

HW1 - Structural Transformation

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Question 1

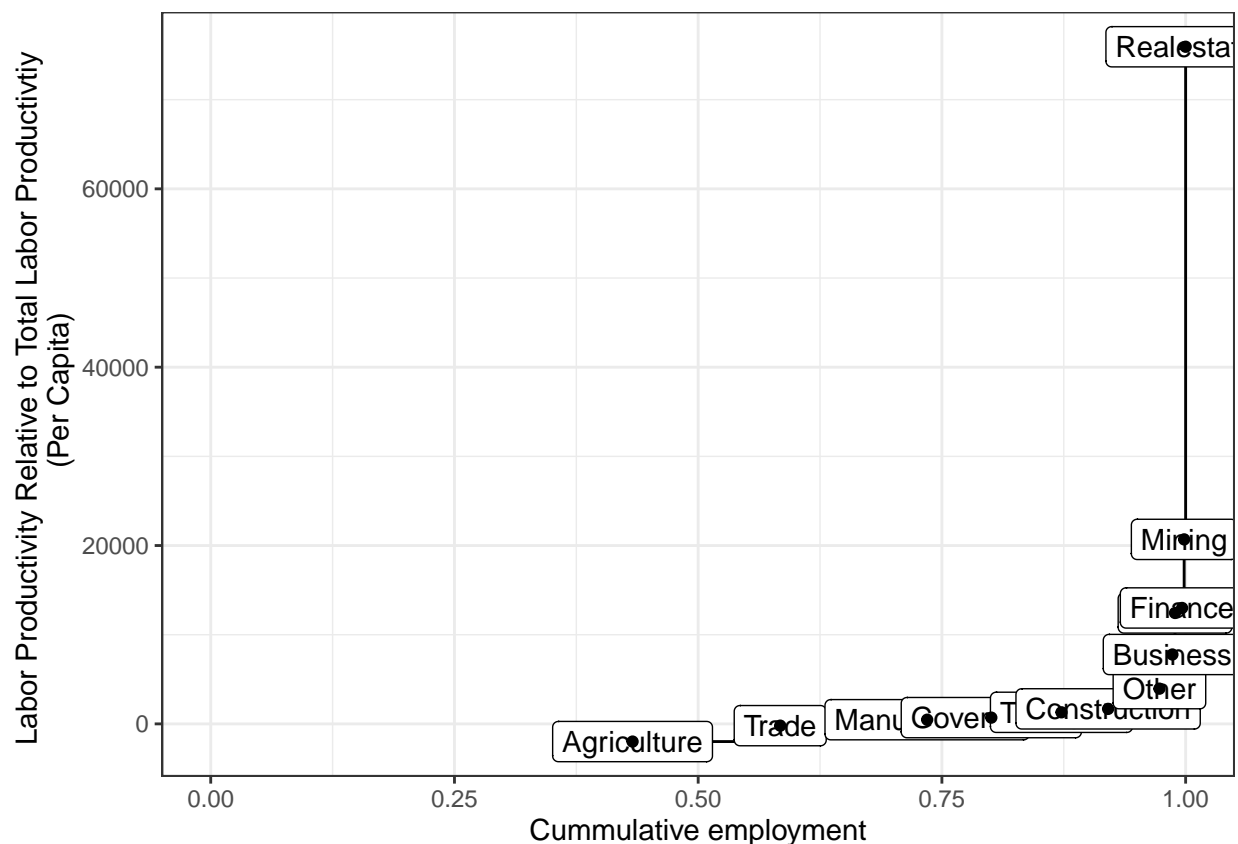
One potential explanation for this difference could stem from the World Bank's focus solely on trade-able goods within markets. As a result, numerous agricultural, locally-produced, or community-owned items may not be included in their calculations, potentially leading to an underestimation of the overall value.

```
## # A tibble: 1 x 3
##   Total_VA_Q15 Total_EMP total_per_worker
##         <dbl>      <dbl>          <dbl>
## 1 183156737500  59696514          3068.
```

Question 2

The Normalized productivity of agriculture is -1983.73, while the employment share of agriculture is 43.2% (as of 2015)

Question 3



This data illustrates an intriguing trend: despite being the least productive sector, Agriculture boasted the largest share of the labor force in Bangladesh in 2015. Conversely, highly productive sectors like Real Estate, Mining, Finance, and Business commanded only a miniscule fraction of the labor force. This disparity among sectors has the potential to hinder overall labor productivity.

