In [11]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import datetime as dt
```

In [12]:
```
imp=pd.read_csv(r"C:\Users\berid\OneDrive\Desktop\mydata\india exportandimport\2018-2010_import.csv")
exp=pd.read_csv(r"C:\Users\berid\OneDrive\Desktop\mydata\india exportandimport\2018-2010_export.csv")
```

In [13]:
```
imp.columns=imp.columns.str.strip()
exp.columns=exp.columns.str.strip()
```

In [14]:
```
exp
```

Out[14]:

	HSCode	Commodity	value	country	year
0	2	MEAT AND EDIBLE MEAT OFFAL.	0.18	AFGHANISTAN TIS	2018
1	3	FISH AND CRUSTACEANS, MOLLUSCS AND OTHER AQUAT...	0.00	AFGHANISTAN TIS	2018
2	4	DAIRY PRODUCE; BIRDS' EGGS; NATURAL HONEY; EDI...	12.48	AFGHANISTAN TIS	2018
3	6	LIVE TREES AND OTHER PLANTS; BULBS; ROOTS AND ...	0.00	AFGHANISTAN TIS	2018
4	7	EDIBLE VEGETABLES AND CERTAIN ROOTS AND TUBERS.	1.89	AFGHANISTAN TIS	2018
...	...	...	...	...	...
137018	95	TOYS, GAMES AND SPORTS REQUISITES; PARTS AND A...	0.03	ZIMBABWE	2010
137019	96	MISCELLANEOUS MANUFACTURED ARTICLES.	0.45	ZIMBABWE	2010
137020	97	WORKS OF ART COLLECTORS' PIECES AND ANTIQUES.	0.00	ZIMBABWE	2010
137021	98	PROJECT GOODS; SOME SPECIAL USES.	0.00	ZIMBABWE	2010
137022	99	MISCELLANEOUS GOODS.	0.07	ZIMBABWE	2010

137023 rows × 5 columns

In [5]:
```
grouped=exp.groupby(["year","country"])["value"].sum().reset_index()
