Tentative Research on the Causes of Declining Birthrate

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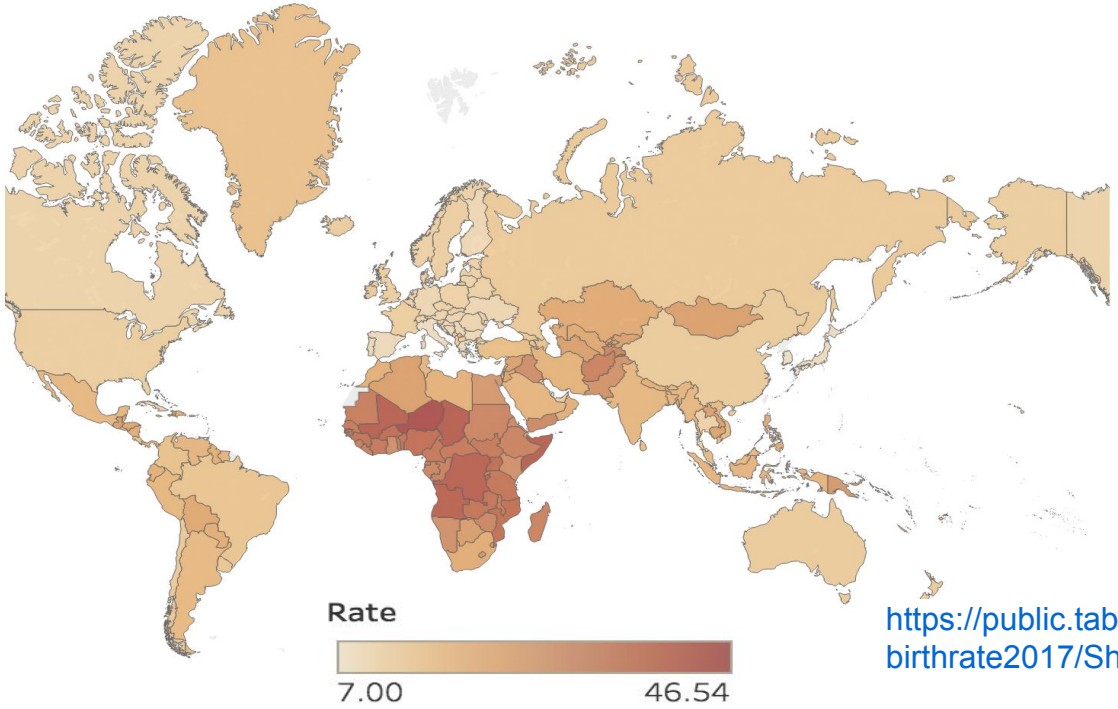
PART I: INTRODUCTION

Global Birth Rate

birth rate 2017

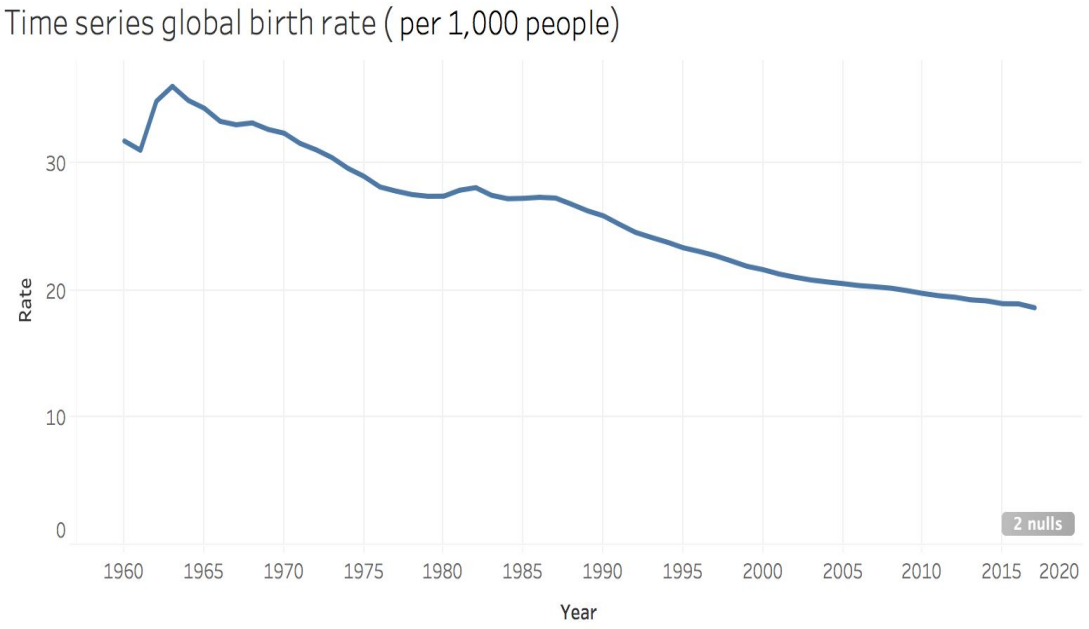


Lowest in EU :
Italy —7.6

Highest in Africa :
Niger —46

https://public.tableau.com/profile/yq6720#!/vizhome/worldbirthrate2017/Sheet2?publish=yes

Declining birth rate



Birth rate declined dramatically in recent 50 years.

Research Motivation and Target Audiences

- Problems of Declining Birth Rate: Aging Problem
  - Decline in Working-Age Population
  - Increase in Health Care Costs

- Audiences of Our Dashboard
  - Policy Makers
  - Researchers: Sociologists

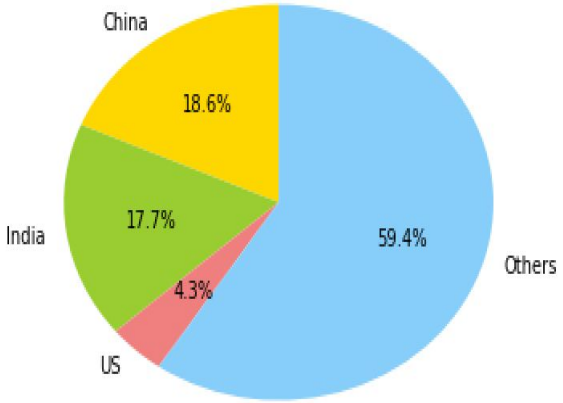
Study Objects

- Three countries

  China, India and US (3 countries with largest population)

- Three factors

  Economy, Gender Equality and Healthcare



Dataset and Methodology

THE WORLD BANK
IBRD • IDA | Data

- Datasets (from 1960-2017)
  - Economy: 1) GDP, 2) Inflation
  - Gender Equality: 1) Wage Gender Gap Ratio, 2) Female Education Rate (Secondary Enrollment Rate)
  - Healthcare: 1) Contraceptive Prevalence, 2)Mortality Rate of Infant
- Tools
  - Tableau
  - Matplotlib

