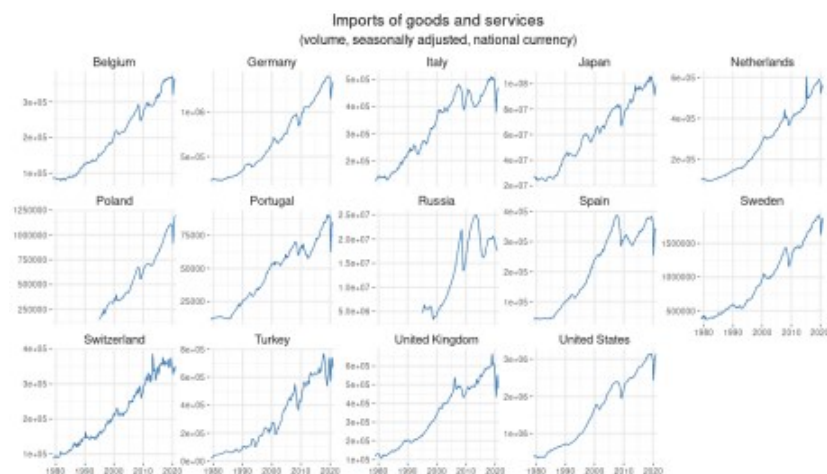# France

Main commercial partners imports of goods and services (volume, quarterly, seasonally adjusted)

First of all, we need to compute the variation of the demand originating from each trading partner of France. We select 18 trading partners that channel 75 percent of French exports.

General case

Data comes from the OECD Economic Outlook database: we use imports of goods and services in volume.

```
partner_country_iso3 <- c('DEU', 'ESP', 'USA', 'ITA', 'GBR', 'BEL', 'NLD',
'CHE', 'POL', 'TUR', 'JPN', 'SWE', 'RUS', 'PRT','CHN', 'SGP', 'HKG', 'DZA')

partner_country_name <- c('Germany', 'Spain', 'United States', 'Italy', 'United
Kingdom', 'Belgium', 'Netherlands', 'Switzerland', 'Poland', 'Turkey', 'Japan',
'Sweden', 'Russia', 'Portugal','China','Singapore','Hong Kong, China','Algeria')
url_country_iso3 <- paste0(partner_country_iso3,collapse = "+")
filter <- paste0(url_country_iso3,".P7.VOBARSA.Q")
df <- rdb("OECD","QNA",mask=filter)

imports <-
  df %>%
  select(period,value,country=LOCATION) %>%
  filter(year(period)>=1979) %>%
  mutate(country = plyr::mapvalues(country, from = partner_country_iso3, to =
partner_country_name))

ggplot(imports ,aes(period,value)) +
  geom_line(colour = blueObsMacro) +
  facet_wrap(~country, ncol = 5, scales = "free_y") +
  scale_x_date(expand = c(0.01,0.01)) +
  theme + xlab(NULL) + ylab(NULL) +
  ggtitle("Imports of goods and services",subtitle="(volume, seasonally
adjusted, national currency)")
```


Special case: Algeria, China, Hong Kong & Singapore.

Data series of imports of goods and services from Algeria, China, Hong Kong & Singapore are not available in our dataset. We decide to use the WEO database (IMF) to retrieve this data. As it is annual, we use a spline interpolation to obtain a quarterly series.

```
partner_country_spec_iso3 <- c('CHN', 'SGP', 'HKG', 'DZA')

url_country_spec_iso3 <- paste0(partner_country_spec_iso3,collapse = "+")
filter <- paste0(url_country_spec_iso3,".TM_RPCH")

df <- rdb("IMF","WEO",mask=filter)

imports_spec <-
  df %>%
  select(period,
         value, country=`weo-country`) %>%
  na.omit() %>%
  mutate(country=
           case_when(country=="HKG" ~ "Hong Kong, China",
                     country=="CHN" ~ "China",
                     country=="DZA" ~ "Algeria",
                     country=="SGP" ~ "Singapore",
                     TRUE ~ country)) %>%
  arrange(country,period) %>%
  group_by(country) %>%
  mutate(value=100*cumprod(1+value/100)) %>%
  bind_rows(data.frame(period=as.Date("1997-01-01"),value=100, country="China"),
            data.frame(period=as.Date("1979-01-01"),value=100,
country="Algeria"),
            data.frame(period=as.Date("1979-01-01"),value=100, country="Hong
Kong, China"),
            data.frame(period=as.Date("1979-01-01"),value=100,
country="Singapore")) %>%
  arrange(country, period) %>%
  spread(country,value)

imports_spec_q <-
  tibble(period=seq(min(imports_spec$period),
                    length.out=nrow(imports_spec)*4,
                    by = "quarter")) %>%
  left_join(imports_spec,by="period") %>%
  gather(country,value,-period) %>%
  filter(!(country== "China" & year(period)<1997)) %>%
  group_by(country) %>%
  mutate(value=na.spline(value))
```
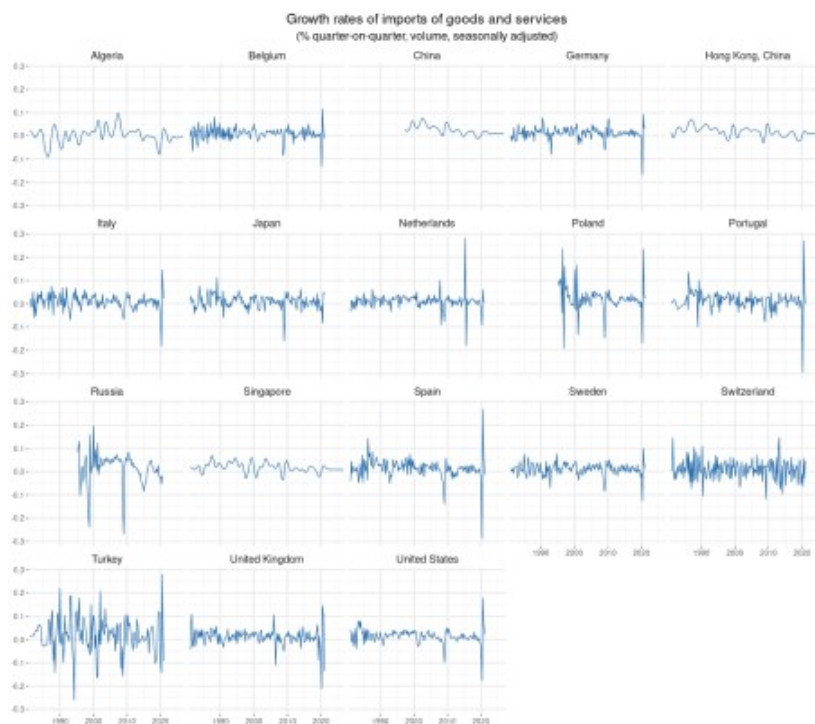
Growth rates

```
imports_growth_rate <-
  imports %>%
  bind_rows(imports_spec_q) %>%
  arrange(country,period) %>%
  group_by(country) %>%
  mutate(value=value/lag(value,1)-1) %>%
  ungroup() %>%
  filter(year(period)>=1980)

ggplot(filter(imports_growth_rate, year(period)>=1981),aes(period,value)) +
  geom_line(colour = blueObsMacro) +
  facet_wrap(~country, ncol = 5, scales = "fixed") +
  scale_x_date(expand = c(0.01,0.01)) +
  theme + xlab(NULL) + ylab(NULL) +
  ggtitle("Growth rates of imports of goods and services", subtitle="(% quarter-
```

```
on-quarter, volume, seasonally adjusted)")
```


Growth rates of imports of goods and services
(% quarter-on-quarter, volume, seasonally adjusted)

```
Mintime <-
  imports_growth_rate %>%
  group_by(country) %>%
  summarize(minTime = min(period)) %>%
  ungroup()

kable(Mintime, "html", caption = "minTime")%>%
  kable_styling(bootstrap_options = c("striped", "hover", "condensed"), position
= "center")
```

minTime

country	minTime
Algeria	1980-01-01
Belgium	1980-01-01
China	1997-01-01
Germany	1980-01-01
Hong Kong, China	1980-01-01
Italy	1980-01-01
Japan	1980-01-01
Netherlands	1980-01-01
Poland	1995-01-01
Portugal	1980-01-01
Russia	1995-01-01
Singapore	1980-01-01
Spain	1980-01-01
Sweden	1980-01-01
Switzerland	1980-01-01
Turkey	1980-01-01
United Kingdom	1980-01-01
United States	1980-01-01

We have uncomplete series only for China, Poland and Russia.