grouped["AllTimeValueByCountry"]=grouped.groupby("country")["value"].transform(lambda x:x.sum())
grouped=grouped.sort_values("AllTimeValueByCountry",ascending=False)

pivoted=grouped.pivot("country","year","value").reset_index()
pivoted["total"]=pivoted.sum(axis=1)
pivoted=pivoted.sort_values("total",ascending=False).head(10)
pivoted
```

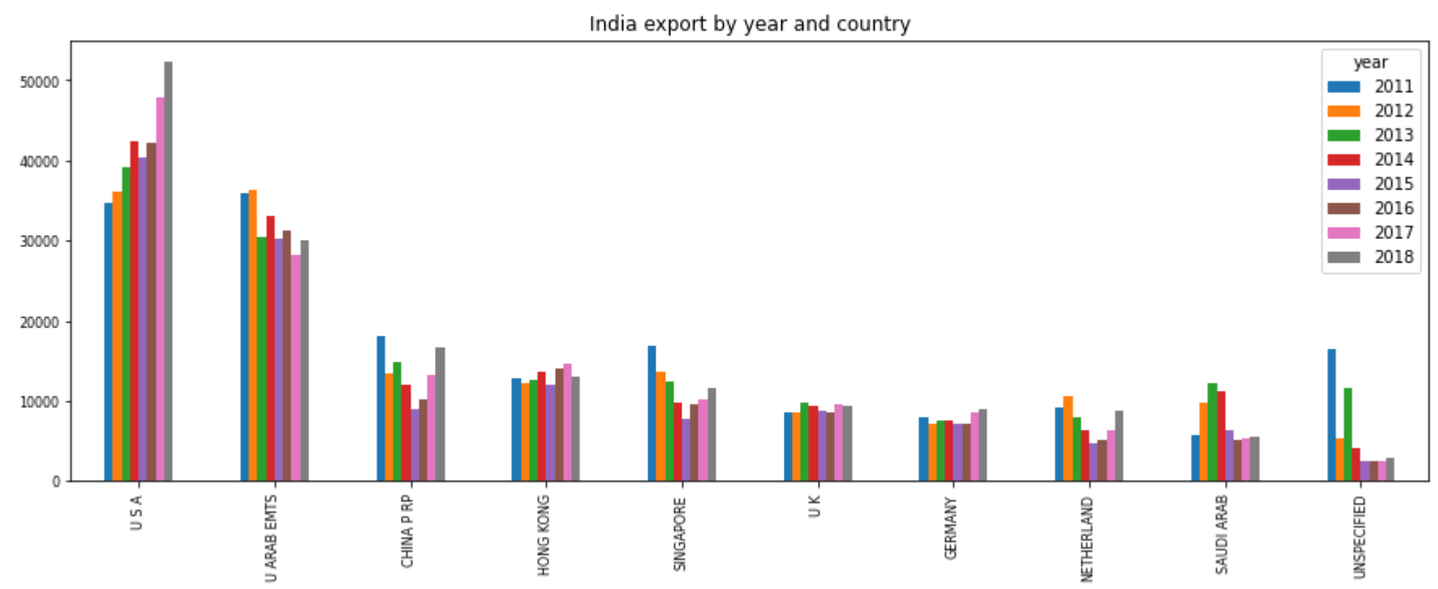
```
C:\Users\berid\AppData\Local\Temp\ipykernel_13304\1134295235.py:6: FutureWarning: Dropping of nuisance columns in DataFrame reductions (with 'numeric_only=None') is deprecated; in
a future version this will raise TypeError.  Select only valid columns before calling the reduction.
  pivoted["total"]=pivoted.sum(axis=1)
```

Out[5]:

year	country	2010	2011	2012	2013	2014	2015	2016	2017	2018	total
231	U S A	25291.56	34741.33	36154.88	39141.81	42448.30	40335.68	42211.96	47878.17	52405.88	360609.57
229	U ARAB EMTS	33822.08	35925.23	36316.29	30520.08	33027.73	30316.16	31175.16	28145.77	30126.38	289374.88
44	CHINA P RP	14168.65	18076.34	13534.66	14824.16	11934.07	9011.19	10171.66	13333.33	16751.94	121806.00
97	HONG KONG	10320.10	12931.71	12279.01	12731.55	13599.74	12092.16	14047.13	14690.11	13001.84	115693.35
193	SINGAPORE	9825.25	16857.45	13619.00	12510.31	9809.17	7719.59	9564.32	10202.57	11572.04	101679.70