PART II
Three potential factors: Economy, Gender Equality, Health Care

Two Features in Economy

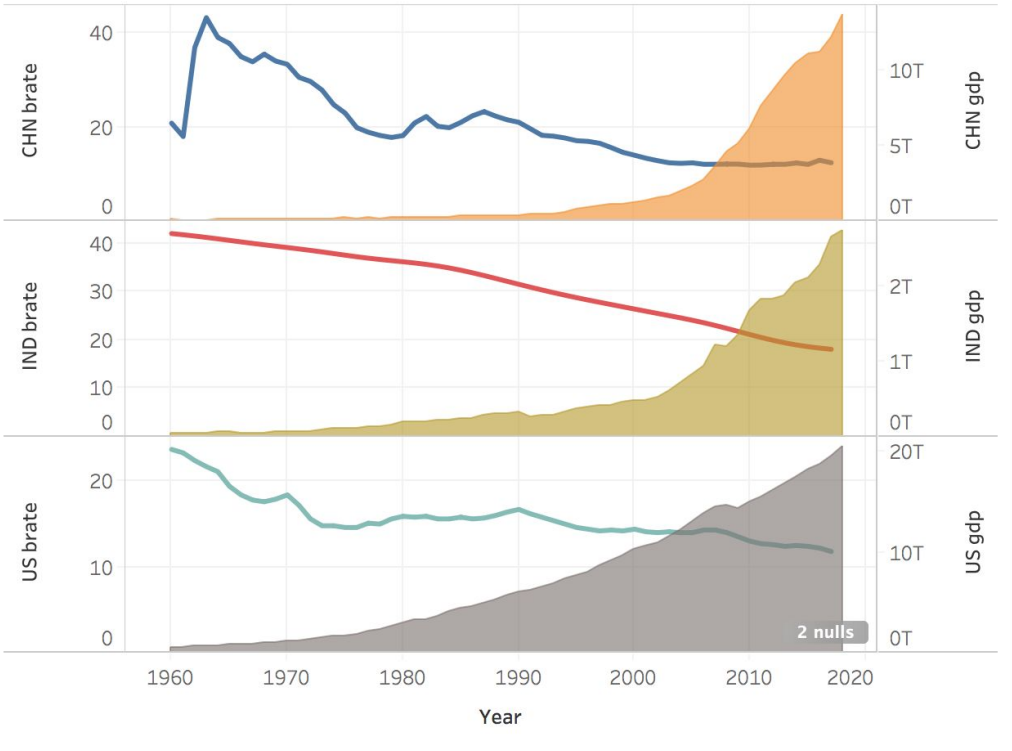
#1 GDP -- [Tableau]

The development of economy

#2 Inflation-- [Matplotlib]

The annual percentage change in the price level
Represent the economic pressure

Compare GDP and Birth Rate



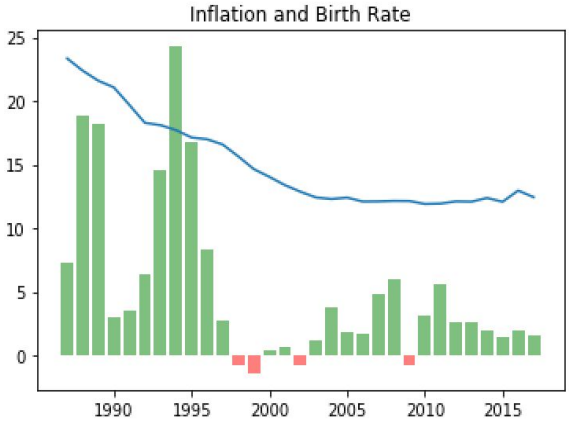
Correlation:

- China: -0.622
- India: -0.874
- US: -0.747

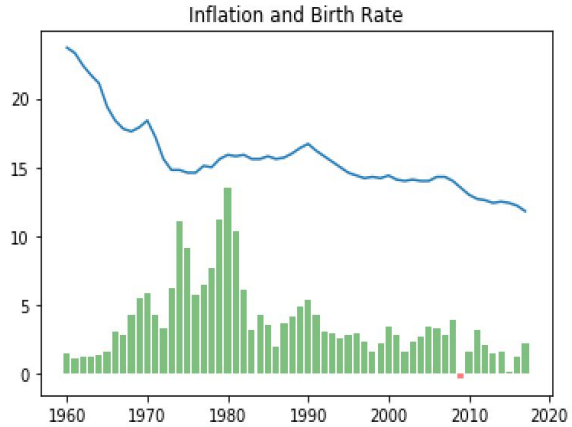
As economy becomes developed, birth rate decreases.

Neither inflation nor deflation affects birth rate

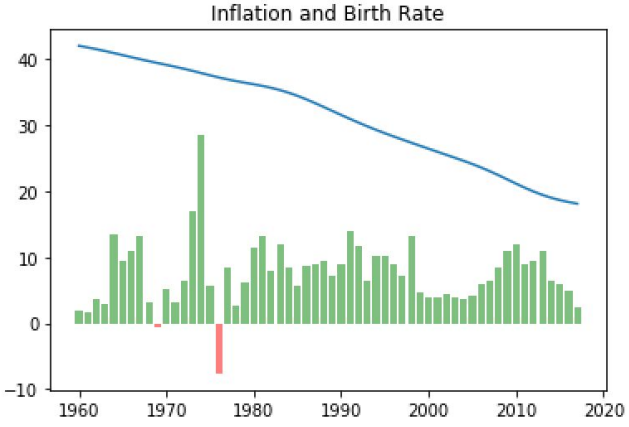
Compare Inflation and Birth Rate



China



US



India

- Green bars indicate inflation
- Red bars indicate deflation

Two Features in Gender Equality

#1 Education Indicator -- [Matplotlib]

School enrollment, secondary, female (% gross)

#2 Female Wage Indicator -- [Tableau]

Wage and salaried workers, female (% of female employment) (modeled ILO estimate)

Facts of Female Fertility

Globally, women have an average of 2.4 live births each.