French exports of goods to main commercial partners (values US dollars, annual)

To compute the relative importance of each trading partner, we use data series of values of exports of goods (Free on board, in US dollars), from DOT database (IMF), for France towards each country.

```
# Importer countries
partner_country <- c('DE', 'ES', 'US', 'IT', 'GB', 'BE', 'CN', 'NL', 'CH',
'PL','TR', 'JP', 'SG', 'HK', 'DZ', 'SE', 'RU', 'PT')
url_partner_country <- paste0(partner_country, collapse = "+")

filter <- paste0('A.FR.TXG_FOB_USD.', url_partner_country)
df <- rdb("IMF","DOT",mask = filter)

bilatx <-
  df %>%
  separate(series_name,into = c("tu","ti","to","importer"),sep=" - ") %>%
  select(importer,
         value,
         period) %>%
  mutate(importer=
           case_when(importer=="Russian Federation" ~ "Russia",
                     TRUE ~ importer)) %>%
  add_column(exporter="France") %>%
  filter(period >= '1979-01-01')
```

The following list shows, the date from which we have data on French exports towards each one of the trading partners selected.

```
start_sample <-
  bilatx %>%
  group_by(importer) %>%
  summarize(minTime = min(year(period))) %>%
  ungroup()

kable(start_sample, "html", caption = "minTime")%>%
  kable_styling(bootstrap_options = c("striped", "hover", "condensed"), position
= "center")
```

minTime

importer	minTime
Algeria	1979
Belgium	1999
China	1979
Germany	1979
Hong Kong, China	1979
Italy	1979
Japan	1979
Netherlands	1979
Poland	1979
Portugal	1979
Russia	1992
Singapore	1979
Spain	1979

importer	minTime
Sweden	1979
Switzerland	1979
Turkey	1979
United Kingdom	1979
United States	1979

We have uncomplete series only for Belgium and Russia.

## Special case of Belgium, China, Poland and Russia

We saw in the previous section that we have uncomplete series of imports of goods and services for China, Poland and Russia, and concerning french exports, we have uncomplete series only for Belgium and Russia. We want to check the growth rates of exports with and without these partners before 1999.

```
export_all <-
  bilatx %>%
  group_by(period) %>%
  summarize(value = sum(value)) %>%
  ungroup() %>%
  mutate(var= "France - all")

export_14 <-
  bilatx %>%
  filter(!importer %in% c("Belgium","China","Poland","Russia")) %>%
  group_by(period) %>%
  summarize(value=sum(value)) %>%
  ungroup() %>%
  mutate(var= "France - 14")

plot_export2 <-
  bind_rows(export_all,
            export_14) %>%
  group_by(var) %>%
  mutate(value2=value/lag(value)-1) %>%
  filter(year(period)<=1998)

ggplot(plot_export2,aes(period,value2, colour = var)) +
  geom_line() +
  scale_x_date(expand = c(0.01,0.01)) +
  theme + xlab(NULL) + ylab(NULL) +
  theme(legend.title=element_blank()) +
  ggtitle("Growth rate of exports, with 14 and 18 partners")
```


Growth rate of exports, with 14 and 18 partners

— France - 14 — France - all
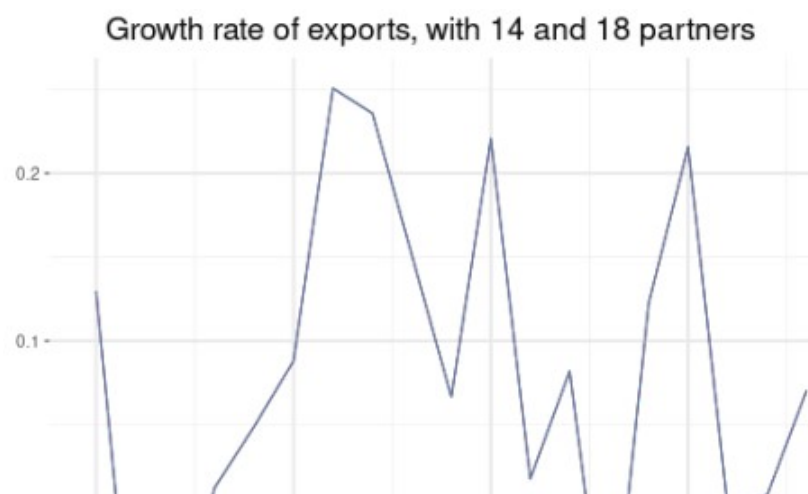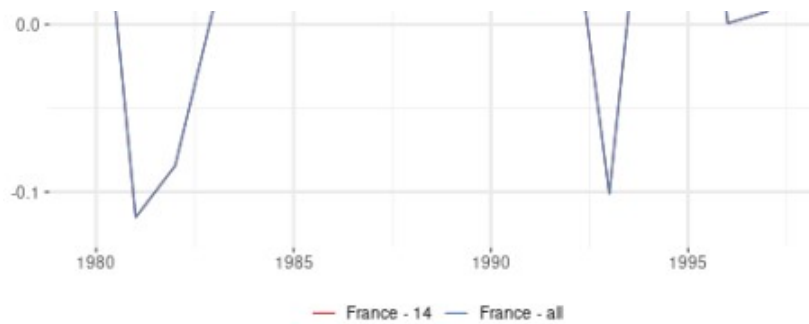
Before 1999, both series are very similar. So we choose to compute weights of 18 commercial partners after 1999 but of only 14 partners before 1999 (without China, Belgium, Poland, and Russia).

Weights of main commercial partners in French exports

For each commercial partner i, we compute α_i, the share of french exports X among all french exports towards these partners, at time t:

$$ \alpha_{i,t} = \frac{ X_{i,t} }{ \sum_i X_{i,t} } $$

```
#Sum of French exports by importer
bilatx %<>%
  group_by(importer,period) %>%
  summarize(value = sum(value)) %>%
  ungroup()


#Sum of French exports to 14 importers
sumX_importer_all <-
  bilatx %>%
  group_by(period) %>%
  summarise(xsum = sum(value)) %>%
  mutate(exporter = 'France') %>%
  ungroup()

alphas_importer_all <-
  left_join(sumX_importer_all, bilatx, by = 'period') %>%
  mutate(alpha = value/xsum) %>%
  select(period,country=importer,alpha)

#Sum of French exports to 14 importers
sumX_importer_14 <-
  bilatx %>%
  filter(! importer %in% c("Belgium", "China","Poland","Russia")) %>%
  group_by(period) %>%
  summarise(xsum = sum(value)) %>%
  mutate(exporter = 'France') %>%
  ungroup()

alphas_importer_14 <-
  left_join(sumX_importer_14,
            filter(bilatx,! importer %in% c("Belgium",
"China","Poland","Russia")),
            by = 'period') %>%
  mutate(alpha = value/xsum) %>%
  select(period,country=importer,alpha)

alphas <-
  bind_rows(
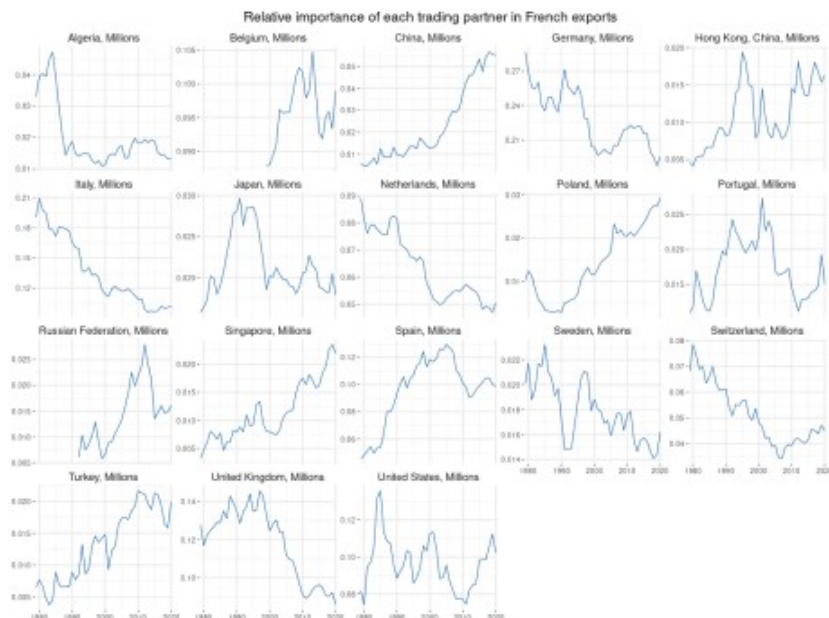```

```
    filter(alphas_importer_14,year(period)<1999),
    filter(alphas_importer_all,year(period)>=1999)
  )

ggplot(alphas,aes(period,alpha)) +
  geom_line(colour = blueObsMacro) +
  facet_wrap(~country, ncol = 5, scales = "free_y") +
  scale_x_date(expand = c(0.01,0.01)) +
  theme + xlab(NULL) + ylab(NULL) +
  ggtitle("Relative importance of each trading partner in French exports")
```


Final index

We sum over the growth rates of imports in volume weighted by the relative importance of each trading partner during the previous year. Then we create a global index.