230	U K	7284.66	8589.64	8612.22	9778.78	9319.48	8828.26	8529.76	9690.82	9308.99	79942.61
81	GERMANY	6750.90	7942.53	7245.91	7515.55	7537.06	7092.58	7181.25	8687.49	8902.18	68855.45
154	NETHERLAND	7677.42	9151.05	10564.80	7995.42	6324.52	4724.91	5069.49	6260.95	8812.61	66581.17
188	SAUDI ARAB	4684.17	5683.06	9785.56	12218.72	11161.21	6381.23	5110.09	5410.42	5561.53	65995.99
235	UNSPECIFIED	14390.17	16436.70	5437.45	11544.48	4161.22	2482.88	2470.11	2429.67	2907.21	62259.89

plot exported value for 10 main countries

In [6]:
```
pivoted.plot(figsize=(15,5),kind="bar",x="country",y=pivoted.columns[2:-1],fontsize=8,xlabel="",stacked=False)
plt.title("India export by year and country")
plt.show()
```



Find 2 most frequently exported commodities together for each year

In [127]:
```
from itertools import combinations
from collections import Counter
mycounter=Counter()

for i in exp.year.unique():
    for row in exp[exp.year==i]["Commodity"]:
        row_list=row.split(";")
        mycounter.update(Counter(combinations(row_list,2)))
    for key,value in mycounter.most_common(1):
        print(i,key,value)
```

```
2018 ('NUCLEAR REACTORS, BOILERS, MACHINERY AND MECHANICAL APPLIANCES', ' PARTS THEREOF.') 224
2017 ('NUCLEAR REACTORS, BOILERS, MACHINERY AND MECHANICAL APPLIANCES', ' PARTS THEREOF.') 444