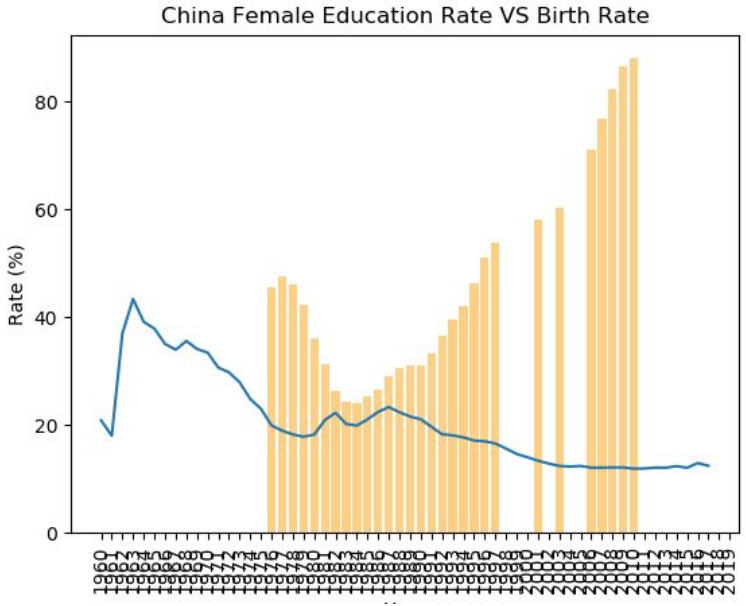
Women's earnings in most countries are less than two-thirds of men's.

53% of women are in the workforce.

Most women are literate, but some countries have rates below 50%.

Source: Bloomberg

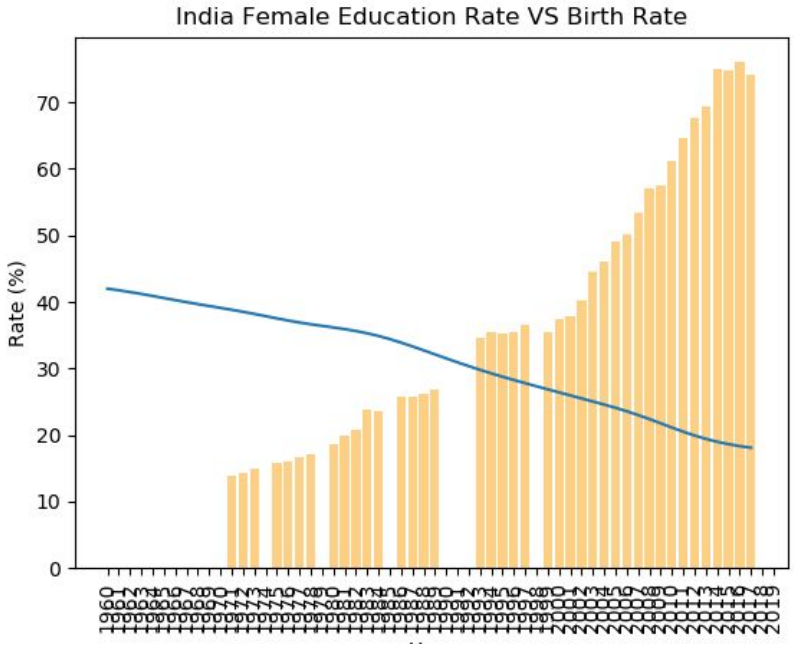
#1 Education Indicators - School enrollment, secondary, female (% gross)



The higher education female receives, the lower birth rate reaches.

- Yellow bars indicate education rate in each country
- Blue line indicates birth rate in each country

#1 Education Indicators - School enrollment, secondary, female (% gross)

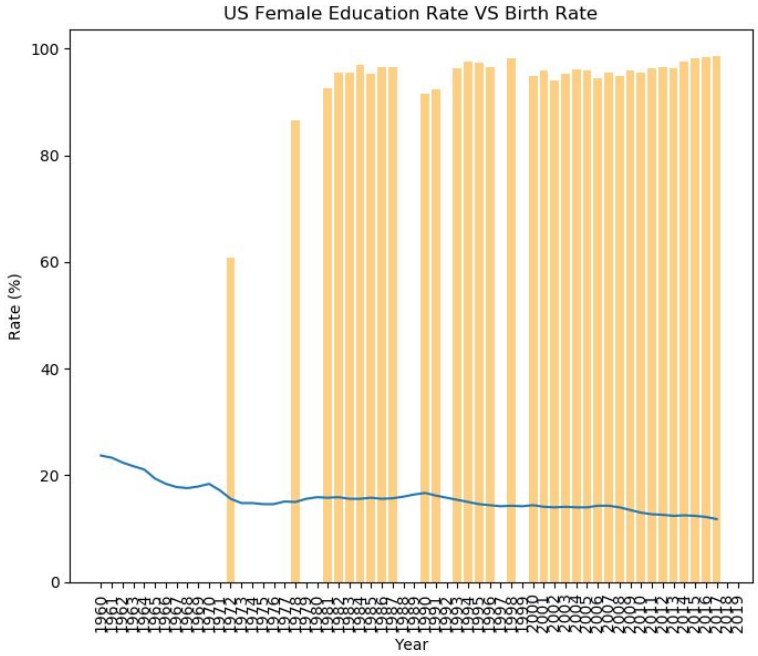


Education Index

```
China Education Pearsons correlation: -0.312
US Education Pearsons correlation: -0.247
India Education Pearsons correlation: -0.585
```

- Yellow bars indicate education rate in each country
- Blue line indicates birth rate in each country

#1 Education Indicators - School enrollment, secondary, female (% gross)