```
imports_growth_rate %<>% mutate(year=year(period))
alphas %<>% mutate(year=year(period)+1) %>%
  select(-period)

wd <-
  right_join(alphas, imports_growth_rate, by = c("year", "country")) %>%
  mutate(value = alpha * value) %>%
  na.omit() %>%
  select(period,value,country) %>%
  group_by(period) %>%
  summarise(value = sum(value)) %>%
  mutate(value = cumprod(1+value))

wd_index2010 <-
  wd %>%
  mutate(year = year(period)) %>%
  filter(year == "2010") %>%
  group_by(year) %>%
  summarize(value = mean(value)) %>%
  ungroup()

wd_index <-
  wd %>%
  mutate(period,
```

```
        value = 100*value/wd_index2010$value)

wd_index_growth <-
  wd_index %>%
  mutate(value=value/lag(value,4)-1,
         var="2- Growth rate")

plot_wd_FR <-
  bind_rows(wd_index_growth,
            mutate(wd_index,var="1- Level"))%>%
  add_column(country="France")
```

Germany

Main commercial partners imports of goods and services (volume, quarterly, seasonally adjusted)

First of all, we need to compute the variation of the demand originating from each trading partner of Germany. We select 18 trading partners that channel 75 percent of German exports.

General case

Data comes from the OECD Economic Outlook database: we use imports of goods and services in volume.

```
partner_country_iso3 <- c('USA','FRA','GBR','NLD','
CHN','ITA','AUT','POL','CHE','BEL','ESP','CZE','SWE','HUN','
TUR','RUS','JPN','DNK')

partner_country_name <- c('United States','France','United
Kingdom','Netherlands','China','Italy','Austria','Poland','
Switzerland','Belgium','Spain','Czech Republic','Sweden','Hungary','
Turkey','Russia','Japan','Denmark')

url_country_iso3 <- paste0(partner_country_iso3,collapse = "+")
filter <- paste0(url_country_iso3,".P7.VOBARSA.Q")
df <- rdb("OECD","QNA",mask=filter)

imports <-
  df %>%
  select(period,value,country=LOCATION) %>%
  filter(year(period)>=1979) %>%
  mutate(country = plyr::mapvalues(country, from = partner_country_iso3, to =
partner_country_name))

ggplot(imports ,aes(period,value)) +
  geom_line(colour = blueObsMacro) +
  facet_wrap(~country, ncol = 5, scales = "free_y") +
  scale_x_date(expand = c(0.01,0.01)) +
  theme + xlab(NULL) + ylab(NULL) +
  ggtitle("Imports of goods and services",subtitle="(volume, seasonally
adjusted, national currency)")
```
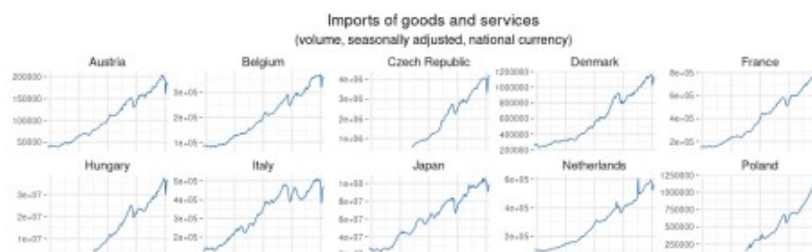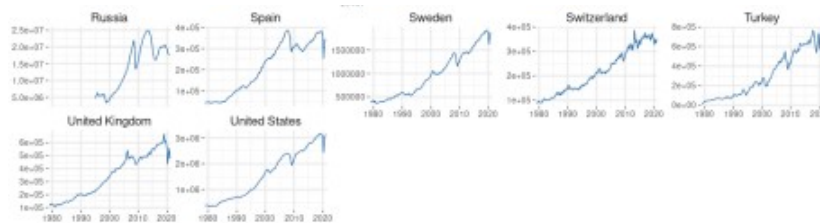
Special case: China.

Data series of imports of goods and services from China are not available in our dataset. We decide to use the WEO database (IMF) to retrieve this data. As it is annual, we use a spline interpolation to obtain a quarterly series.

```
partner_country_spec_iso3 <- c('CHN')

url_country_spec_iso3 <- paste0(partner_country_spec_iso3,collapse = "+")
filter <- paste0(url_country_spec_iso3,".TM_RPCH")

df <- rdb("IMF","WEO",mask=filter)

imports_spec <-
  df %>%
  select(period,
         value, country=`weo-country`) %>%
  mutate(country="China") %>%
  na.omit() %>%
  arrange(country,period) %>%
  mutate(value=100*cumprod(1+value/100)) %>%
  bind_rows(data.frame(period=as.Date("1997-01-01"),value=100, country="China"))
%>%
  arrange(country, period) %>%
  spread(country,value)

imports_spec_q <-
  tibble(period=seq(min(imports_spec$period),
                    length.out=nrow(imports_spec)*4,
                    by = "quarter")) %>%
  left_join(imports_spec,by="period") %>%
  gather(country,value,-period) %>%
  mutate(value=na.spline(value))
```
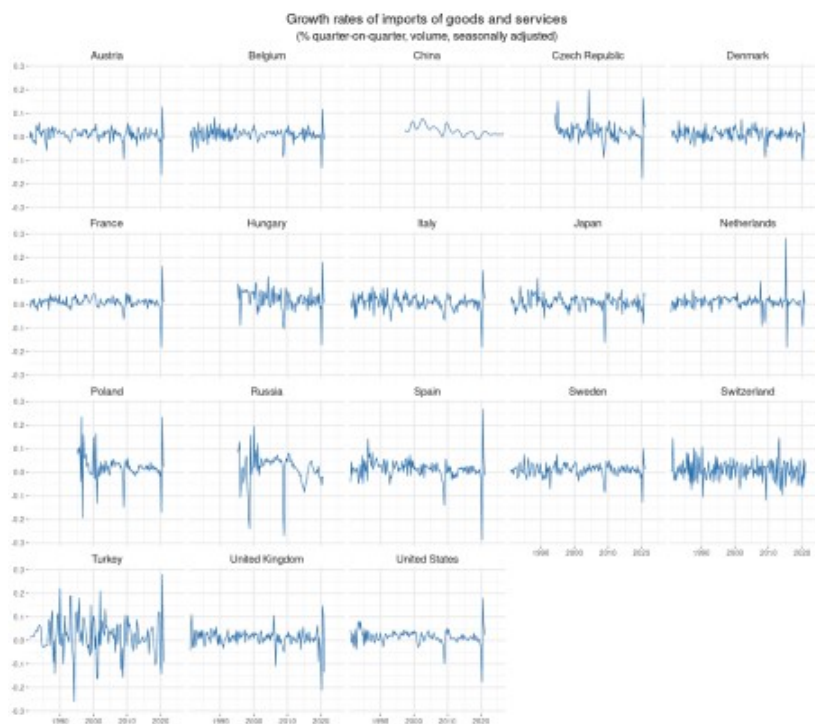
Growth rates

```
imports_growth_rate <-
  imports %>%
  bind_rows(imports_spec_q) %>%
  arrange(country,period) %>%
  group_by(country) %>%
  mutate(value=value/lag(value,1)-1) %>%
  ungroup() %>%
  filter(year(period)>=1980)

ggplot(filter(imports_growth_rate, year(period)>=1981),aes(period,value)) +
  geom_line(colour = blueObsMacro) +
  facet_wrap(~country, ncol = 5, scales = "fixed") +
  scale_x_date(expand = c(0.01,0.01)) +
  theme + xlab(NULL) + ylab(NULL) +
  ggtitle("Growth rates of imports of goods and services", subtitle="(% quarter-
```

```
on-quarter, volume, seasonally adjusted)")
```


Growth rates of imports of goods and services
(% quarter-on-quarter, volume, seasonally adjusted)

```
Mintime <-
  imports_growth_rate %>%
  group_by(country) %>%
  summarize(minTime = min(period)) %>%
  ungroup()

kable(Mintime, "html", caption = "minTime")%>%
  kable_styling(bootstrap_options = c("striped", "hover", "condensed"), position
= "center")
```

minTime

country	minTime
Austria	1980-01-01
Belgium	1980-01-01
China	1997-01-01
Czech Republic	1994-01-01
Denmark	1980-01-01
France	1980-01-01
Hungary	1995-01-01
Italy	1980-01-01
Japan	1980-01-01
Netherlands	1980-01-01
Poland	1995-01-01
Russia	1995-01-01
Spain	1980-01-01
Sweden	1980-01-01
Switzerland	1980-01-01
Turkey	1980-01-01
United Kingdom	1980-01-01
United States	1980-01-01

We have uncomplete series only for China, Czech Republic, Hungary, Poland and Russia.

German exports of goods to main commercial partners (values US dollars, annual)

To compute the relative importance of each trading partner, we use data series of values of exports of goods (Free on board, in US dollars), from DOT database (IMF), for Germany towards each country.

