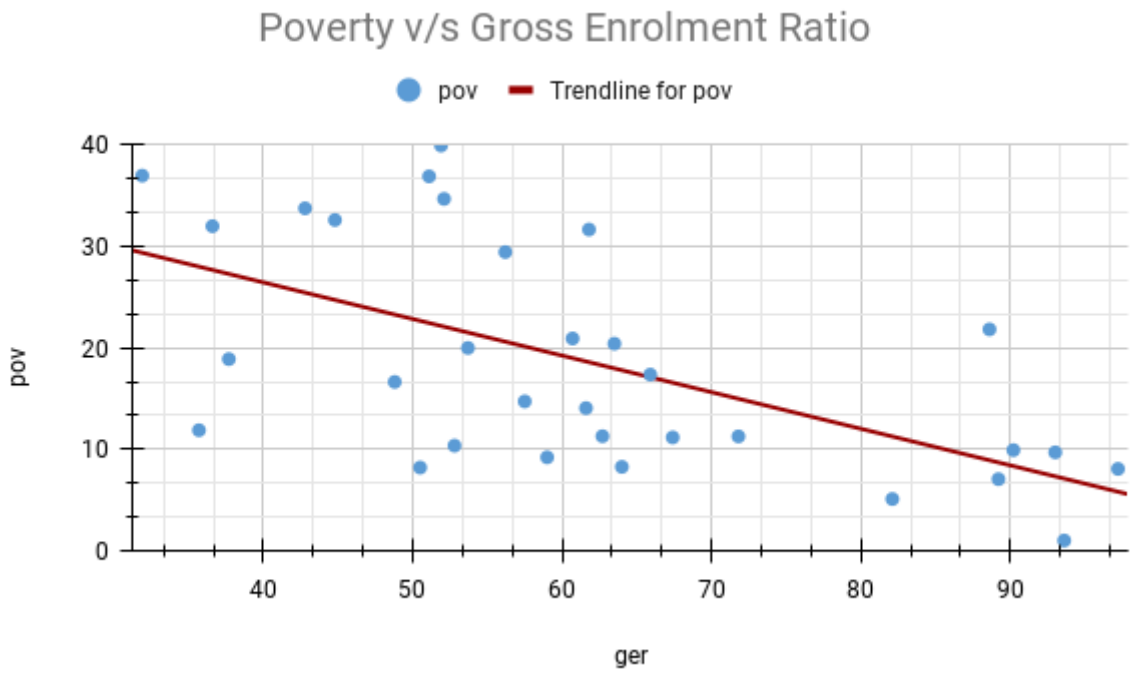


**Figure 1 – Scatter Plot of *pov* v/s *ger***

There are few other independent variables for multiple linear regression model to uncover the ceteris paribus effect education has on the poverty rate. The other independent variables are Literacy Rate, Labour Force Participation Rate, Unemployment Rate, Per Capita Net State Domestic Product and Percentage of Population in Urban Area.

**Table 1 – Variables Description**

| *Sl No* | *Name* | *Description* | *Source* |
|---|---|---|---|
| 1 | *pov* | Poverty Rate (%) 2011-12 (Based on MRP Consumption) | Planning Commission, National Sample Survey Organization (NSSO), Government of India. |
| 2 | *ger* | Gross Enrolment Ratio (Classes IX-XII) | Statistics of School Education 2011-12 |
| 3 | *lit* | Literacy Rate (%) | Census 2011 |
| 4 | *lfpr* | Labour Force Participation Rate (per 1000) | Key Indicators of Employment and Unemployment in India, NSS 68$^{th}$ Round (2011-12) |
| 5 | *unemp* | Unemployment Rate (per 1000) | Key Indicators of Employment and Unemployment in India, NSS 68$^{th}$ Round (2011-12) |
| 6 | *nsdp* | Per Capita Net State Domestic Product in ₹ , 2011-12 (At Current Prices) (Base : 2011-12) | National Statistical Office (NSO) |
| 7 | *urb* | Percentage of Population in Urban Area (%) | Handbook of Statistics on Indian States, Reserve Bank of India |

The descriptive statistics for each variable are shown in the table below.