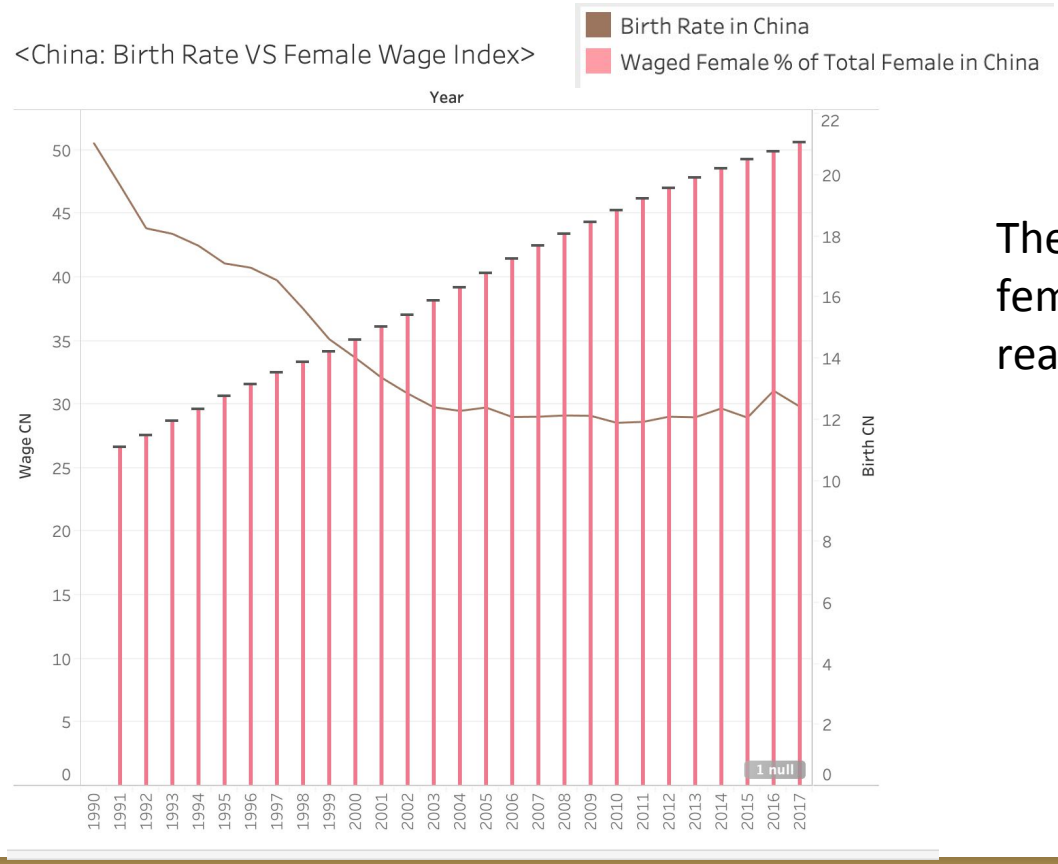


However, the education level does not play an important role in the birth rate after it reached a certain value.

- Yellow bars indicate education rate in each country
- Blue line indicates birth rate in each country

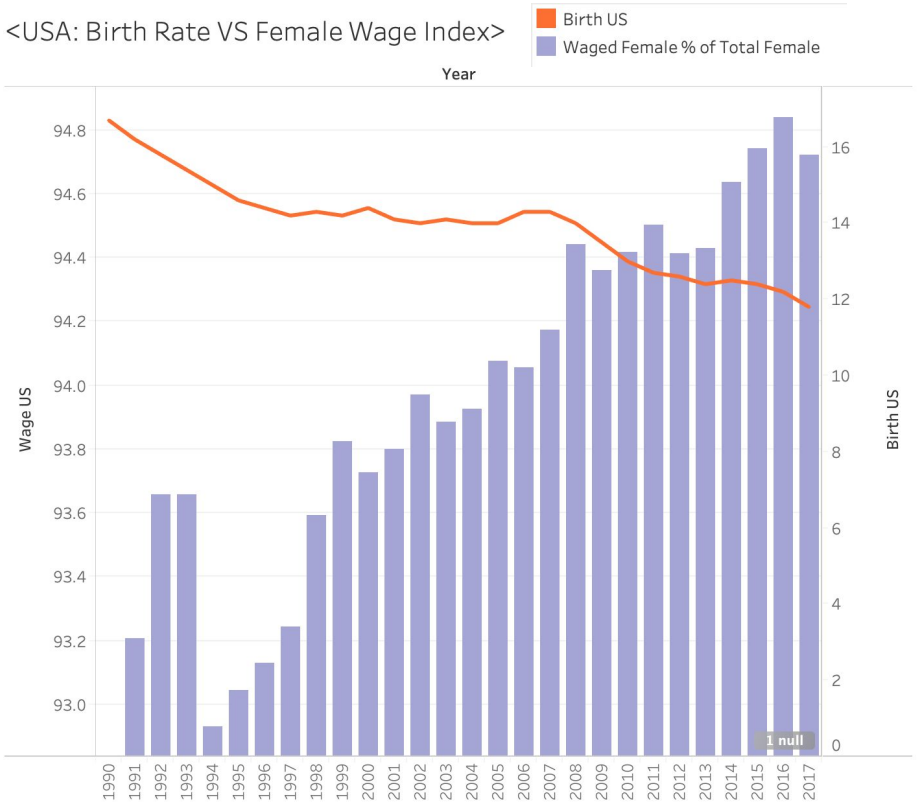
#2: Wage and salaried workers, female (% of female employment)

<China: Birth Rate VS Female Wage Index>



The higher ratio of salaried female, the lower birth rate reaches.

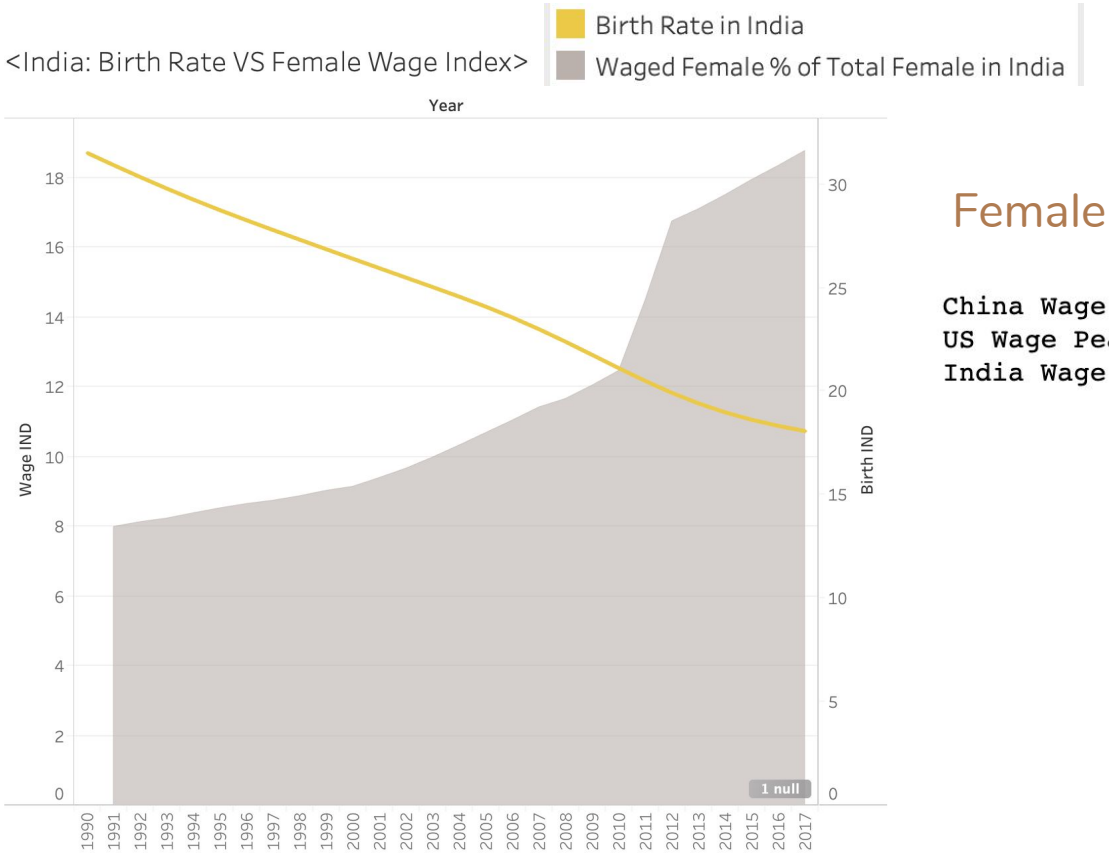
#2: Wage and salaried workers, female (% of female employment)



Similarly, the ratio of salaried women does not play an important role in the birth rate after it reached a certain value.