```
# Importer countries
partner_country <- c('US','FR','GB','NL','CN','IT','AT','PL','CH','BE','ES','
CZ','SE','HU','TR','RU','JP','DK')
url_partner_country <- paste0(partner_country, collapse = "+")

filter <- paste0('A.DE.TXG_FOB_USD.', url_partner_country)
df <- rdb("IMF","DOT",mask = filter)

bilatx <-
  df %>%
  separate(series_name,into = c("tu","ti","to","importer"),sep=" - ") %>%
  select(importer,
         value,
         period) %>%
  mutate(importer=
           case_when(importer=="Russian Federation" ~ "Russia",
                     TRUE ~ importer)) %>%
  add_column(exporter="Germany") %>%
  filter(period >= '1979-01-01')
```

The following list shows, the date from which we have data on German exports towards each one of the trading partners selected.

```
start_sample <-
  bilatx %>%
  group_by(importer) %>%
  summarize(minTime = min(year(period))) %>%
  ungroup()

kable(start_sample, "html", caption = "minTime")%>%
  kable_styling(bootstrap_options = c("striped", "hover", "condensed"), position
= "center")
```

minTime

importer	minTime
Austria	1979
Belgium	1999
China	1979
Czech Republic	1993
Denmark	1979
France	1979
Hungary	1979
Italy	1979
Japan	1979
Netherlands	1979
Poland	1979
Russia	1993
Spain	1979

importer	minTime
Sweden	1979
Switzerland	1979
Turkey	1979
United Kingdom	1979
United States	1979

We have uncomplete series only for Belgium, Czech Republic and Russia.

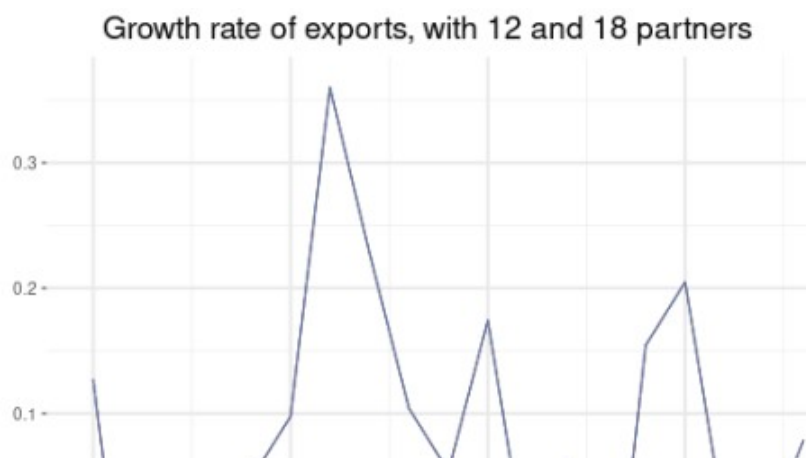## Special case of Belgium, China, Czech Republic, Hungary, Poland and Russia

We saw in the previous section that we have uncomplete series of imports of goods and services for China, Czech Republic, Hungary, Poland and Russia, and concerning german exports, we have uncomplete series only for Belgium, Czech Republic and Russia. We want to check the growth rates of exports with and without these partners before 1999.

```
export_all <-
  bilatx %>%
  group_by(period) %>%
  summarize(value = sum(value)) %>%
  ungroup() %>%
  mutate(var= "Germany - all")

export_12 <-
  bilatx %>%
  filter(!importer %in% c("Belgium", "China","Poland","Russia")) %>%
  group_by(period) %>%
  summarize(value=sum(value)) %>%
  ungroup() %>%
  mutate(var= "Germany - 12")

plot_export2 <-
  bind_rows(export_all,
            export_12) %>%
  group_by(var) %>%
  mutate(value2=value/lag(value)-1) %>%
  filter(year(period)<=1998)

ggplot(plot_export2,aes(period,value2, colour = var)) +
  geom_line() +
  scale_x_date(expand = c(0.01,0.01)) +
  theme + xlab(NULL) + ylab(NULL) +
  theme(legend.title=element_blank()) +
  ggtitle("Growth rate of exports, with 12 and 18 partners")
```


Growth rate of exports, with 12 and 18 partners

Germany - 12 —— Germany - all

Before 1999, both series are very similar. So we choose to compute weights of 18 commercial partners after 1999 but of only 12 partners before 1999 (without Belgium, China, Czech Republic, Hungary, Poland and Russia).

Weights of main commercial partners in German exports

For each trading partner i, we compute α_i, the share of german exports X among all german exports towards these partners, at time t:

$$ \alpha_{i,t} = \frac{ X_{i,t} }{ \sum_i X_{i,t} } $$

```
#Sum of German exports by importer
bilatx %<>%
  group_by(importer,period) %>%
  summarize(value = sum(value)) %>%
  ungroup()

#Sum of German exports to 12 importers
sumX_importer_all <-
  bilatx %>%
  group_by(period) %>%
  summarise(xsum = sum(value)) %>%
  mutate(exporter = 'Germany') %>%
  ungroup()

alphas_importer_all <-
  left_join(sumX_importer_all, bilatx, by = 'period') %>%
  mutate(alpha = value/xsum) %>%
  select(period,country=importer,alpha)

#Sum of German exports to 12 importers
sumX_importer_12 <-
  bilatx %>%
  filter(! importer %in% c("Belgium", "China", "Czech Republic", "Hungary",
"Poland", "Russia")) %>%
  group_by(period) %>%
  summarise(xsum = sum(value)) %>%
  mutate(exporter = 'Germany') %>%
  ungroup()

alphas_importer_12 <-
  left_join(sumX_importer_12,
            filter(bilatx,! importer %in% c("Belgium", "China", "Czech
Republic", "Hungary", "Poland", "Russia")),
            by = 'period') %>%
  mutate(alpha = value/xsum) %>%
  select(period,country=importer,alpha)
```
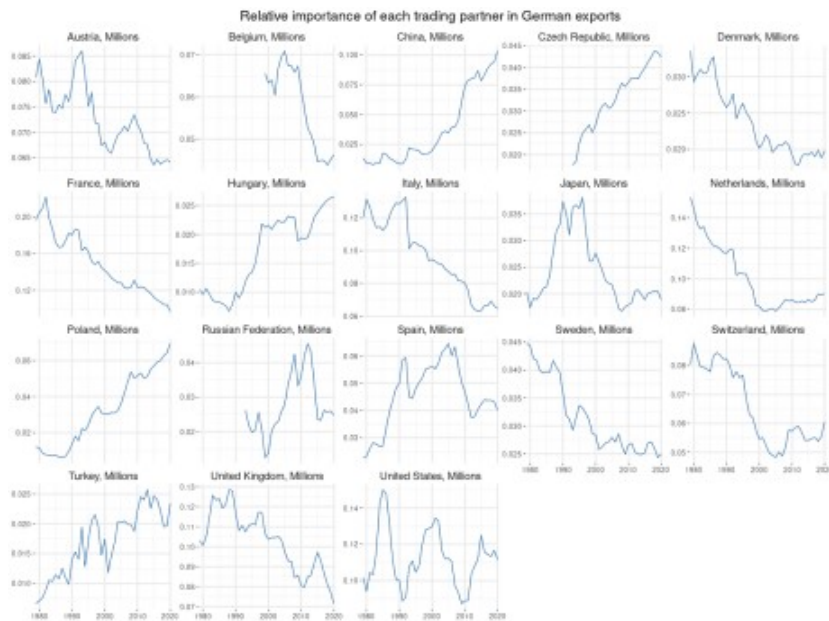
```
alphas <-
  bind_rows(
    filter(alphas_importer_12,year(period)<1999),
    filter(alphas_importer_all,year(period)>=1999)
  )

ggplot(alphas,aes(period,alpha)) +
  geom_line(colour = blueObsMacro) +
  facet_wrap(~country, ncol = 5, scales = "free_y") +
  scale_x_date(expand = c(0.01,0.01)) +
  theme + xlab(NULL) + ylab(NULL) +
  ggtitle("Relative importance of each trading partner in German exports")
```


Final index

We sum over the growth rates of imports in volume weighted by the relative importance of each trading partner during the previous year. Then we create a global index.

```
imports_growth_rate %<>% mutate(year=year(period))
alphas %<>% mutate(year=year(period)+1) %>%
  select(-period)

wd <-
  right_join(alphas, imports_growth_rate, by = c("year", "country")) %>%
  mutate(value = alpha * value) %>%
  na.omit() %>%
  select(period,value,country) %>%
  group_by(period) %>%
  summarise(value = sum(value)) %>%
  mutate(value = cumprod(1+value))

wd_index2010 <-
  wd %>%
  mutate(year = year(period)) %>%
  filter(year == "2010") %>%
  group_by(year) %>%
  summarize(value = mean(value)) %>%
  ungroup()
```

```
wd_index <-
  wd %>%
  mutate(period,
         value = 100*value/wd_index2010$value)

wd_index_growth <-
  wd_index %>%
  mutate(value=value/lag(value,4)-1,
         var="2- Growth rate")

plot_wd_DE <-
  bind_rows(wd_index_growth,
            mutate(wd_index,var="1- Level")) %>%
add_column(country="Germany")
```

Italy

Main commercial partners imports of goods and services (volume, quarterly, seasonally adjusted)

First of all, we need to compute the variation of the demand originating from each trading partner of Italy. We select 22 trading partners that channel 75 percent of Italian exports.

General case

Data comes from the OECD Economic Outlook database: we use imports of goods and services in volume.