2016 ('NUCLEAR REACTORS, BOILERS, MACHINERY AND MECHANICAL APPLIANCES', ' PARTS THEREOF.') 662
2015 ('ELECTRICAL MACHINERY AND EQUIPMENT AND PARTS THEREOF', ' SOUND RECORDERS AND REPRODUCERS, TELEVISION IMAGE AND SOUND RECORDERS AND REPRODUCERS,AND PARTS.') 877
2014 ('ELECTRICAL MACHINERY AND EQUIPMENT AND PARTS THEREOF', ' SOUND RECORDERS AND REPRODUCERS, TELEVISION IMAGE AND SOUND RECORDERS AND REPRODUCERS,AND PARTS.') 1093
2013 ('NUCLEAR REACTORS, BOILERS, MACHINERY AND MECHANICAL APPLIANCES', ' PARTS THEREOF.') 1309
2012 ('NUCLEAR REACTORS, BOILERS, MACHINERY AND MECHANICAL APPLIANCES', ' PARTS THEREOF.') 1521
2011 ('ELECTRICAL MACHINERY AND EQUIPMENT AND PARTS THEREOF', ' SOUND RECORDERS AND REPRODUCERS, TELEVISION IMAGE AND SOUND RECORDERS AND REPRODUCERS,AND PARTS.') 1741
2010 ('ELECTRICAL MACHINERY AND EQUIPMENT AND PARTS THEREOF', ' SOUND RECORDERS AND REPRODUCERS, TELEVISION IMAGE AND SOUND RECORDERS AND REPRODUCERS,AND PARTS.') 1963
```

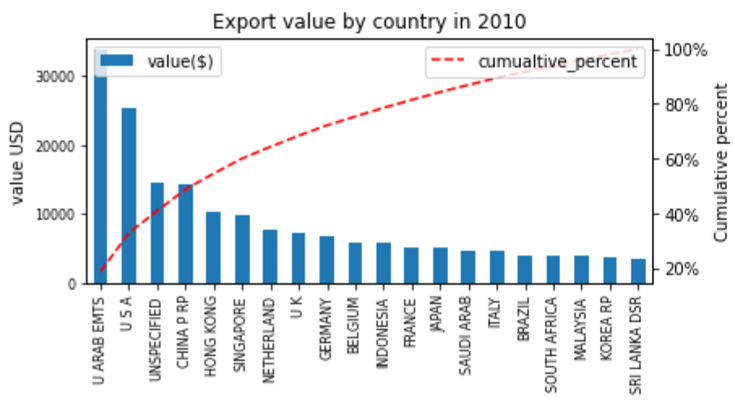
find most frequently exported commodities from India for yeach country

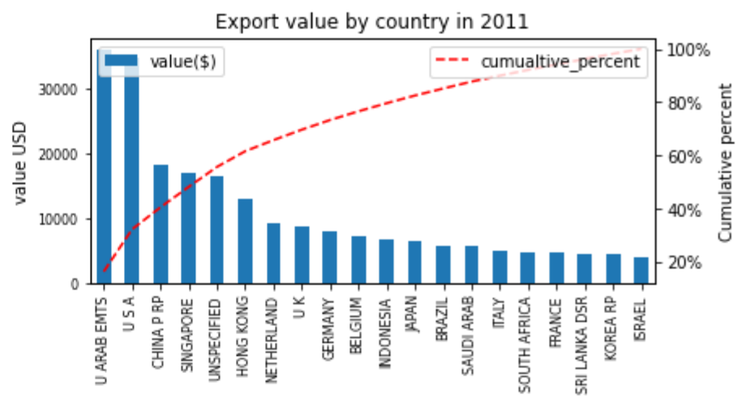
In [5]:
```
data={}
for i in exp.country.unique():
    for x in exp.year.unique():
        grouped=exp[(exp.country==i)&(exp.year==x)].Commodity.str.split("; ",expand=True).stack().value_counts()
