

# Trade and Economic Indicators for South Asia

```
library(parallel)

# Detect all available cores and leave one out
num_cores <- detectCores() - 1
```

## Load and Prepare Trade Data

```
# Import trade data
trade <- read_csv("data/TradeData_all-world-16-20.csv")
```

```
Rows: 1642 Columns: 47
— Column specification
Delimiter: ","
chr (19): TypeCode, FreqCode, ReporterISO, ReporterDesc, FlowCode, FlowDesc,...
dbl (20): RefPeriodId, RefYear, RefMonth, Period, ReporterCode, PartnerCode,...
lgl (8): IsOriginalClassification, IsLeaf, IsQtyEstimated, IsAltQtyEstimate...

i Use `spec()` to retrieve the full column specification for this data.
i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
# Select and rename columns
trade <- trade |>
  select(RefYear, ReporterDesc, FlowDesc, PartnerDesc, PrimaryValue) |>
  rename(year = RefYear, reporter = ReporterDesc, trade_direction = FlowDesc,
         partner = PartnerDesc, trade_value_usd = PrimaryValue)

trade
```

```
# A tibble: 1,642 × 5
  year reporter trade_direction partner trade_value_usd
  <dbl> <chr> <chr> <chr> <dbl>
1 2016 Afghanistan Import World 6534140413
2 2016 Afghanistan Export World 596455337
3 2016 Albania Import World 4669289913
4 2016 Albania Export World 1962117416
5 2016 Algeria Import World 47090683586
6 2016 Algeria Export World 29992101470
7 2016 Andorra Import World 1354095937
```

```

8 2016 Andorra      Export      World      96912959.
9 2016 Angola       Import      World      14347710498
10 2016 Angola      Export      World      28057499522
# i 1,632 more rows

```

## TDI: Trade Dependence Index (Pakistan, 2016–2020)

```

TDI <- trade %>%
  filter(reporter == "Pakistan") %>%
  select(year, trade_direction, trade_value_usd) %>%
  spread(trade_direction, trade_value_usd)

gdp <- WDI(indicator = c("GDP" = "NY.GDP.MKTP.CD"), country = "PAK", start =
1990, end = 2020)

TDI <- merge(TDI, gdp, by = "year") %>%
  select(year, Export, Import, GDP)

TDI$tdi <- (TDI$Export + TDI$Import) / TDI$GDP * 100
TDI <- TDI %>% select(year, tdi)
TDI$tdi <- round(TDI$tdi, 0)

TDI

```

```

  year tdi
1 2016  22
2 2017  23
3 2018  24
4 2019  23
5 2020  23

```

## TDI: South Asia (2020)

```

SouthAsia <- c("India", "Pakistan", "Bangladesh", "Sri Lanka", "Nepal", "Bhutan",
"Maldives")

x <- trade %>%
  filter(reporter %in% SouthAsia & year == 2020) %>%
  select(reporter, trade_direction, trade_value_usd) %>%
  spread(trade_direction, trade_value_usd)

gdp <- WDI(indicator = c("GDP" = "NY.GDP.MKTP.CD"),
  country = c("IND", "PAK", "BGD", "LKA", "NPL", "BTN"),
  start = 2020, end = 2020)

x <- merge(x, gdp, by.x = "reporter", by.y = "country") %>%