```
partner_country_iso3 <- c('DEU','FRA','USA','GBR','
ESP','CHE','BEL','POL','CHN','NLD','TUR','AUS','RUS','ROU','
JPN','HKG','ARE','CZE','HUN','SWE','SAU','KOR')

partner_country_name <- c('Germany','France','United States','United
Kingdom','Spain','Switzerland','Belgium','Poland','China','
Netherlands','Turkey','Austria','Russia','Romania','Japan','Hong Kong,
China','United Arab Emirates','Czech Republic','Hungary','Sweden','Saudi
Arabia','South Korea')
url_country_iso3 <- paste0(partner_country_iso3,collapse = "+")
filter <- paste0(url_country_iso3,".P7.VOBARSA.Q")
df <- rdb("OECD","QNA",mask=filter)

imports <-
  df %>%
  select(period,value,country=LOCATION) %>%
  filter(year(period)>=1979) %>%
  mutate(country = plyr::mapvalues(country, from = partner_country_iso3, to =
partner_country_name))

ggplot(imports ,aes(period,value)) +
  geom_line(colour = blueObsMacro) +
  facet_wrap(~country, ncol = 5, scales = "free_y") +
  scale_x_date(expand = c(0.01,0.01)) +
  theme + xlab(NULL) + ylab(NULL) +
  ggtitle("Imports of goods and services",subtitle="(volume, seasonally
adjusted, national currency)")
```
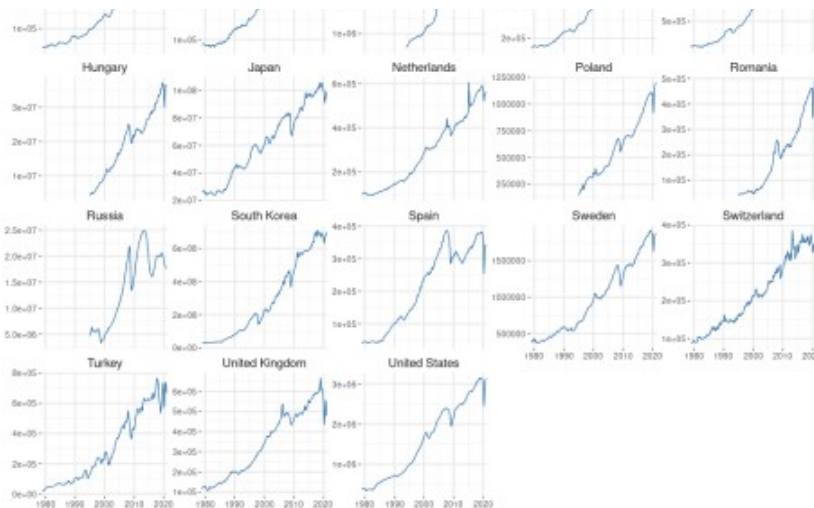

Imports of goods and services
(volume, seasonally adjusted, national currency)
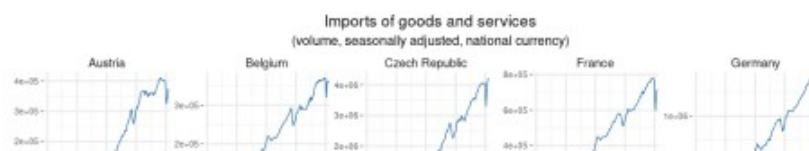
Special case: China, Hong Kong, Romania, Saudi Arabia & United Arab Emirates.

Data series of imports of goods and services from China, Hong Kong, Romania, Saudi Arabia & United Arab Emirates are not available in our dataset. We decide to use the WEO database (IMF) to retrieve this data (except for Romania whose series have extreme values). As it is annual, we use a spline interpolation to obtain a quarterly series.

```
partner_country_spec_iso3 <- c('CHN', 'HKG', 'ARE','SAU')

url_country_spec_iso3 <- paste0(partner_country_spec_iso3,collapse = "+")
filter <- paste0(url_country_spec_iso3,".TM_RPCH")

df <- rdb("IMF","WEO",mask=filter)

imports_spec <-
  df %>%
  select(period,
         value, country=`weo-country`) %>%
  na.omit() %>%
  mutate(country=
          case_when(country=="CHN" ~ "China",
                    country=="SAU" ~ "Saudi Arabia",
                    country=="HKG" ~ "Hong Kong, China",
                    #country=="ROU" ~ "Romania",
                    country=="ARE" ~ "United Arab Emirates",
                    TRUE ~ country)) %>%
  arrange(country,period) %>%
  group_by(country) %>%
  mutate(value=100*cumprod(1+value/100)) %>%
  bind_rows(data.frame(period=as.Date("1997-01-01"),value=100, country="China"),
            data.frame(period=as.Date("1979-01-01"),value=100, country="Saudi
Arabia"),
            data.frame(period=as.Date("1979-01-01"),value=100, country="Hong
Kong, China"),
            #data.frame(period=as.Date("1979-01-01"),value=100,
country="Romania"),
            data.frame(period=as.Date("1979-01-01"),value=100, country="United
Arab Emirates")) %>%
  arrange(country, period) %>%
  spread(country,value)

imports_spec_q <-
  tibble(period=seq(min(imports_spec$period),
```

```
                    length.out=nrow(imports_spec)*4,
                    by = "quarter")) %>%
  left_join(imports_spec,by="period") %>%
  gather(country,value,-period) %>%
  filter(!(country== "China" & year(period)<1997)) %>%
  group_by(country) %>%
  mutate(value=na.spline(value))
```

Growth rates

```
imports_growth_rate <-
  imports %>%
  bind_rows(imports_spec_q) %>%
  arrange(country,period) %>%
  group_by(country) %>%
  mutate(value=value/lag(value,1)-1) %>%
  ungroup() %>%
  filter(year(period)>=1980)

ggplot(filter(imports_growth_rate, year(period)>=1981),aes(period,value)) +
  geom_line(colour = blueObsMacro) +
  facet_wrap(~country, ncol = 5, scales = "fixed") +
  scale_x_date(expand = c(0.01,0.01)) +
  theme + xlab(NULL) + ylab(NULL) +
  ggtitle("Growth rates of imports of goods and services", subtitle="(% quarter-
on-quarter, volume, seasonally adjusted)")
```


Growth rates of imports of goods and services
(% quarter-on-quarter, volume, seasonally adjusted)

```
Mintime <-
  imports_growth_rate %>%
  group_by(country) %>%
  summarize(minTime = min(period)) %>%
```

```
  ungroup()

kable(Mintime, "html", caption = "minTime")%>%
  kable_styling(bootstrap_options = c("striped", "hover", "condensed"), position
= "center")
```

country	minTime
Austria	1980-01-01
Belgium	1980-01-01
China	1997-01-01
Czech Republic	1994-01-01
France	1980-01-01
Germany	1980-01-01
Hong Kong, China	1980-01-01
Hungary	1995-01-01
Japan	1980-01-01
Netherlands	1980-01-01
Poland	1995-01-01
Romania	1995-01-01
Russia	1995-01-01
Saudi Arabia	1980-01-01
South Korea	1980-01-01
Spain	1980-01-01
Sweden	1980-01-01
Switzerland	1980-01-01
Turkey	1980-01-01
United Arab Emirates	1980-01-01
United Kingdom	1980-01-01
United States	1980-01-01

We have uncomplete series only for China, Czech Republic, Hungary, Poland, Romania and Russia.

Italian exports of goods to main commercial partners (values US dollars, annual)

To compute the relative importance of each trading partner, we use data series of values of exports of goods (Free on board, in US dollars), from DOT database (IMF), for Italy towards each country.

```
# Importer countries
partner_country <- c('DE','FR','US','GB','ES','CH','BE','PL','CN','NL','TR','
AT','RU','RO','JP','HK','AE','CZ','HU','SE','SA','KR')

url_partner_country <- paste0(partner_country, collapse = "+")

filter <- paste0('A.IT.TXG_FOB_USD.', url_partner_country)
df <- rdb("IMF","DOT",mask = filter)

bilatx <-
  df %>%
  separate(series_name,into = c("tu","ti","to","importer"),sep=" - ") %>%
  select(importer,
         value,
         period) %>%
```

```
mutate(importer=
        case_when(importer=="Russian Federation" ~ "Russia",
                  importer=="Korea, Republic of" ~ "South Korea",
                  TRUE ~ importer)) %>%
add_column(exporter="Italy") %>%
filter(period >= '1979-01-01')
```

The following list shows, the date from which we have data on Italian exports towards each one of the trading partners selected.