**Table 2 – Descriptive Statistics**

| *Variable* | *Sample Size* | *Mean* | *Median* | *Standard Deviation* | *Minimum* | *Maximum* |
|---|---|---|---|---|---|---|
| *pov* | 32.000 | 18.592 | 15.670 | 11.086 | 1.000 | 39.930 |
| *ger* | 32.000 | 61.763 | 59.850 | 18.256 | 31.900 | 97.200 |
| *lit* | 32.000 | 77.176 | 76.600 | 8.448 | 61.800 | 94.000 |
| *lfpr* | 32.000 | 408.969 | 404.000 | 52.635 | 283.000 | 526.000 |
| *unemp* | 32.000 | 35.469 | 25.000 | 35.144 | 5.000 | 177.000 |
| *nsdp* | 32.000 | 83101.656 | 71270.000 | 50095.139 | 21750.000 | 259444.000 |
| *urb* | 32.000 | 36.228 | 29.716 | 20.984 | 10.036 | 97.504 |

***Methodology***

To begin, a simple regression model will be created to check the hypothesis and to estimate the ceteris paribus impact of education on poverty.

$$pov = \beta_0 + \beta_1(ger) \pm \varepsilon$$

Then model 2 will be developed incorporating other explanatory variables.

$$pov = \beta_0 + \beta_1(ger) + \beta_2(lit) + \beta_3(lfpr) + \beta_4(unemp) + \beta_5(nsdp) + \beta_6(urb) \pm \varepsilon$$

In this model statistical significance of variables will be checked using t-statistics and p-values.

Now, the final multiple regression model will be created by omitting statistically insignificant variables from the model 2. And finally using F-tests it would we be checked whether those eliminated variables are jointly significant or not.

We will analyze the education-poverty relationship in this study and see if our hypothesis is valid or not.

**Empirical Results:**

**Model 1 – Simple Regression Model**

In this simple regression model, dependent variable is *pov* and independent variable is *ger*.

$$pov = \beta_0 + \beta_1(ger) \pm \varepsilon$$

OLS Regression Results

| | | | |
|---|---|---|---|
| Dep. Variable: | pov | R-squared: | 0.353 |
| Model: | OLS | Adj. R-squared: | 0.331 |
| Method: | Least Squares | F-statistic: | 16.36 |
| Date: | Sun, 08 May 2022 | Prob (F-statistic): | 0.000338 |
| Time: | 12:35:00 | Log-Likelihood: | -114.92 |
| No. Observations: | 32 | AIC: | 233.8 |
| Df Residuals: | 30 | BIC: | 236.8 |
| Df Model: | 1 | | |
| Covariance Type: | nonrobust | | |

| | coef | std err | t | P>\|t\| | [0.025 | 0.975] |
|---|---|---|---|---|---|---|
| const | 40.8715 | 5.737 | 7.125 | 0.000 | 29.156 | 52.588 |
| ger | -0.3607 | 0.089 | -4.045 | 0.000 | -0.543 | -0.179 |

| | | | |
|---|---|---|---|
| Omnibus: | 1.738 | Durbin-Watson: | 1.855 |
| Prob(Omnibus): | 0.419 | Jarque-Bera (JB): | 1.206 |
| Skew: | 0.206 | Prob(JB): | 0.547 |
| Kurtosis: | 2.143 | Cond. No. | 230. |

From the above OLS regression results, the estimated equation is as follows:

$$pov = 40.8715 - 0.3607(ger) \pm 0.089$$

The coefficient term is -0.3607 for the primary independent variable *ger*, this negative coefficient term validates the hypothesis that education has a negative impact on poverty rates, it indicates if *ger* increases by 1 unit then *pov* decreases by 0.3607 units.

The t value for *ger* is -4.045. It is statistically significant at the 1%, 5%, and 10% levels of significance. The R-squared for this model is 0.353 which means 35.3% variation in *pov* can be explained by *ger*.