        print(x,i,grouped.head(1))
```

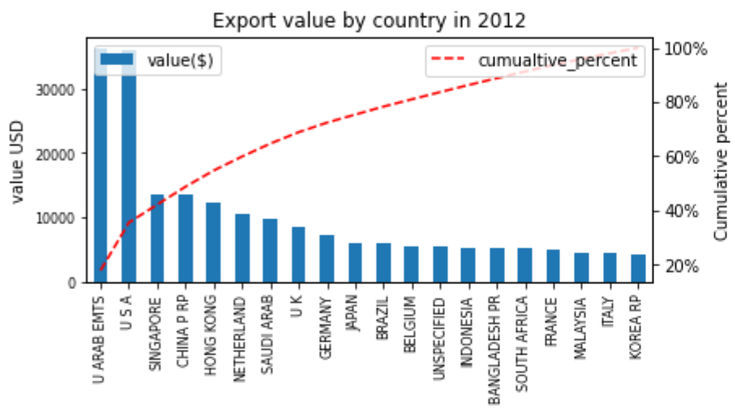
```
2012 BURUNDI LIVE ANIMALS.    1
dtype: int64
2011 BURUNDI DAIRY PRODUCE    1
dtype: int64
2010 BURUNDI PRODUCTS OF THE MILLING INDUSTRY    1
dtype: int64
2018 C AFRI REP CEREALS.    1
dtype: int64
2017 C AFRI REP CEREALS.    1
dtype: int64
2016 C AFRI REP CEREALS.    1
dtype: int64
2015 C AFRI REP CEREALS.    1
dtype: int64
2014 C AFRI REP EDIBLE FRUIT AND NUTS    1
dtype: int64
2013 C AFRI REP EDIBLE FRUIT AND NUTS    1
dtype: int64
2012 C AFRI REP EDIBLE FRUIT AND NUTS    1
dtype: int64
```

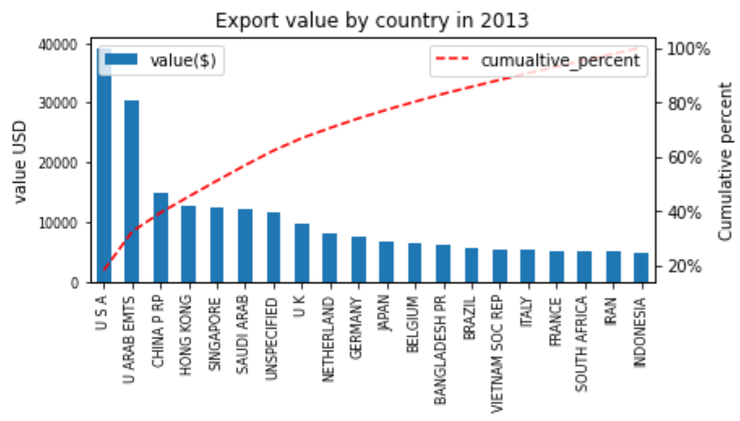
plot export value by country(top 20) and cumulative percent of total value of these top20

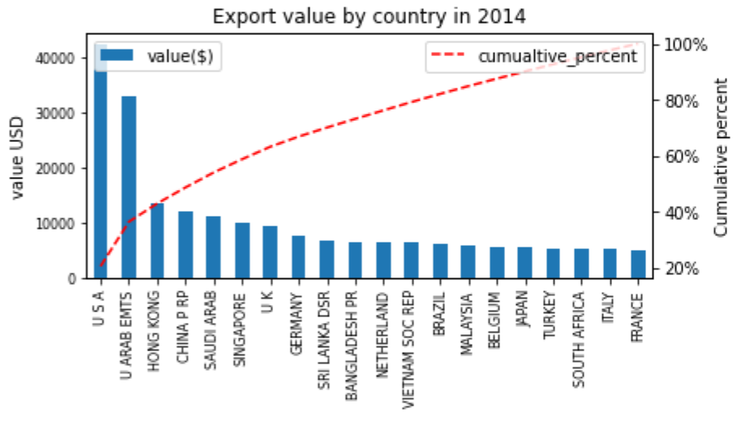
In [29]:
```
import matplotlib.ticker as mtick
fig,axes=plt.subplots(5,2,figsize=(15,25))
years=sorted(exp.year.unique())

for ax,year in zip(axes.ravel(),years):
    grouped=exp[exp.year==year].groupby("country")["value"].sum().reset_index().sort_values("value",ascending=False).head(20)
    grouped["percent"]=grouped.value/grouped.value.sum()*100
    grouped["cumulative_percent"]=grouped.percent.cumsum()

    grouped.plot(kind="bar",ax=ax,x="country",y="value",legend=True,xlabel="",ylabel="",fontsize=8,label="value($)")
    ax.set_ylabel("value USD")