```
start_sample <-
  bilatx %>%
  group_by(importer) %>%
  summarize(minTime = min(year(period))) %>%
  ungroup()

kable(start_sample, "html", caption = "minTime")%>%
  kable_styling(bootstrap_options = c("striped", "hover", "condensed"), position
= "center")
```

minTime

importer	minTime
Austria	1979
Belgium	1999
China	1979
Czech Republic	1993
France	1979
Germany	1979
Hong Kong, China	1979
Hungary	1979
Japan	1979
Netherlands	1979
Poland	1979
Romania	1979
Russia	1993
Saudi Arabia	1979
South Korea	1979
Spain	1979
Sweden	1979
Switzerland	1979
Turkey	1979
United Arab Emirates	1979
United Kingdom	1979
United States	1979

We have uncomplete series only for Belgium, Czech Republic, and Russia.

Special case of Belgium, China, Czech Republic, Hungary, Poland, Romania and Russia

We saw in the previous section that we have uncomplete series of imports of goods and services for China, Czech Republic, Hungary, Poland, Romania and Russia, and concerning italian exports, we have uncomplete series only for Belgium, Czech Republic, and Russia. We want to check the growth rates of exports with and without these partners before 1999.

```
export_all <-
  bilatx %>%
  group_by(period) %>%
  summarize(value = sum(value)) %>%
  ungroup() %>%
  mutate(var= "Italy - all")

export_15 <-
  bilatx %>%
  filter(!importer %in% c("Belgium", "China", "Czech Republic", "Hungary",
"Poland", "Romania","Russia")) %>%
  group_by(period) %>%
  summarize(value=sum(value)) %>%
  ungroup() %>%
  mutate(var= "Italy - 15")

plot_export2 <-
  bind_rows(export_all,
            export_15) %>%
  group_by(var) %>%
  mutate(value2=value/lag(value)-1) %>%
  filter(year(period)<=1998)

ggplot(plot_export2,aes(period,value2, colour = var)) +
  geom_line() +
  scale_x_date(expand = c(0.01,0.01)) +
  theme + xlab(NULL) + ylab(NULL) +
  theme(legend.title=element_blank()) +
  ggtitle("Growth rate of exports, with 15 and 22 partners")
```


Growth rate of exports, with 15 and 22 partners
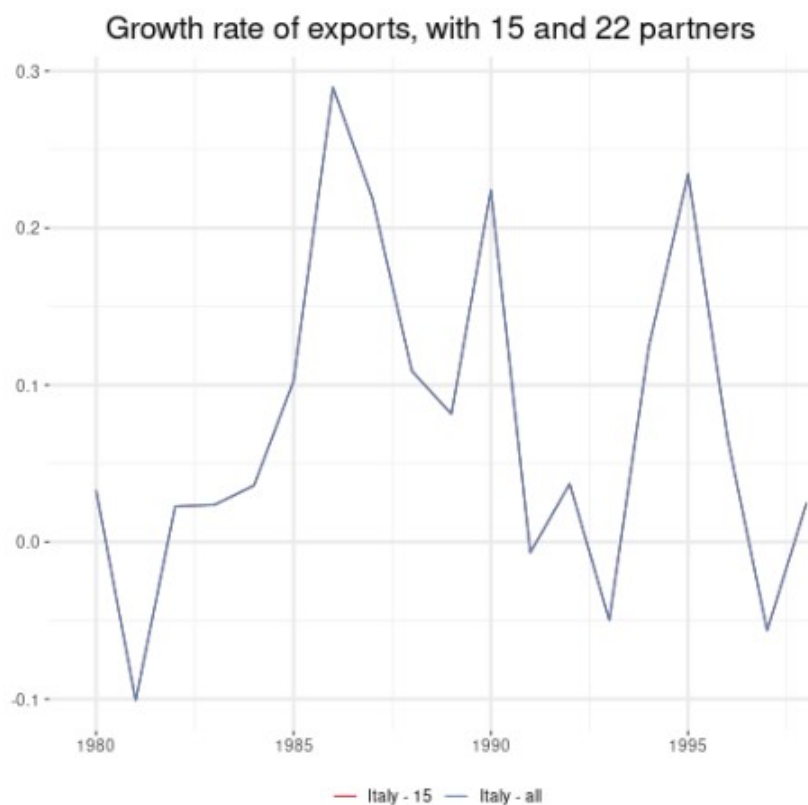
Before 1999, both series are very similar. So we choose to compute weights of 22 commercial partners after 1999 but of only 15 partners before 1999 (without Belgium, China, Czech Republic, Hungary, Poland, Romania and Russia).

Weights of main commercial partners in Italian exports

For each commercial partner i, we compute α_i, the share of italian exports X among all italian exports towards these partners, at time t:

$$ \alpha_{i,t} = \frac{ X_{i,t} }{ \sum_i X_{i,t} } $$

```r
#Sum of Italian exports by importer
bilatx %<>%
  group_by(importer,period) %>%
  summarize(value = sum(value)) %>%
  ungroup()

#Sum of Italian exports to 16 importers
sumX_importer_all <-
  bilatx %>%
  group_by(period) %>%
  summarise(xsum = sum(value)) %>%
  mutate(exporter = 'Italy') %>%
  ungroup()

alphas_importer_all <-
  left_join(sumX_importer_all, bilatx, by = 'period') %>%
  mutate(alpha = value/xsum) %>%
  select(period,country=importer,alpha)

#Sum of Italian exports to 16 importers
sumX_importer_15 <-
  bilatx %>%
  filter(! importer %in% c("Belgium", "China", "Czech Republic", "Hungary",
"Poland", "Romania", "Russia")) %>%
  group_by(period) %>%
  summarise(xsum = sum(value)) %>%
  mutate(exporter = 'Italy') %>%
  ungroup()

alphas_importer_15 <-
  left_join(sumX_importer_15,
            filter(bilatx,! importer %in% c("Belgium", "China", "Czech
Republic", "Hungary", "Poland", "Romania","Russia")),
            by = 'period') %>%
  mutate(alpha = value/xsum) %>%
  select(period,country=importer,alpha)

alphas <-
  bind_rows(
    filter(alphas_importer_15,year(period)<1999),
    filter(alphas_importer_all,year(period)>=1999)
  )

ggplot(alphas,aes(period,alpha)) +
  geom_line(colour = blueObsMacro) +
  facet_wrap(~country, ncol = 5, scales = "free_y") +
  scale_x_date(expand = c(0.01,0.01)) +
  theme + xlab(NULL) + ylab(NULL) +
  ggtitle("Relative importance of each trading partner in Italian exports")
```
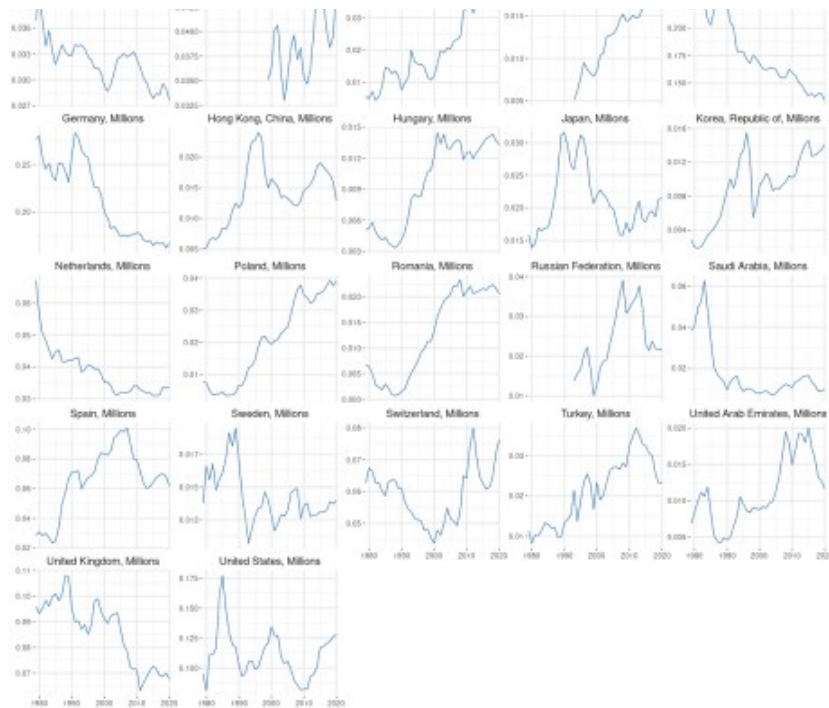
Final index

We sum over the growth rates of imports in volume weighted by the relative importance of each trading partner during the previous year. Then we create a global index.