**Model 2 – Multiple Regression Model (incorporating other explanatory variables)**

To further enhance the Model 1, other explanatory variables like *lit, lfpr, unemp, nsdp* and *urb* are also taken into account.

$$pov = \beta_0 + \beta_1(ger) + \beta_2(lit) + \beta_3(lfpr) + \beta_4(unemp) + \beta_5(nsdp) + \beta_6(urb) \pm \varepsilon$$

OLS Regression Results

| | | | |
|---|---|---|---|
| Dep. Variable: | pov | R-squared: | 0.533 |
| Model: | OLS | Adj. R-squared: | 0.421 |
| Method: | Least Squares | F-statistic: | 4.752 |
| Date: | Sun, 08 May 2022 | Prob (F-statistic): | 0.00234 |
| Time: | 18:25:15 | Log-Likelihood: | -109.70 |
| No. Observations: | 32 | AIC: | 233.4 |
| Df Residuals: | 25 | BIC: | 243.7 |
| Df Model: | 6 | | |
| Covariance Type: | nonrobust | | |

| | coef | std err | t | P>\|t\| | [0.025 | 0.975] |
|---|---|---|---|---|---|---|
| const | 67.5886 | 18.262 | 3.701 | 0.001 | 29.978 | 105.200 |
| ger | -0.2435 | 0.126 | -1.926 | 0.066 | -0.504 | 0.017 |
| lit | -0.1023 | 0.333 | -0.307 | 0.761 | -0.788 | 0.583 |
| lfpr | -0.0518 | 0.035 | -1.501 | 0.146 | -0.123 | 0.019 |
| unemp | -0.0329 | 0.051 | -0.649 | 0.523 | -0.137 | 0.072 |
| nsdp | -8.546e-05 | 4.62e-05 | -1.849 | 0.076 | -0.000 | 9.72e-06 |
| urb | 0.0937 | 0.122 | 0.765 | 0.451 | -0.159 | 0.346 |

| | | | |
|---|---|---|---|
| Omnibus: | 1.029 | Durbin-Watson: | 2.071 |
| Prob(Omnibus): | 0.598 | Jarque-Bera (JB): | 0.649 |
| Skew: | 0.348 | Prob(JB): | 0.723 |
| Kurtosis: | 2.949 | Cond. No. | 1.18e+06 |

From the above OLS regression results, the estimated equation is as follows:

$$pov = 67.5886 - 0.2435(ger) - 0.1023(lit) - 0.0518(lfpr) - 0.0329(unemp) - 0.00008546(nsdp) + 0.0937(urb) \pm \varepsilon$$

The R-squared value for this model is 0.533 which means 53.3% variation in *pov* can be explained collectively by the independent variables around its mean.

The coefficient term for the primary independent variable *ger* is -0.2435, this negative coefficient term still validates the hypothesis that education has a negative impact on poverty rates and if *ger* increases by 1% then *pov* decreases by 0.2435%. Moreover, it has t-statistic of -1.926 and a p-value of 0.066 which means it is statistically significant at close to 5% and the 10% level.

The p-values for *lit, unemp* and *urb* are 0.761, 0.523 and 0.451 respectively, which are not statistically significant even at 10% level, hence these statistically insignificant variables can be removed in further models.

The t-statistic for *lfpr* is -1.501 and the p-value is 0.146, so it is statistically significant at the 15% level.

The coefficient term for *nsdp* is -0.00008546 which is very low but it has t-statistic of -1.849 and the p-value is 0.076, so it is statistically significant at the 10% level. Hence, it will not be eliminated.

**Model 3 – Multiple Regression Model (omitting statistically insignificant variables)**

Statistically insignificant variables like *lit, unemp, and urb* are eliminated and new multiple regression is being performed in this model.

$$pov = \beta_0 + \beta_1(ger) + \beta_2(lfpr) + \beta_3(nsdp) \pm \varepsilon$$

OLS Regression Results

| | | | |
|---|---|---|---|
| Dep. Variable: | pov | R-squared: | 0.509 |
| Model: | OLS | Adj. R-squared: | 0.456 |
| Method: | Least Squares | F-statistic: | 9.668 |
| Date: | Sun, 08 May 2022 | Prob (F-statistic): | 0.000152 |
| Time: | 21:26:53 | Log-Likelihood: | -110.51 |
| No. Observations: | 32 | AIC: | 229.0 |
| Df Residuals: | 28 | BIC: | 234.9 |
| Df Model: | 3 | | |
| Covariance Type: | nonrobust | | |

| | coef | std err | t | P>\|t\| | [0.025 | 0.975] |
|---|---|---|---|---|---|---|
| const | 65.1242 | 12.252 | 5.315 | 0.000 | 40.027 | 90.222 |
| ger | -0.2337 | 0.101 | -2.320 | 0.028 | -0.440 | -0.027 |
| lfpr | -0.0644 | 0.028 | -2.304 | 0.029 | -0.122 | -0.007 |
| nsdp | -6.908e-05 | 3.67e-05 | -1.885 | 0.070 | -0.000 | 5.99e-06 |

| | | | |
|---|---|---|---|
| Omnibus: | 2.699 | Durbin-Watson: | 1.994 |
| Prob(Omnibus): | 0.259 | Jarque-Bera (JB): | 1.863 |
| Skew: | 0.589 | Prob(JB): | 0.394 |
| Kurtosis: | 3.101 | Cond. No. | 8.19e+05 |