    ax.legend(loc="upper left")

    ax2=ax.twinx()
    ax2.plot(grouped.country,grouped.cumulative_percent,ls="--",color="r",label="cumualtive_percent")
    ax2.set_ylabel("Cumulative percent")

    plt.subplots_adjust(hspace=1,wspace=0.4)
    plt.legend(loc="upper right")
    plt.title("Export value by country in "+str(year))
    ax2.yaxis.set_major_formatter(mtick.PercentFormatter(100))
plt.show()
```

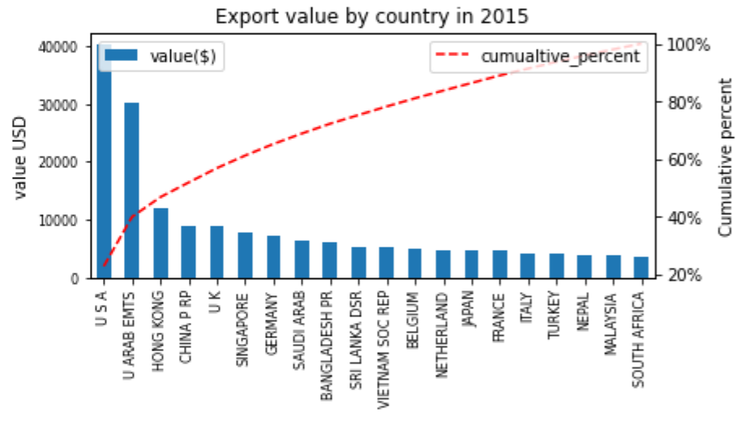


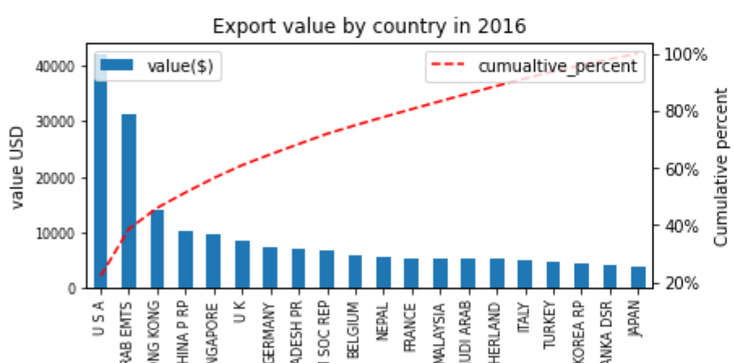


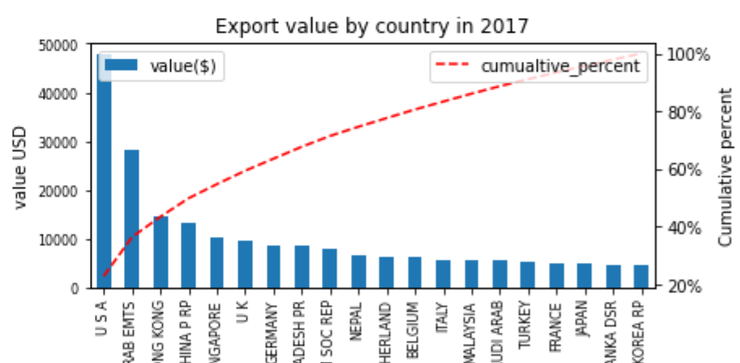


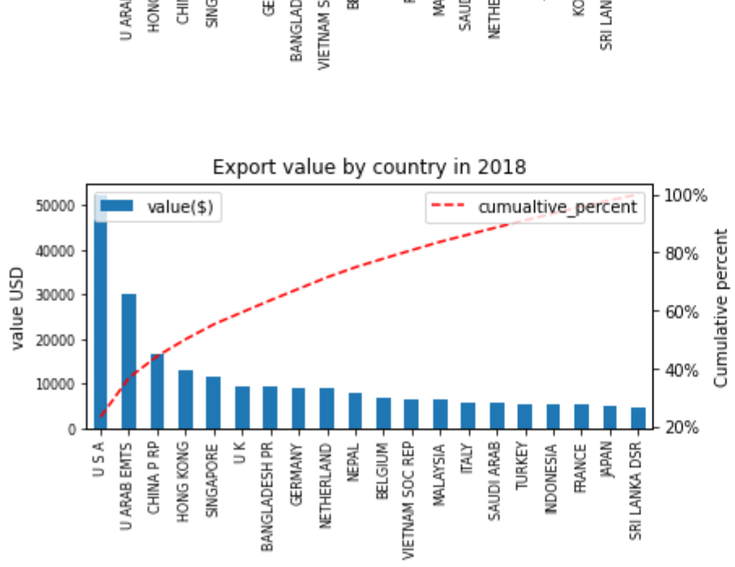


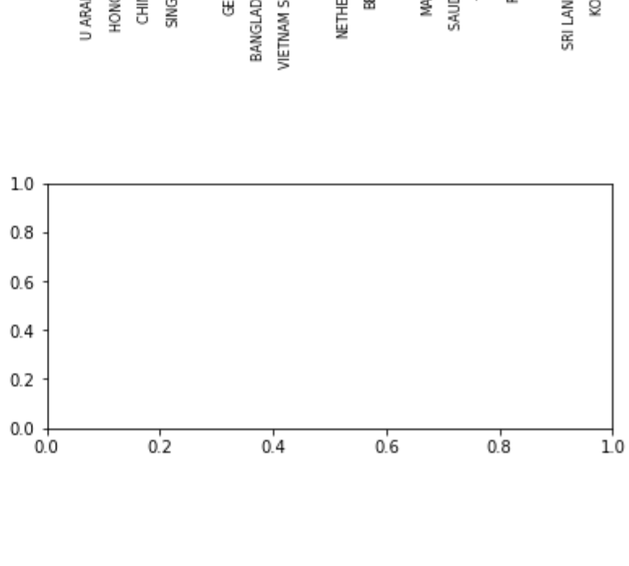












find countries where Indian export annual increase never dropped below zero percent

In [40]:
```
grouped=exp.groupby(["country","year"])["value"].sum().reset_index().sort_values(["country","year"])
grouped["prev_year"]=grouped.groupby("country")["value"].apply(lambda x:x.shift(1))
grouped["increase_vs_prev_year"]=((100*grouped.value-grouped.prev_year)/grouped.prev_year-100).round(1)
grouped
```

Out[40]:

	country	year	value	prev_year	increase_vs_prev_year
0	AFGHANISTAN TIS	2010	422.31	NaN	NaN
1	AFGHANISTAN TIS	2011	510.81	422.31	20.0
2	AFGHANISTAN TIS	2012	472.55	510.81	-8.5
3	AFGHANISTAN TIS	2013	474.26	472.55	-0.6
4	AFGHANISTAN TIS	2014	422.48	474.26	-11.9
...	...	...	...	...	...