```
imports_growth_rate %<>% mutate(year=year(period))
alphas %<>% mutate(year=year(period)+1) %>%
  select(-period)

wd <-
  right_join(alphas, imports_growth_rate, by = c("year", "country")) %>%
  mutate(value = alpha * value) %>%
  na.omit() %>%
  select(period,value,country) %>%
  group_by(period) %>%
  summarise(value = sum(value)) %>%
  mutate(value = cumprod(1+value))

wd_index2010 <-
  wd %>%
  mutate(year = year(period)) %>%
  filter(year == "2010") %>%
  group_by(year) %>%
  summarize(value = mean(value)) %>%
  ungroup()

wd_index <-
  wd %>%
  mutate(period,
         value = 100*value/wd_index2010$value)

wd_index_growth <-
  wd_index %>%
  mutate(value=value/lag(value,4)-1,
         var="2- Growth rate")

plot_wd_IT <-
```

```
    bind_rows(wd_index_growth,
             mutate(wd_index,var="1- Level")) %>%
add_column(country="Italy")
```

Spain

Imports of goods and services of Spain main commercial partners (volume, quarterly, seasonally adjusted)

First of all, we need to compute the variation of the demand originating from each trading partner of Spain. We select 18 trading partners that channel 75 percent of Spanish exports.

General case

Data comes from the OECD Economic Outlook database: we use imports of goods and services in volume.

```
partner_country_iso3 <- c('FRA','DEU','ITA','GBR','
PRT','USA','NLD','BEL','MAR','TUR','CHN','POL','MEX','CHE','
DZA','JPN','SAU','BRA')

partner_country_name <- c('France','Germany','Italy','United
Kingdom','Portugal','United States','Netherlands','Belgium','Morocco','Turkey','
China','Poland','Mexico','Switzerland','Algeria','Japan','Saudi
Arabia','Brazil')

url_country_iso3 <- paste0(partner_country_iso3,collapse = "+")
filter <- paste0(url_country_iso3,".P7.VOBARSA.Q")
df <- rdb("OECD","QNA",mask=filter)

imports <-
  df %>%
  select(period,value,country=LOCATION) %>%
  filter(year(period)>=1979) %>%
  mutate(country = plyr::mapvalues(country, from = partner_country_iso3, to =
partner_country_name))

ggplot(imports ,aes(period,value)) +
  geom_line(colour = blueObsMacro) +
  facet_wrap(~country, ncol = 5, scales = "free_y") +
  scale_x_date(expand = c(0.01,0.01)) +
  theme + xlab(NULL) + ylab(NULL) +
  ggtitle("Imports of goods and services",subtitle="(volume, seasonally
adjusted, national currency)")
```
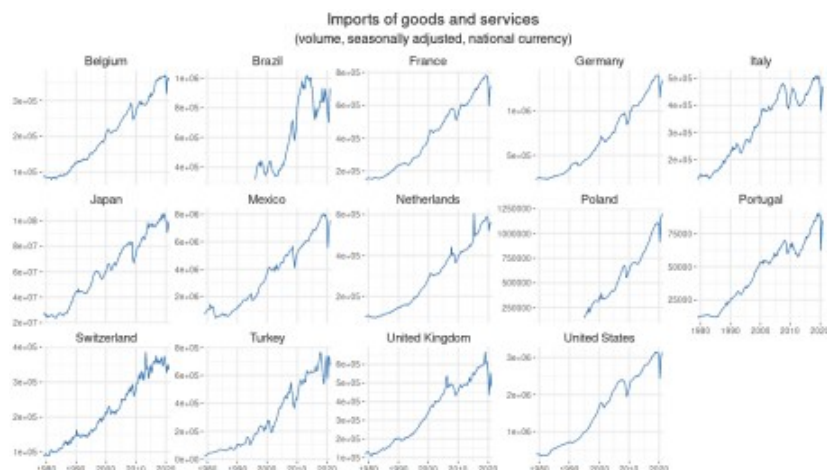
Special case: Algeria, China, Morocco & Saudi Arabia.

Data series of imports of goods and services from Algeria, China, Morocco & Saudi Arabia are not available in our dataset. We decide to use the WEO database (IMF) to retrieve this data. As it is annual, we use a spline interpolation to obtain quarterly series.

```
partner_country_spec_iso3 <- c('DZA', 'CHN', 'MAR', 'SAU')

url_country_spec_iso3 <- paste0(partner_country_spec_iso3,collapse = "+")
filter <- paste0(url_country_spec_iso3,".TM_RPCH")

df <- rdb("IMF","WEO",mask=filter)

imports_spec <-
  df %>%
  select(period,
         value, country=`weo-country`) %>%
  na.omit() %>%
  mutate(country=
            case_when(country=="SAU" ~ "Saudi Arabia",
                      country=="CHN" ~ "China",
                      country=="DZA" ~ "Algeria",
                      country=="MAR" ~ "Morocco",
                      TRUE ~ country)) %>%
  arrange(country,period) %>%
  group_by(country) %>%
  mutate(value=100*cumprod(1+value/100)) %>%
  bind_rows(data.frame(period=as.Date("1997-01-01"),value=100, country="China"),
            data.frame(period=as.Date("1979-01-01"),value=100,
country="Algeria"),
            data.frame(period=as.Date("1979-01-01"),value=100, country="Saudi
Arabia"),
            data.frame(period=as.Date("1979-01-01"),value=100,
country="Morocco")) %>%
  arrange(country, period) %>%
  spread(country,value)

imports_spec_q <-
  tibble(period=seq(min(imports_spec$period),
                    length.out=nrow(imports_spec)*4,
                    by = "quarter")) %>%
  left_join(imports_spec,by="period") %>%
  gather(country,value,-period) %>%
  filter(!(country== "China" & year(period)<1997)) %>%
  group_by(country) %>%
  mutate(value=na.spline(value))
```
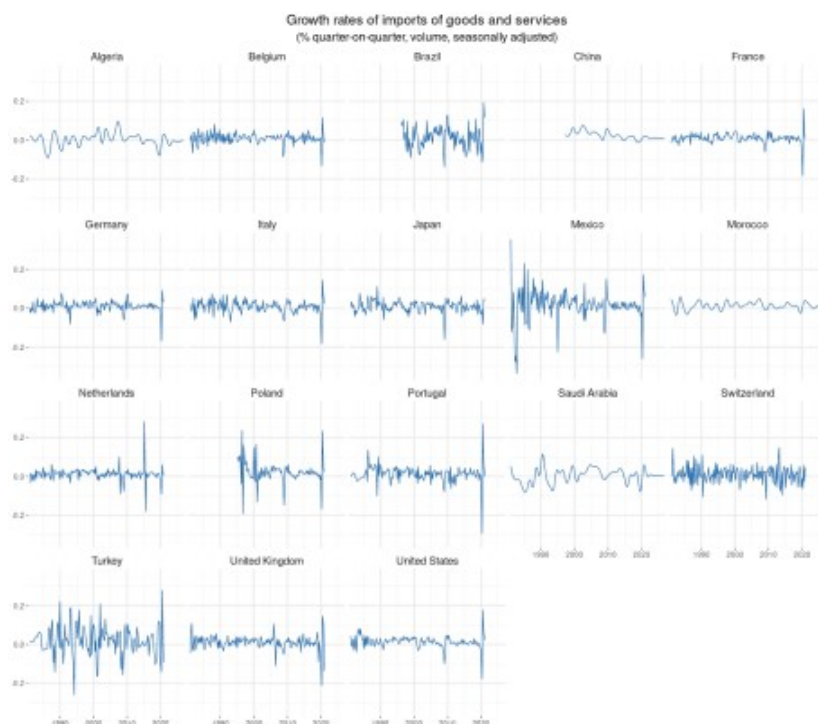
Growth rates

```
imports_growth_rate <-
  imports %>%
  bind_rows(imports_spec_q) %>%
  arrange(country,period) %>%
  group_by(country) %>%
  mutate(value=value/lag(value,1)-1) %>%
  ungroup() %>%
  filter(year(period)>=1980)
```

```
ggplot(filter(imports_growth_rate, year(period)>=1981),aes(period,value)) +
  geom_line(colour = blueObsMacro) +
  facet_wrap(~country, ncol = 5, scales = "fixed") +
  scale_x_date(expand = c(0.01,0.01)) +
  theme + xlab(NULL) + ylab(NULL) +
  ggtitle("Growth rates of imports of goods and services", subtitle="(% quarter-
on-quarter, volume, seasonally adjusted)")
```


Growth rates of imports of goods and services
(% quarter-on-quarter, volume, seasonally adjusted)

```
Mintime <-
  imports_growth_rate %>%
  group_by(country) %>%
  summarize(minTime = min(period)) %>%
  ungroup()

kable(Mintime, "html", caption = "minTime")%>%
  kable_styling(bootstrap_options = c("striped", "hover", "condensed"), position
= "center")
```

minTime

country	minTime
Algeria	1980-01-01
Belgium	1980-01-01
Brazil	1996-01-01
China	1997-01-01
France	1980-01-01
Germany	1980-01-01
Italy	1980-01-01
Japan	1980-01-01
Mexico	1980-01-01
Morocco	1980-01-01
Netherlands	1980-01-01
Poland	1995-01-01
Portugal	1980-01-01
Saudi Arabia	1980-01-01

country	minTime
Switzerland	1980-01-01
Turkey	1980-01-01
United Kingdom	1980-01-01
United States	1980-01-01

We have uncomplete series only for Brazil, China, and Poland.

Spanish exports of goods to main commercial partners (values US dollars, annual)

To compute the relative importance of each trading partner, we use data series of values of exports of goods (Free on board, in US dollars), from DOT database (IMF), for Spain towards each country.