From the above OLS regression results, the estimated equation is as follows:

$$pov = 65.1242 - 0.2337(ger) - 0.0644(lfpr) - 0.00006908(nsdp) \pm \varepsilon$$

The R-squared value for this model is 0.509 which means 50.9% variation in *pov* can be explained collectively by the independent variables *ger, lfpr* and *nsdp* around its mean.

The coefficient term for the primary independent variable *ger* is -0.2337, this negative coefficient term still validates the hypothesis that education has a negative impact on poverty rates and if *ger* increases by 1% then *pov* decreases by 0.2337%. Moreover, it has t-statistic of -2.320 and a p-value of 0.028 which means it is statistically significant at 5% and the 10% level.

The coefficient term for *lfpr* is -0.0644 which means if *lfpr* increases by 1% then *pov* decreases by 0.0644% and it has t-statistic of -2.304 and a p-value of 0.029 which means it is statistically significant at 5% and the 10% level.

The t-statistic of *nsdp* is -1.885 and a p-value of 0.070 which means it is statistically significant at the 10% level.

**Table 3 – Regression Models Summary**

| **Dependent Variable :** *pov* | | | | |
|---|---|---|---|---|
| | | **Model 1** | **Model 2** | **Model 3** |
| **Independent Variables** | *ger* | -0.3607***<br>(0.089) | -0.2435**<br>(0.126) | -0.2337**<br>(0.101) |
| | *lit* | - | -0.1023<br>(0.333) | - |
| | *lfpr* | - | -0.0518<br>(0.035) | -0.0644**<br>(0.028) |
| | *unemp* | - | -0.0329<br>(0.051) | - |
| | *nsdp* | - | -0.00008546*<br>(0.0000462) | -0.00006908*<br>(0.0000367) |
| | *urb* | - | 0.0937<br>(0.122) | - |
| **Intercept** | | 40.8715<br>(5.737) | 67.5886<br>(18.262) | 65.1242<br>(12.252) |
| **Sample Size** | | 32 | 32 | 32 |
| **R-squared** | | 0.353 | 0.533 | 0.509 |
| **Adj. R-squared** | | 0.331 | 0.421 | 0.456 |

*Significant at *10%, **5%, ***1%*

**F-Test:**

In Model 2 it was concluded that *lit, unemp* and *urb* were individually statistically insignificant and hence they were eliminated in Model 3. Now using F-test it will be examined whether they are jointly significant or not.

For this test Model 2 will be Unrestricted Model and Model 3 will be Restricted Model.

Unrestricted Model:

$$pov = 67.5886 - 0.2435(ger) - 0.1023(lit) - 0.0518(lfpr) - 0.0329(unemp) - 0.00008546(nsdp) + 0.0937(urb) \pm \varepsilon$$

Restricted Model:

$$pov = 65.1242 - 0.2337(ger) - 0.0644(lfpr) - 0.00006908(nsdp) \pm \varepsilon$$

Hypothesis:

$$H_0 : \beta_2 = \beta_4 = \beta_6 = 0$$

$$H_1 : \beta_2 = \beta_4 = \beta_6 \neq 0$$

On Solving:

$$F = \frac{(R^2_{um} - R^2_{rm})/q}{(1 - R^2_{um})/(n - k - 1)}$$

$$F = \frac{(0.533 - 0.509)/3}{(1 - 0.533)/(32 - 6 - 1)}$$

$$F = \frac{0.008}{0.467/25}$$

$$F = 0.428$$

From the F-Distribution tables the critical values are known i.e.