#2: Wage and salaried workers, female (% of female employment)

<India: Birth Rate VS Female Wage Index>



Female Wage Index

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China Wage Pearsons correlation: -0.774
US Wage Pearsons correlation: -0.567
India Wage Pearsons correlation: -0.925
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Two Features in Healthcare

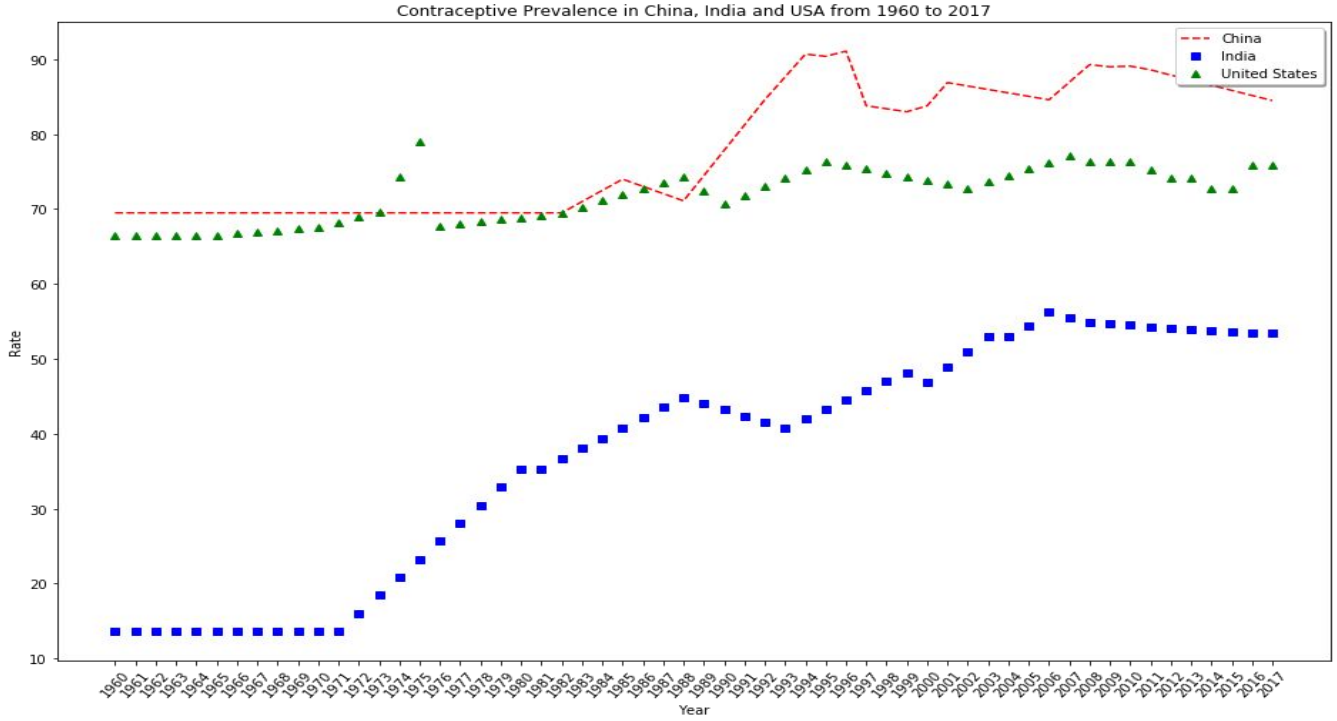
#1 Contraceptive Prevalence -- [Matplotlib]

The high rate of contraception means that a country has a better healthcare

#2 Mortality Rate of Infant -- [Matplotlib]

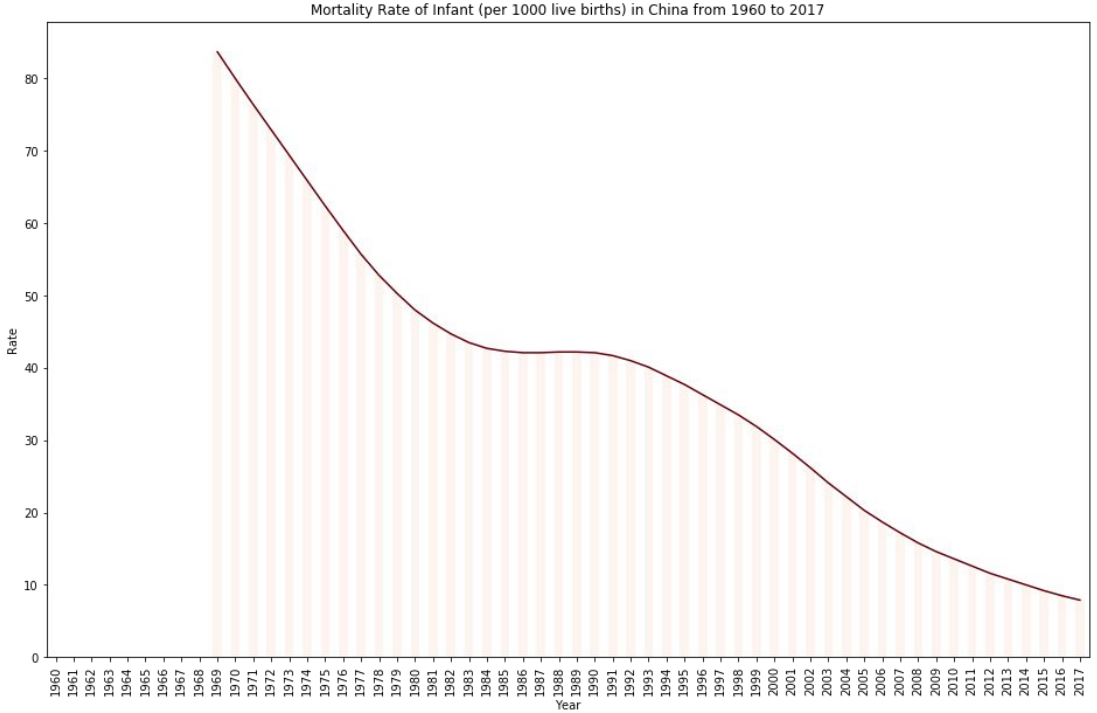
The lower mortality rate of infant, the better healthcare a country has