Question 4

The percentage increase after flipping productivity of agriculture and manufacturing is 22.5% (from 3068.131 to 3759.322)

Question 5

```
structural_change_bangladesh <- structural_change |>
  filter((var == "VA_Q15" | var == "EMP") & country == "Bangladesh")

# Find the rows where value added (VA) and employment (EMP) data start and end
va_start <- which(structural_change_bangladesh$var == "VA_Q15")[1]
va_end <- which(structural_change_bangladesh$var == "VA_Q15")[length(which(structural_change_bangladesh$var == "VA_Q15"))]
emp_start <- which(structural_change_bangladesh$var == "EMP")[1]
emp_end <- which(structural_change_bangladesh$var == "EMP")[length(which(structural_change_bangladesh$var == "EMP"))]

# Create Columns for Each Sector
```

```

for (sector in sectors) {
  structural_change_bangladesh[paste(sector, "Labor_Productivity", sep = "_")] <- NA
}

# Getting Labour Productivity for Each Year
for (year_index in va_start:va_end) {
  year <- structural_change_bangladesh$year[year_index]
  for (sector in sectors) {
    # Calculating
    productivity <- structural_change_bangladesh[year_index, sector] /
      structural_change_bangladesh[year_index + (emp_start - va_start), sector]
    # Putting in the column
    structural_change_bangladesh[year_index, paste(sector, "Labor_Productivity", sep = "_")] <- productivity
  }
}

#Calculating CV:

#Columns to calculate:
start_col <- 19
end_col <- ncol(structural_change_bangladesh)

cv_values <- numeric()

# For Loop To Calculate For Each Sector
for (i in 1:29) {
  # Extract labor productivity values for the current row
  row_values <- unlist(structural_change_bangladesh[i, start_col:end_col])
  # Calculate CV
  cv <- sd(row_values) / mean(row_values)
  cv_values <- c(cv_values, cv)
}

#Creating Dataframe for Graph:
Years <- 1990:2018
graph_data <- data.frame(Years, cv_values)

#Graphing:
ggplot(data = graph_data, aes(x = Years, y = cv_values)) +
  geom_point() +
  geom_smooth(method = "lm", se = FALSE) + # Add a linear regression line
  labs(title = "Scatterplot of CV Values Over Time", x = "Year", y = "CV Value")

```

As labor productivity across sectors converges towards the mean over time, it suggests that less productive sectors are narrowing the gap with others. This trend results from reduced variation in productivity within each sector, leading to more consistent output. Such stability fosters an environment conducive to progress. Consequently, Bangladesh may resemble advanced countries discussed in previous lectures more closely than other low-income countries, owing to this decreased variation in sector productivity.

Question 6

```
## # A tibble: 3 x 7
```

```
##   year Agriculture_VA_Q15 Agriculture_EMP      mfg_va mfg_emp  services_va
##   <dbl>           <dbl>           <dbl>      <dbl>  <dbl>      <dbl>
## 1  1990      12232852827.      26836213  5682913328.  5289198  31048064719.
## 2  2005      18822526115.      22984794 16003341476.  5051255  65661485604.
## 3  2018      30887840910.      25808861 51965884144.  9735080 142898353083.
## # i 1 more variable: services_emp <dbl>
```