$F_{0.001,3,25} = 7.45,$

$F_{0.010,3,25} = 4.68,$

$F_{0.025,3,25} = 3.69,$

$F_{0.050,3,25} = 2.99,$

$F_{0.100,3,25} = 2.32$

Now,

$F( =0.428) < F_{0.001,3,25}( =7.45)$, $F( =0.428) < F_{0.010,3,25}( =4.68)$, $F( =0.428) < F_{0.025,3,25}( =3.69)$, $F( =0.428) < F_{0.050,3,25}( =2.99)$ and $F( =0.428) < F_{0.100,3,25}( =2.32)$, hence *lit, unemp* and *urb* are not jointly significant at any of the 0.1%, 1%, 2.5%, 5% and 10% significance level.

It can be seen that we fail to reject null hypothesis at every significance level discussed above, hence it can be concluded that *lit, unemp* and *urb* are not jointly significant (or jointly insignificant).

**Conclusion:**

The original hypothesis is still valid after testing the significance of the various independent variables in different models. A negative relationship between poverty and education can be seen in each model.

In Model 1, simple linear regression was used to test if *ger* significantly affected *pov*. The overall regression was statistically significant with R-squared of 0.353 and *ger* was statistically significant at the 1%, 5%, and 10% levels of significance.

In Model 2, simple linear regression with all other explanatory variable was used. R-squared value for this model is 0.533. It was concluded that *lit, unemp* and *urb* were statistically insignificant.

In Model 3, the statistically insignificant variables were eliminated and R-squared was found to be 0.509. The R-squared value slightly decreased from Model 2 but Adj. R-squared was increased from 0.421 to 0.456 which means this model is better.

In F-Test it can be seen that we fail to reject null hypothesis at every significance level, hence model 3 is better than model 2.

The coefficient term for the primary independent variable *ger* is -0.3607 and -0.2435 in model 1 and model 2 respectively. And in model 3 the coefficient term for *ger* is -0.2337 which means if *ger* increases by 1% then *pov* decreases by 0.2337%. Moreover, it has t-statistic of -2.320 and a p-value of 0.028 which means it is statistically significant at 5% and the 10% level.

From model 2 and F-Test we can conclude that *lit, unemp* and *urb* are statistically insignificant when considered jointly or independently.

The variables that were statistically significant throughout the study were *ger, lfpr* and *nsdp*.

We cannot observe the influence of education on poverty in other countries or on grade school education since the data in the study solely focus on India and only examine high school education. The findings of this analysis show that additional research in this area is required. Several secondary independent variables can be added to regression models to illustrate the situation. Cross-country analysis can also help to further the investigation.

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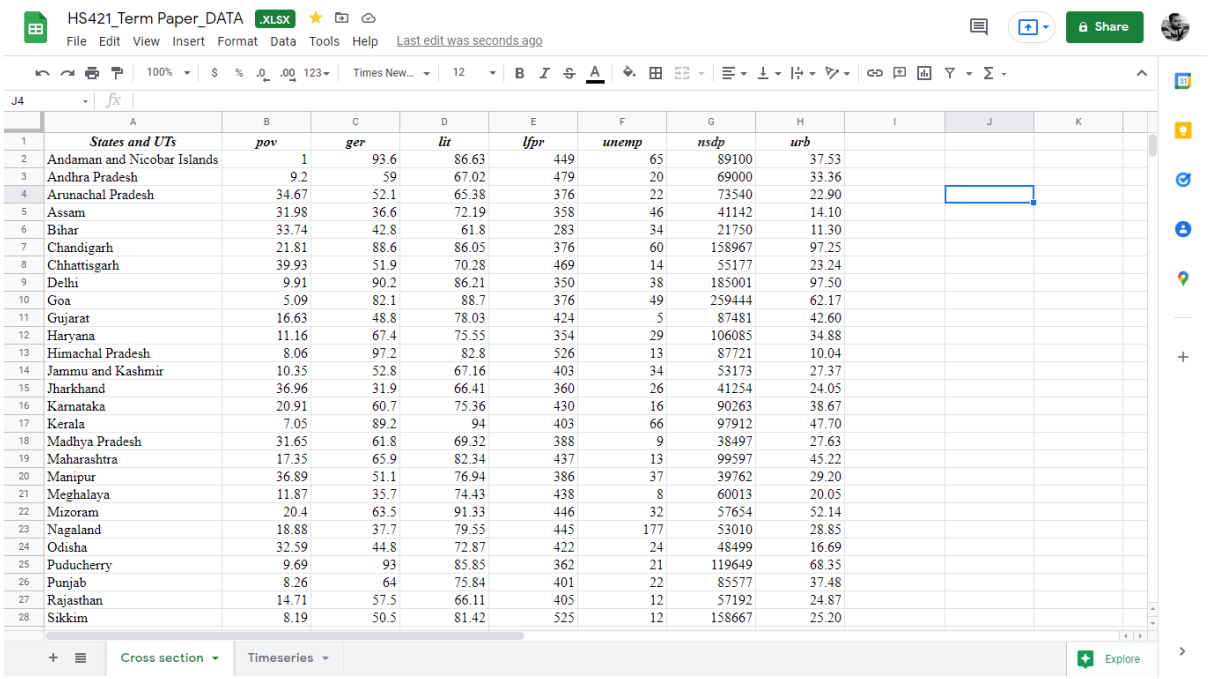
## Appendix:

Screenshot of Data Sheet



HS421_Term Paper_DATA .XLSX

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Share

| | States and UTs | pov | ger | lit | lfpr | unemp | nsdp | urb |
|---|---|---|---|---|---|---|---|---|
| 2 | Andaman and Nicobar Islands | 1 | 93.6 | 86.63 | 449 | 65 | 89100 | 37.53 |
| 3 | Andhra Pradesh | 9.2 | 59 | 67.02 | 479 | 20 | 69000 | 33.36 |
| 4 | Arunachal Pradesh | 34.67 | 52.1 | 65.38 | 376 | 22 | 73540 | 22.90 |
| 5 | Assam | 31.98 | 36.6 | 72.19 | 358 | 46 | 41142 | 14.10 |
| 6 | Bihar | 33.74 | 42.8 | 61.8 | 283 | 34 | 21750 | 11.30 |
| 7 | Chandigarh | 21.81 | 88.6 | 86.05 | 376 | 60 | 158967 | 97.25 |
| 8 | Chhattisgarh | 39.93 | 51.9 | 70.28 | 469 | 14 | 55177 | 23.24 |
| 9 | Delhi | 9.91 | 90.2 | 86.21 | 350 | 38 | 185001 | 97.50 |
| 10 | Goa | 5.09 | 82.1 | 88.7 | 376 | 49 | 259444 | 62.17 |
| 11 | Gujarat | 16.63 | 48.8 | 78.03 | 424 | 5 | 87481 | 42.60 |
| 12 | Haryana | 11.16 | 67.4 | 75.55 | 354 | 29 | 106085 | 34.88 |
| 13 | Himachal Pradesh | 8.06 | 97.2 | 82.8 | 526 | 13 | 87721 | 10.04 |
| 14 | Jammu and Kashmir | 10.35 | 52.8 | 67.16 | 403 | 34 | 53173 | 27.37 |
| 15 | Jharkhand | 36.96 | 31.9 | 66.41 | 360 | 26 | 41254 | 24.05 |
| 16 | Karnataka | 20.91 | 60.7 | 75.36 | 430 | 16 | 90263 | 38.67 |
| 17 | Kerala | 7.05 | 89.2 | 94 | 403 | 66 | 97912 | 47.70 |
| 18 | Madhya Pradesh | 31.65 | 61.8 | 69.32 | 388 | 9 | 38497 | 27.63 |
| 19 | Maharashtra | 17.35 | 65.9 | 82.34 | 437 | 13 | 99597 | 45.22 |
| 20 | Manipur | 36.89 | 51.1 | 76.94 | 386 | 37 | 39762 | 29.20 |
| 21 | Meghalaya | 11.87 | 35.7 | 74.43 | 438 | 8 | 60013 | 20.05 |
| 22 | Mizoram | 20.4 | 63.5 | 91.33 | 446 | 32 | 57654 | 52.14 |
| 23 | Nagaland | 18.88 | 37.7 | 79.55 | 445 | 177 | 53010 | 28.85 |
| 24 | Odisha | 32.59 | 44.8 | 72.87 | 422 | 24 | 48499 | 16.69 |
| 25 | Puducherry | 9.69 | 93 | 85.85 | 362 | 21 | 119649 | 68.35 |
| 26 | Punjab | 8.26 | 64 | 75.84 | 401 | 22 | 85577 | 37.48 |
| 27 | Rajasthan | 14.71 | 57.5 | 66.11 | 405 | 12 | 57192 | 24.87 |
| 28 | Sikkim | 8.19 | 50.5 | 81.42 | 525 | 12 | 158667 | 25.20 |

Cross section | Timeseries | Explore