Contraceptive Prevalence

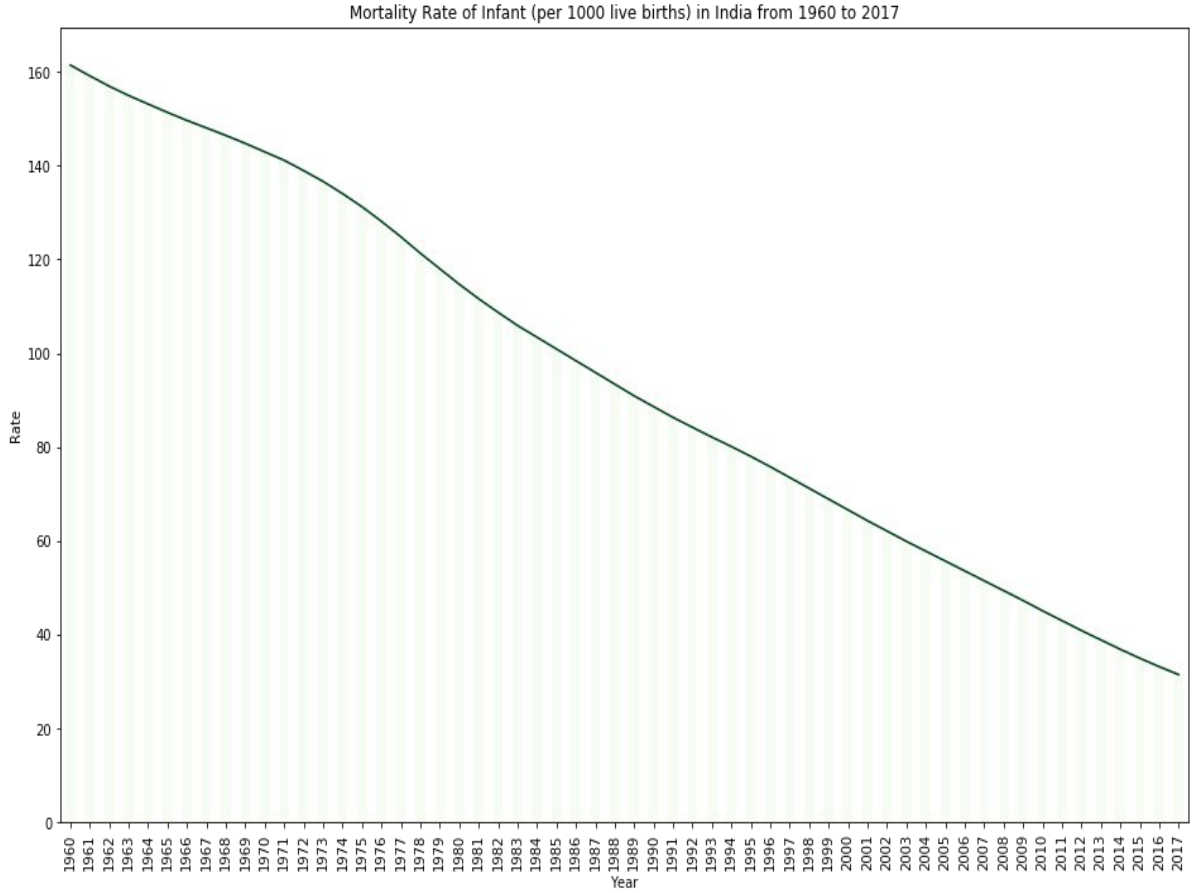


Mortality Rate of Infant

- China



- India


Mortality Rate of Infant (per 1000 live births) in India from 1960 to 2017
Rate
Year
0
20
40
60
80
100
120
140
160
1960
1961
1962
1963
1964
1965
1966
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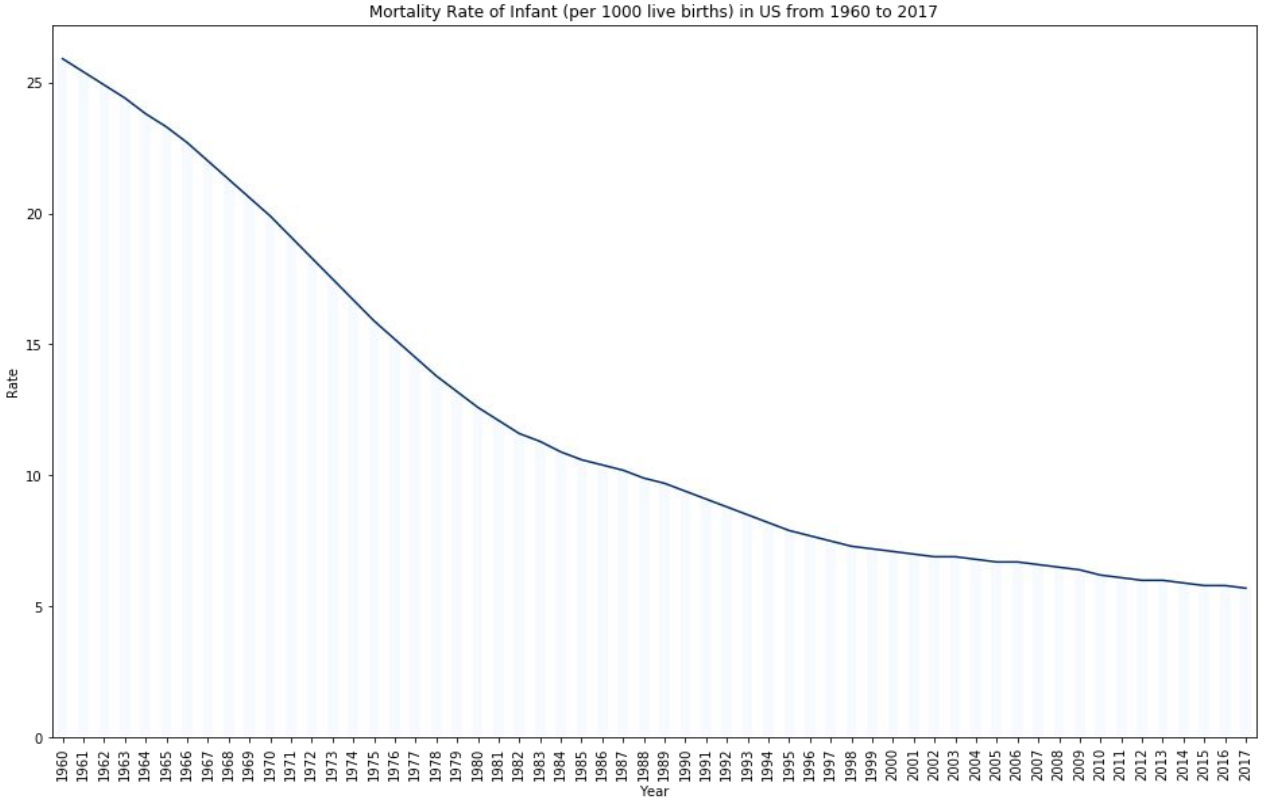
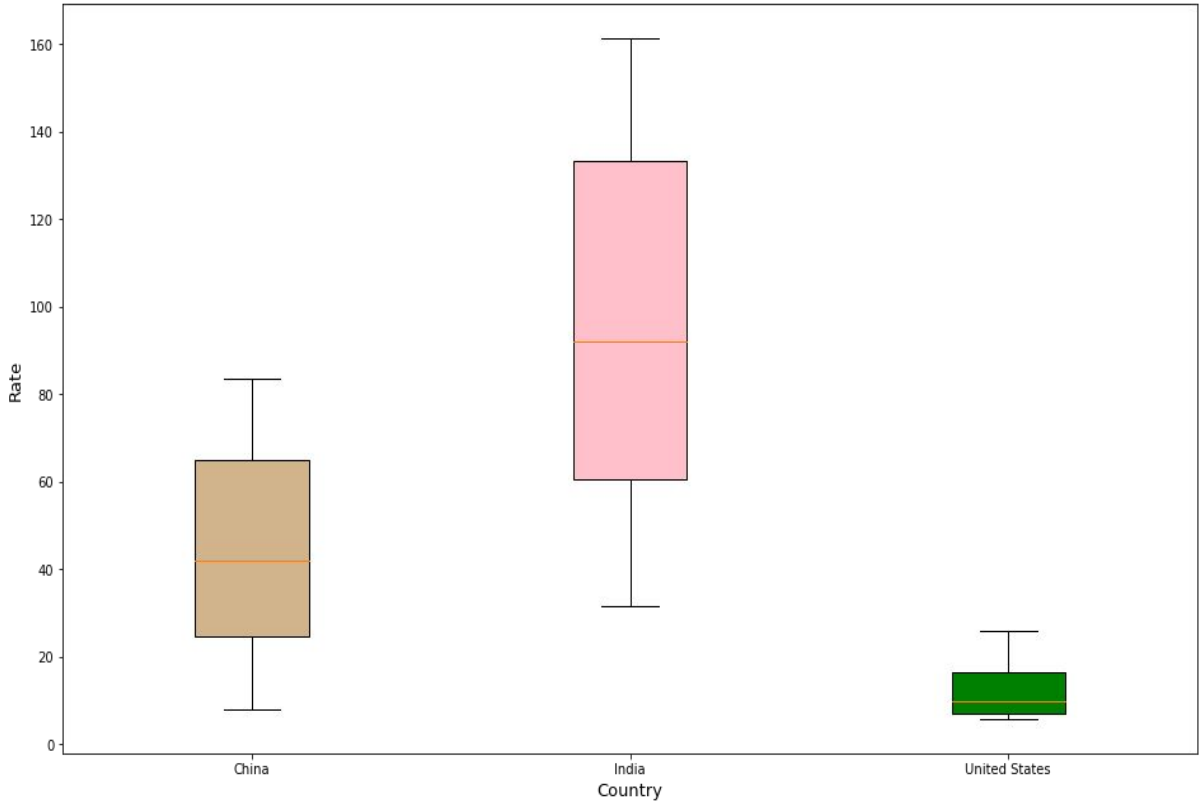
- United States