```

```
select(reporter, Export, Import, GDP)

x$tdi <- (x$Export + x$Import)/x$GDP * 100
x$tdi <- round(x$tdi, 0)

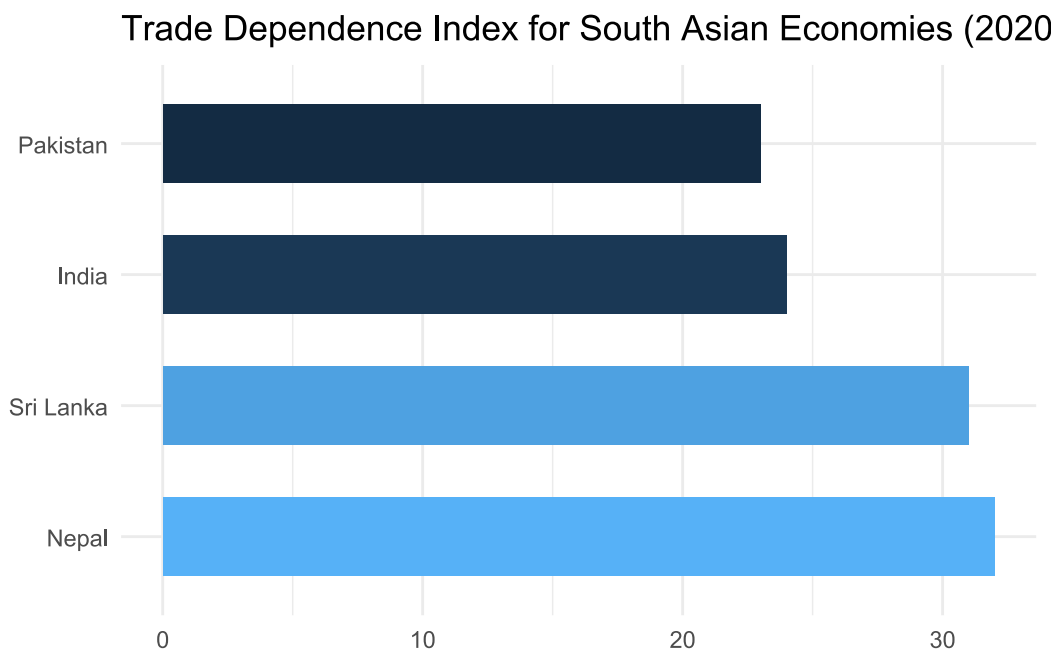
x[, c("reporter", "tdi")]
```

```
  reporter tdi
1    India  24
2    Nepal  32
3 Pakistan  23
4 Sri Lanka 31
```

### Plot: TDI by Country

```
TDI_plot <- ggplot(x, aes(x = tdi, y = reorder(reporter, desc(tdi)))) +
  geom_col(aes(fill = tdi), width = 0.6, show.legend = FALSE) +
  labs(title = "Trade Dependence Index for South Asian Economies (2020)", x =
NULL, y = NULL) +
  theme_minimal()

TDI_plot
```



### Import Penetration Index (Pakistan)

```

IP <- trade %>%
  filter(reporter == "Pakistan") %>%
  select(year, trade_direction, trade_value_usd) %>%
  spread(trade_direction, trade_value_usd)

gdp <- WDI(indicator= c("GDP" = "NY.GDP.MKTP.CD"), country="PAK", start=2016,
end=2020)

IP <- merge(IP, gdp, by = "year") %>%
  select(year, Export, Import, GDP)

IP$Domestic_Demand <- IP$GDP - IP$Export + IP$Import
IP$ip <- (IP$Import / IP$Domestic_Demand) * 100

IP <- IP %>% select(year, ip) %>% mutate(ip = round(ip, 0))
IP

```

```

  year ip
1 2016 14
2 2017 15
3 2018 15
4 2019 14
5 2020 14

```

## Import Penetration: South Asia (2020)

```

x <- x %>% select(-tdi)
x$Domestic_Demand <- x$GDP - x$Export + x$Import
x$ip <- (x$Import / x$Domestic_Demand) * 100
x$ip <- round(x$ip, 0)

x[, c("reporter", "ip")]

```

```

  reporter ip
1      India 13
2      Nepal 23
3  Pakistan 14
4 Sri Lanka 17