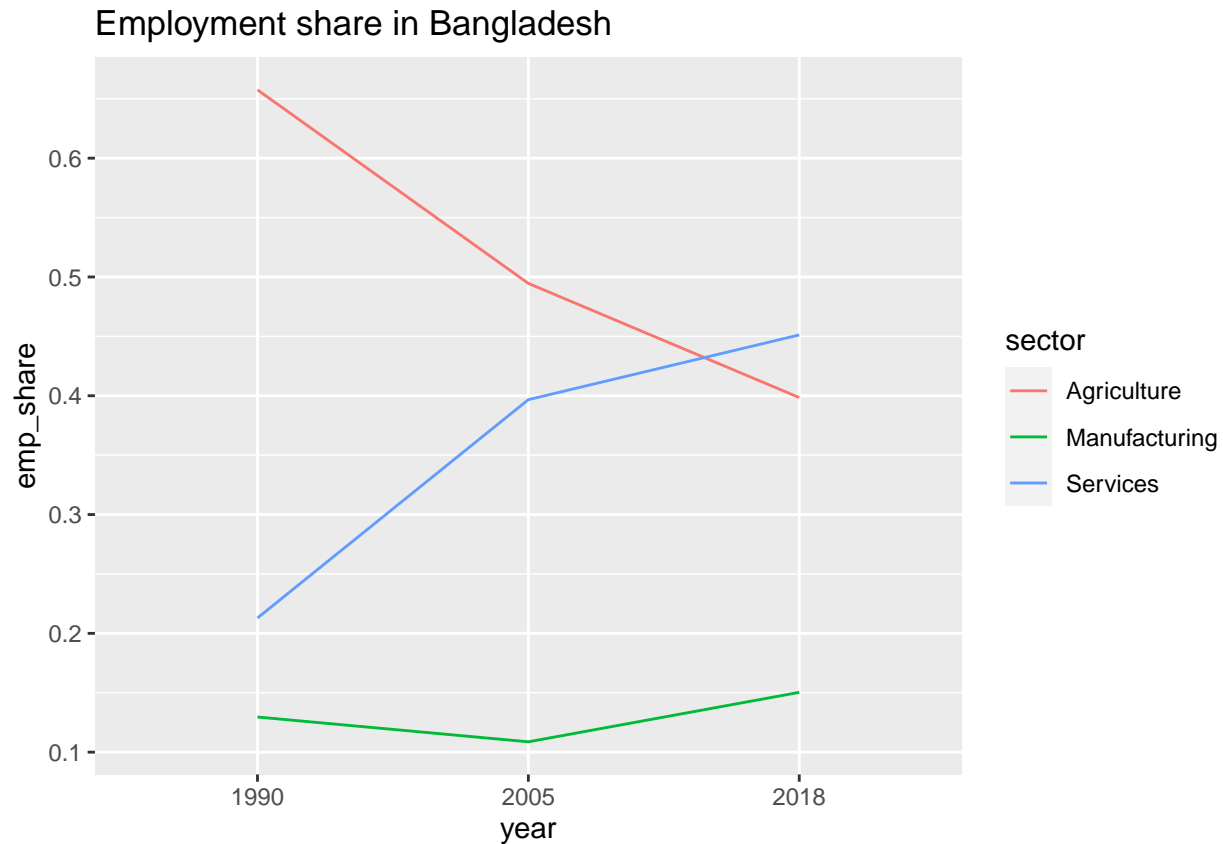
Question 7

Between 1990 and 2005, approximately 47% of productivity decomposition stemmed from inter-sector labor reallocation, illustrating Bangladesh's shift away from agriculture dependency towards manufacturing. Conversely, 52% of the productivity decomposition during this period originated from intra-sector reallocation, likely influenced by advancements in the ready-made garment industry.

In the timeframe from 2005 to 2018, 71% of the productivity decomposition was attributed to within-sector productivity growth, possibly reflecting enhancements in the services sector. This shift, accompanied by a structural change towards the service sector (28%), may encapsulate Bangladesh's narrative of structural transformation.

```
## # A tibble: 6 x 15
##   sector year      emp      va      lp      L emp_share      VA      LP del_lp del_LP
##   <chr> <chr> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 Agric~ 2005  2.30e7 1.88e10  819.  4.65e7  0.495 1.00e11 2162.    0      0
## 2 Agric~ 2018  2.58e7 3.09e10 1197.  6.48e7  0.398 2.26e11 3486.   378. 1323.
## 3 Manuf~ 2005  5.05e6 1.60e10 3168.  4.65e7  0.109 1.00e11 2162.    0      0
## 4 Manuf~ 2018  9.74e6 5.20e10 5338.  6.48e7  0.150 2.26e11 3486.  2170. 1323.
## 5 Servi~ 2005  1.84e7 6.57e10 3561.  4.65e7  0.397 1.00e11 2162.    0      0
## 6 Servi~ 2018  2.92e7 1.43e11 4890.  6.48e7  0.451 2.26e11 3486.  1329. 1323.
## # i 4 more variables: del_emp_share <dbl>, product <dbl>, numerator <dbl>,
## #   within <dbl>
```

Question 8



The decomposition within sectors further confirms that the bulk of productivity growth from the 1990s to 2005 occurred within the manufacturing sector, with the service sector contributing the least. In contrast, between 2005 and 2018, the service sector experienced the most significant productivity growth, with agriculture contributing only 14%. Additionally, the graph reveals a sharp decline in the employment share within the agriculture sector from 2005 onwards, accompanied by a proportional increase in the service sector. Notably, while manufacturing does not dominate employment share, it still experiences growth between 2005 and 2018.

Question 9

We withhold final judgement on Bangladesh's developmental prospects based on these findings regarding their structural trajectory. Similar to the approach outlined in Fan et al., our optimism for Bangladesh would be warranted if the expansion of the services sector is driven by productivity growth rather than mere demand. This scenario would suggest the potential for sustained growth. While we lack this specific model applied to Bangladesh, we maintain cautious optimism regarding their structural transition from agriculture to services.