Mortality Rate After Dealing with Missing Values



Correlation

- correlation between birth rate and contraceptive prevalence
  - China: -0.744
  - India: -0.927
  - United States: -0.751

Correlation

- correlation between birth rate and mortality rate
  - China: 0.894
  - India: 0.988
  - United States: 0.878

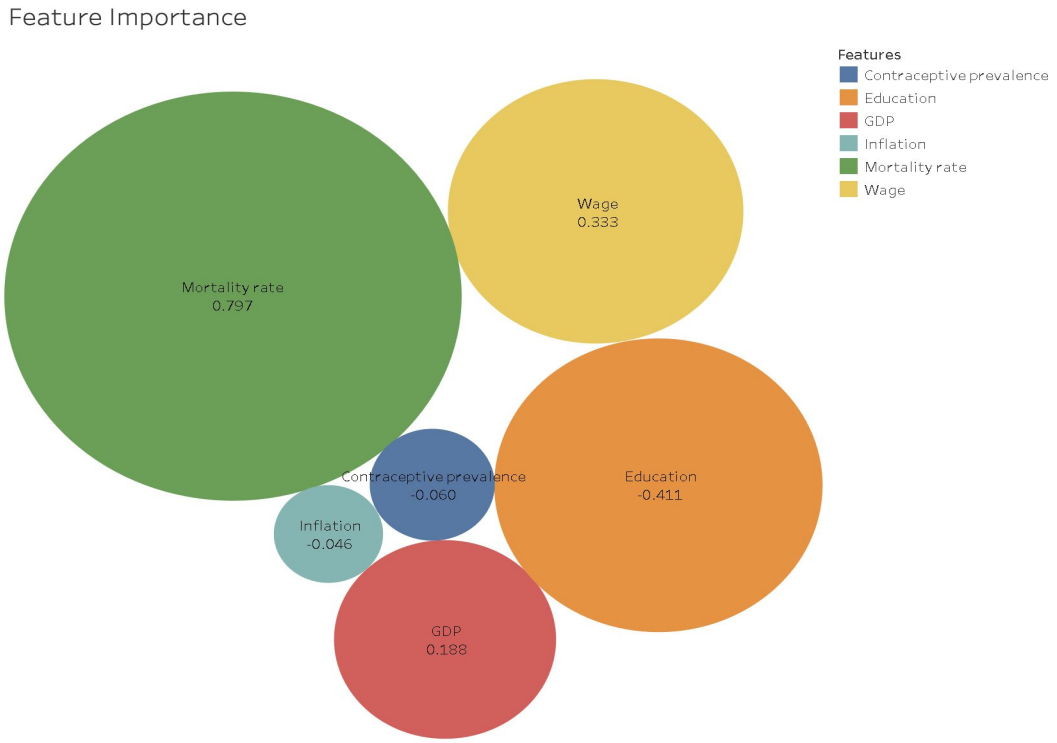
Part III: Linear model

Feature Importance

China

Three most important features:

- Mortality rate
- Education
- Wage

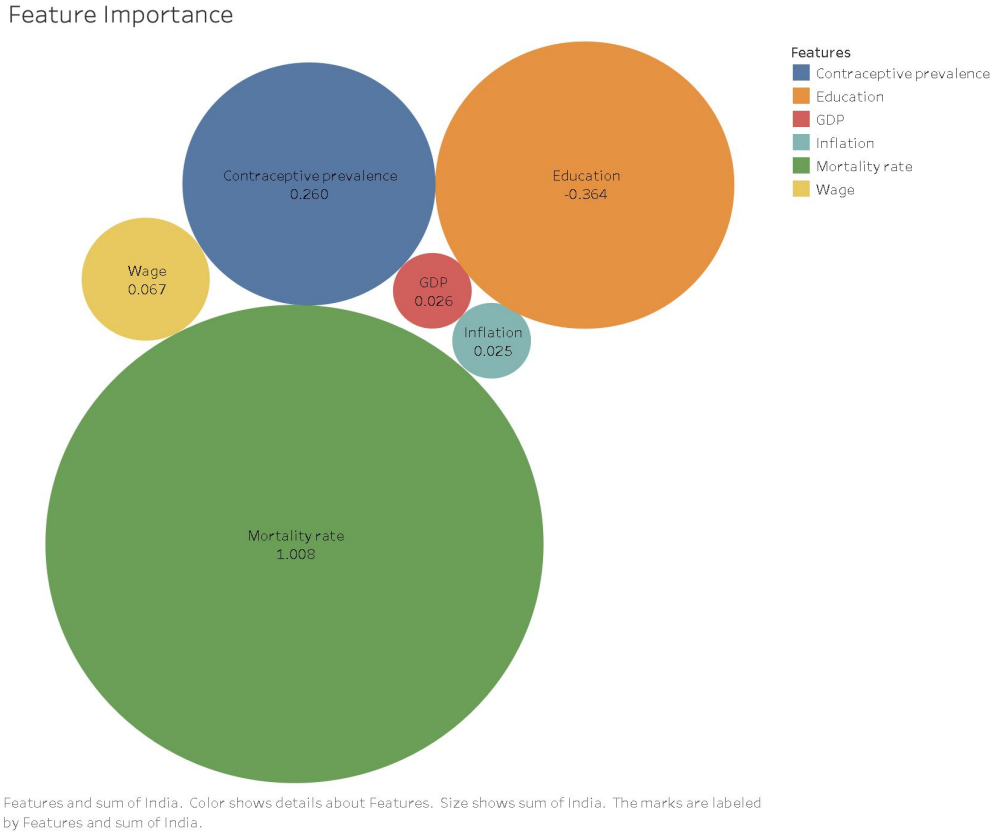


Feature Importance

India

Three most important features:

- Mortality rate
- Education
- Contraceptive prevalence

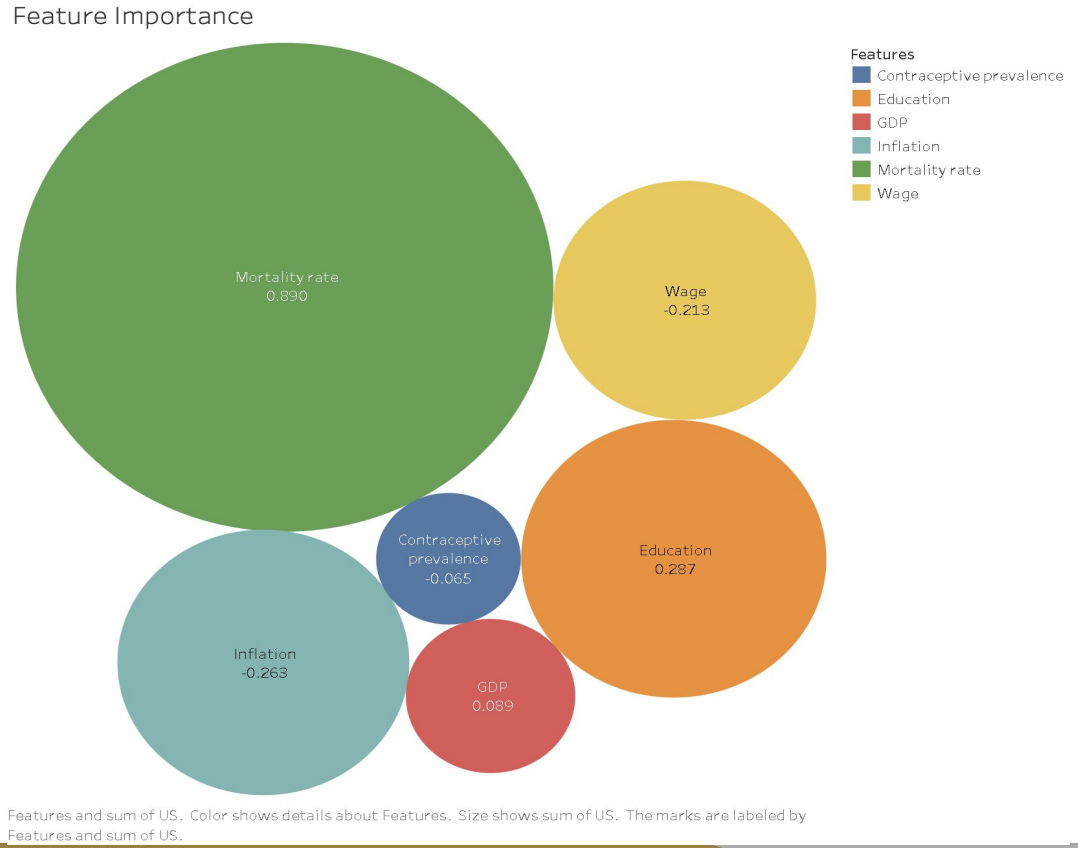


Feature Importance

United States

Three most important features:

- Mortality rate
- Education
- Inflation



Part IV: Conclusion

How Three Factors Impact Birth Rate?

- Economy
  The higher the GDP, the lower the birth rate is
- Gender Equality - Female
  Within a certain range, the higher education and wage female receives, the lower the birth rate reaches
- Health Care
  As rate of contraceptive prevalence goes up, the birth rate goes down
  The higher mortality rate of infant with the higher birth rate

Features Weight Differently to Every Country

Mortality Rate, Female Education,

Inflation/Wage/Contraceptive prevalence

Other factors

- **Culture** - Religions, Openness to family types (LGBT parenting, single parent) ...
- **Policy** - Chinese One-child policy, German Family Policy ...

Suggestions to Policy Makers

- Improve medical quality
- Provide more welfare/support to family with more babies