```

## Plot: IP by Country

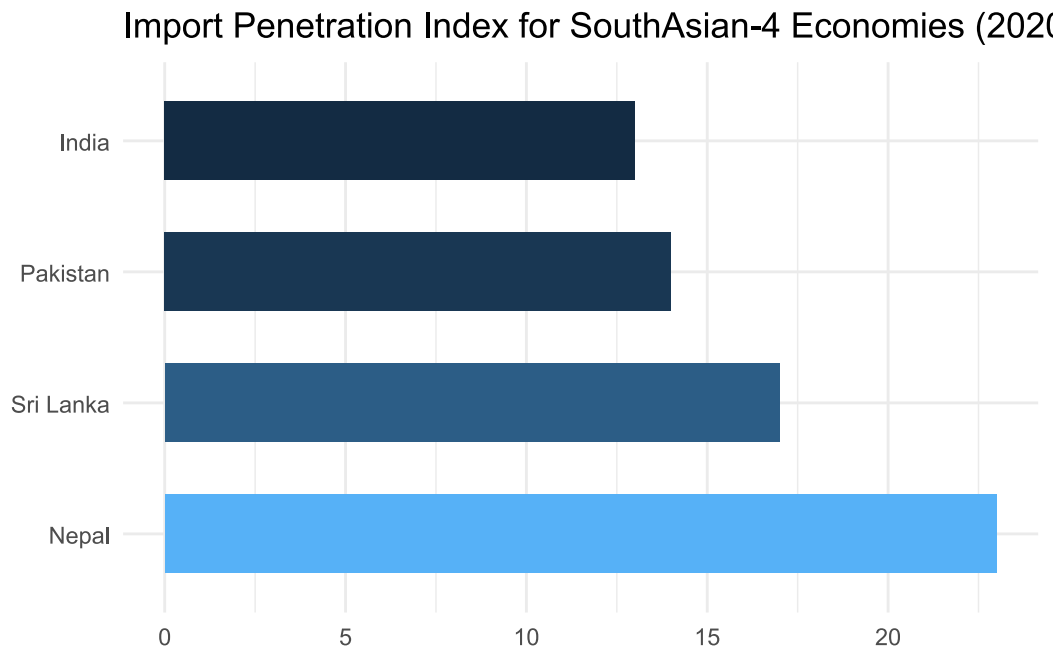
```

IP_plot <- ggplot(x, aes(x = ip, y = reorder(reporter, desc(ip)))) +
  geom_col(aes(fill = ip), width = 0.6, show.legend = FALSE) +
  labs(title = "Import Penetration Index for SouthAsian-4 Economies (2020)", x
= NULL, y = NULL) +

```

```
theme_minimal()
```

```
IP_plot
```



## Export Propensity (Pakistan and Region)

```
EP <- trade %>%  
  filter(reporter == "Pakistan" & trade_direction == "Export") %>%  
  select(year, trade_value_usd) %>%  
  rename(Export = trade_value_usd)  
  
gdp <- WDI(indicator= c("GDP" = "NY.GDP.MKTP.CD"), country="PAK", start=2016,  
end=2020)  
  
EP <- merge(EP, gdp, by = "year") %>% select(year, Export, GDP)  
  
EP$ep <- (EP$Export / EP$GDP) * 100  
EP$ep <- round(EP$ep, 0)  
  
EP %>% select(year, ep)
```

```
year ep  
1 2016 7  
2 2017 6  
3 2018 7
```

```
4 2019 7
5 2020 7
```

```
x <- x %>% select(reporter, Export, GDP)
x$ep <- (x$Export / x$GDP) * 100
x$ep <- round(x$ep, 0)

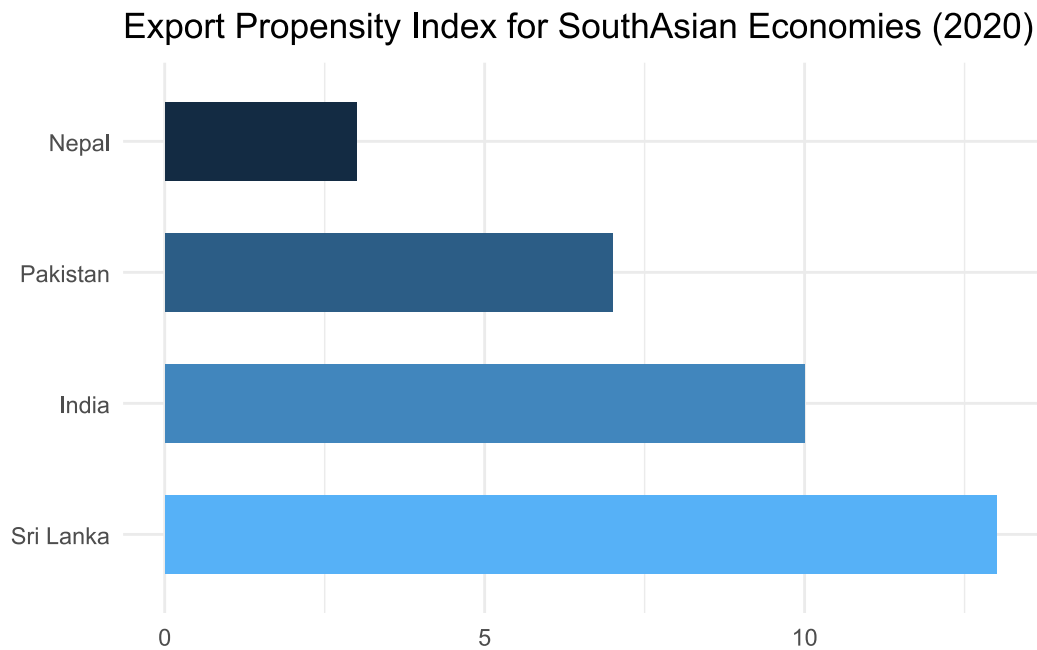
x %>% select(reporter, ep)
```

```
  reporter ep
1    India 10
2    Nepal  3
3 Pakistan  7
4 Sri Lanka 13
```