```
# Importer countries
partner_country <- c('FR','DE','IT','GB','PT','US','NL','BE','MA','TR','CN','
PL','MX','CH','DZ','JP','SA','BR')

url_partner_country <- paste0(partner_country, collapse = "+")

filter <- paste0('A.ES.TXG_FOB_USD.', url_partner_country)
df <- rdb("IMF","DOT",mask = filter)

bilatx <-
  df %>%
  separate(series_name,into = c("tu","ti","to","importer"),sep=" - ") %>%
  select(importer,
         value,
         period) %>%
  add_column(exporter="Spain") %>%
  filter(period >= '1979-01-01')
```

The following list shows, the date from which we have data on spanish exports towards each one of the trading partners selected.

```
start_sample <-
  bilatx %>%
  group_by(importer) %>%
  summarize(minTime = min(year(period))) %>%
  ungroup()

kable(start_sample, "html", caption = "minTime")%>%
  kable_styling(bootstrap_options = c("striped", "hover", "condensed"), position
= "center")
```

minTime

importer	minTime
Algeria	1979
Belgium	1997
Brazil	1979
China	1979
France	1979
Germany	1979
Italy	1979
Japan	1979
Mexico	1979

importer	minTime
Morocco	1979
Netherlands	1979
Poland	1979
Portugal	1979
Saudi Arabia	1979
Switzerland	1979
Turkey	1979
United Kingdom	1979
United States	1979

We have uncomplete series only for Belgium.

Special case of Belgium, Brazil, China and Poland

We saw in the previous section that we have uncomplete series of imports of goods and services for Brazil, China, and Poland, and concerning spanish exports, we have uncomplete series only for Belgium. We want to check the growth rates of exports with and without these partners before 1997.

```
export_all <-
  bilatx %>%
  group_by(period) %>%
  summarize(value = sum(value)) %>%
  ungroup() %>%
  mutate(var= "Spain - all")

export_14 <-
  bilatx %>%
  filter(!importer %in% c("Belgium", "Brazil", "China", "Poland")) %>%
  group_by(period) %>%
  summarize(value=sum(value)) %>%
  ungroup() %>%
  mutate(var= "Spain - 14")

plot_export2 <-
  bind_rows(export_all,
            export_14) %>%
  group_by(var) %>%
  mutate(value2=value/lag(value)-1) %>%
  filter(year(period)<=1996)

ggplot(plot_export2,aes(period,value2, colour = var)) +
  geom_line() +
  scale_x_date(expand = c(0.01,0.01)) +
  theme + xlab(NULL) + ylab(NULL) +
  theme(legend.title=element_blank()) +
  ggtitle("Growth rate of exports, with 14 and 18 partners")
```


Growth rate of exports, with 14 and 18 partners

Before 1999, both series are very similar. So we choose to compute weights of 18 commercial partners after 1997 but of only 14 partners before 1997 (without Belgium, Brazil, China and Poland).

Weights of main commercial partners in spanish exports

For each commercial partner i, we compute α_i, the share of spanish exports X among all spanish exports towards these partners, at time t:

$$ \alpha_{i,t} = \frac{ X_{i,t} }{ \sum_i X_{i,t} } $$

```
#Sum of Spanish exports by importer
bilatx %<>%
  group_by(importer,period) %>%
  summarize(value = sum(value)) %>%
  ungroup()


#Sum of Spanish exports to 14 importers
sumX_importer_all <-
  bilatx %>%
  group_by(period) %>%
  summarise(xsum = sum(value)) %>%
  mutate(exporter = 'Spain') %>%
  ungroup()

alphas_importer_all <-
  left_join(sumX_importer_all, bilatx, by = 'period') %>%
  mutate(alpha = value/xsum) %>%
  select(period,country=importer,alpha)

#Sum of French exports to 14 importers
sumX_importer_14 <-
  bilatx %>%
  filter(! importer %in% c("Belgium", "Brazil", "China", "Poland")) %>%
  group_by(period) %>%
  summarise(xsum = sum(value)) %>%
  mutate(exporter = 'Spain') %>%
  ungroup()

alphas_importer_14 <-
  left_join(sumX_importer_14,
            filter(bilatx,! importer %in% c("Belgium", "Brazil", "China",
"Poland")),
            by = 'period') %>%
  mutate(alpha = value/xsum) %>%
```
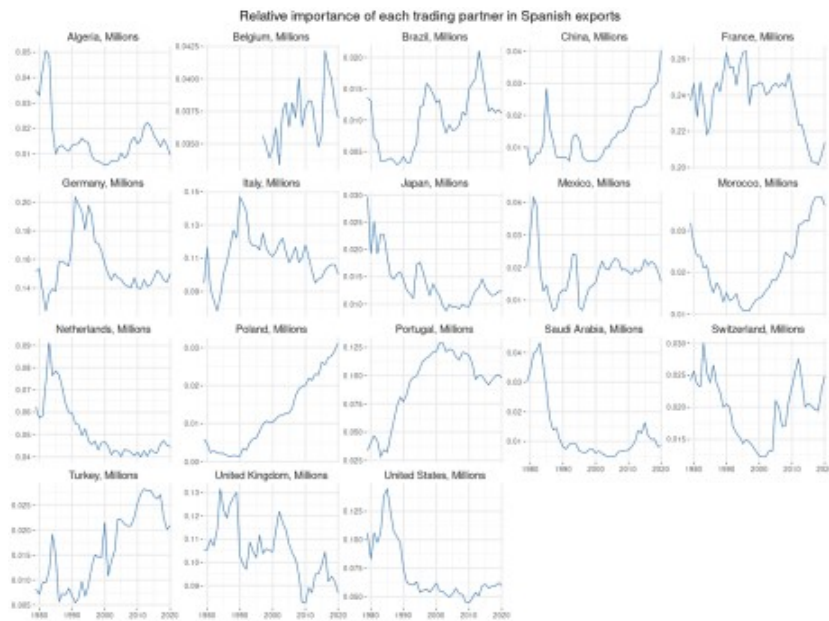
```
    select(period,country=importer,alpha)

alphas <-
  bind_rows(
    filter(alphas_importer_14,year(period)<1997),
    filter(alphas_importer_all,year(period)>=1997)
  )

ggplot(alphas,aes(period,alpha)) +
  geom_line(colour = blueObsMacro) +
  facet_wrap(~country, ncol = 5, scales = "free_y") +
  scale_x_date(expand = c(0.01,0.01)) +
  theme + xlab(NULL) + ylab(NULL) +
  ggtitle("Relative importance of each trading partner in Spanish exports")
```


Final index

We sum over the growth rates of imports in volume weighted by the relative importance of each trading partner during the previous year. Then we create a global index.

```
imports_growth_rate %<>% mutate(year=year(period))
alphas %<>% mutate(year=year(period)+1) %>%
  select(-period)

wd <-
  right_join(alphas, imports_growth_rate, by = c("year", "country")) %>%
  mutate(value = alpha * value) %>%
  na.omit() %>%
  select(period,value,country) %>%
  group_by(period) %>%
  summarise(value = sum(value)) %>%
  mutate(value = cumprod(1+value))

wd_index2010 <-
  wd %>%
  mutate(year = year(period)) %>%
  filter(year == "2010") %>%
  group_by(year) %>%
  summarize(value = mean(value)) %>%
  ungroup()
```

```
wd_index <-
  wd %>%
  mutate(period,
         value = 100*value/wd_index2010$value)

wd_index_growth <-
  wd_index %>%
  mutate(value=value/lag(value,4)-1,
         var="2- Growth rate")

plot_wd_ES <-
  bind_rows(wd_index_growth,
            mutate(wd_index,var="1- Level")) %>%
  add_column(country="Spain")
```

Foreign Demand

```
foreign_demand<-
  bind_rows(plot_wd_FR,
            plot_wd_DE,
            plot_wd_IT,
            plot_wd_ES)

ggplot(foreign_demand,aes(period,value,colour=country)) +
  geom_line() +
  facet_wrap(~var, scales = "free_y",ncol=1) +
  scale_x_date(expand = c(0.01,0.01)) +
  theme + xlab(NULL) + ylab(NULL) +
  ggtitle(expression(atop("Foreign demand for France, Germany, Italy and Spain",
atop(italic("base 100 = 2010"),""))))
```

```
list_country <- list("FR"="France",
                     "DE"="Germany",
```

```r
                    "IT"="Italy",
                    "ES"= "Spain")

foreign_demand$country <- factor(foreign_demand$country)
levels(foreign_demand$country)<-list_country

world_demand <-
  foreign_demand %>%
  filter(var=="1- Level") %>%
  select(period,value,country) %>%
  add_column(var="world_demand")

write.csv(world_demand,"Foreign_demand.csv",row.names = FALSE)
```