### Plot: EP by Country

```
EP_plot <- ggplot(x, aes(x = ep, y = reorder(reporter, desc(ep)))) +
  geom_col(aes(fill = ep), width = 0.6, show.legend = FALSE) +
  labs(title = "Export Propensity Index for SouthAsian Economies (2020)", x =
  NULL, y = NULL) +
  theme_minimal()

EP_plot
```



## Marginal Propensity to Import (Pakistan)

```
PKM <- trade %>%  
  filter(reporter == "Pakistan" & trade_direction == "Import") %>%  
  select(year, trade_value_usd) %>%  
  rename(Import = trade_value_usd)  
  
PKM <- merge(PKM, gdp, by = "year") %>% select(year, Import, GDP)  
  
PKM$dImport <- PKM$Import - lag(PKM$Import)  
PKM$dGDP <- PKM$GDP - lag(PKM$GDP)  
  
PKM$PKM <- PKM$dImport / PKM$dGDP  
PKM$PKM <- round(PKM$PKM, 2)  
  
PKM %>% select(year, PKM)
```

	year	PKM
1	2016	NA
2	2017	0.41
3	2018	0.16
4	2019	0.29
5	2020	0.21

## Marginal Propensity to Import: South Asia

```
x <- trade %>%  
  filter(reporter %in% SouthAsia & trade_direction == "Import") %>%  
  select(reporter, year, trade_value_usd)  
  
gdp <- WDI(indicator = c("GDP" = "NY.GDP.MKTP.CD"),  
           country = c("IND", "PAK", "BGD", "LKA", "NPL", "BTN"),  
           start = 2020, end = 2020)  
  
gdp$country <- ifelse(gdp$country == "Pakistan", "Pakistan", gdp$country)  
  
x <- merge(x, gdp, by.x = c("year", "reporter"),  
          by.y = c("year", "country")) %>%  
  select(year, reporter, trade_value_usd, GDP)  
  
x <- x %>%  
  group_by(reporter) %>%  
  mutate(dImports = trade_value_usd - lag(trade_value_usd, n = 1, default = NA),  
         dGDP = GDP - lag(GDP, n = 1, default = NA),  
         PKM = dImports / dGDP) %>%  
  ungroup() %>%  
  select(year, reporter, PKM) %>%
```

```
spread(reporter, PKM)

x <- x[-1,]

x <- x %>% pivot_longer(cols = India:`Sri Lanka`, names_to = "country", values_to = "PKM")
```

### Plot: PKM over Time

```
PKM_plot <- ggplot(x, aes(x = year, y = PKM, color = country)) +
  geom_line() +
  scale_color_brewer(palette = "Set1") +
  labs(title = "PKM for SAsian economies (2016-2020)", x = NULL, y = NULL, color = "Economies") +
  theme_minimal()

PKM_plot
```

PKM for SAsian economies (2016-2020)