2128	ZIMBABWE	2014	223.84	157.96	40.7
2129	ZIMBABWE	2015	205.01	223.84	-9.4
2130	ZIMBABWE	2016	109.02	205.01	-47.8
2131	ZIMBABWE	2017	163.46	109.02	48.9
2132	ZIMBABWE	2018	181.62	163.46	10.1

2133 rows × 5 columns

In [54]:
```
s = grouped[grouped.increase_vs_prev_year.isna()==False]["increase_vs_prev_year"].gt(0).groupby(grouped["country"]).all()
out = s.index[s].tolist()
out
```

Out[54]: ['ALBANIA', 'JAMAICA', 'SERBIA', 'SOUTH SUDAN ', 'STATE OF PALEST']

Are there any countries where Indian export for one year was always greater than previous year. Less than previous year

In [72]:
```
s=(grouped.value>grouped.prev_year).groupby(grouped["country"]).all()

#s=(grouped.value<grouped.prev_year).groupby(grouped["country"]).all()
out = s.index[s].tolist()
out
```

Out[72]: []

There were none

Indian export increase year by year

In [89]:
```
import matplotlib.ticker as mtick
countries=["U ARAB EMTS","U S A","CHINA P RP","HONG KONG","SINGAPORE","NETHERLAND","U K","GERMANY","GEORGIA"]
fig,axes=plt.subplots(3,3,figsize=(15,10))
cmap=plt.get_cmap("hot")
colors=list(cmap(np.linspace(0,0.7,len(countries))))

for ax,country,color in zip(axes.ravel(),countries,colors):
    grouped[grouped.country==country].plot(ax=ax,kind="line",x="year",y="increase_vs_prev_year",xlabel="",legend=False,color=color,fontsize=8)
    ax.set_title("Indian export increase vs previous year for "+country,size=8)
    plt.subplots_adjust(hspace=0.6)
    ax.yaxis.set_major_formatter(mtick.PercentFormatter(100))
plt.show()
```

Merge dataframes

In [90]:
```
merged=exp.merge(imp, on =["country","year"])
```

What was the most frequently imported commodities in India for each year

In [107]:
```
data={}
for i in imp.country.unique():
    for x in imp.year.unique():
        grouped=imp[(imp.country==i)&(imp.year==x)].Commodity.str.split("; ",expand=True).stack().value_counts()
        print(x,i,grouped.head(1))
```

```
2018 AFGHANISTAN TIS PRODUCTS OF ANIMAL ORIGIN, NOT ELSEWHERE SPECIFIED OR INCLUDED.    1
dtype: int64
2017 AFGHANISTAN TIS EDIBLE VEGETABLES AND CERTAIN ROOTS AND TUBERS.    1
dtype: int64
2016 AFGHANISTAN TIS EDIBLE VEGETABLES AND CERTAIN ROOTS AND TUBERS.    1
dtype: int64
2015 AFGHANISTAN TIS EDIBLE VEGETABLES AND CERTAIN ROOTS AND TUBERS.    2
dtype: int64
2014 AFGHANISTAN TIS EDIBLE VEGETABLES AND CERTAIN ROOTS AND TUBERS.    1
dtype: int64
2013 AFGHANISTAN TIS EDIBLE VEGETABLES AND CERTAIN ROOTS AND TUBERS.    1
dtype: int64
2012 AFGHANISTAN TIS EDIBLE VEGETABLES AND CERTAIN ROOTS AND TUBERS.    1
dtype: int64
2011 AFGHANISTAN TIS EDIBLE VEGETABLES AND CERTAIN ROOTS AND TUBERS.    1
dtype: int64
2010 AFGHANISTAN TIS EDIBLE VEGETABLES AND CERTAIN ROOTS AND TUBERS.    1
dtype: int64
2018 ALBANIA OIL SEEDS AND OLEA. FRUITS    1
```

plot export vs import for 50 countries which India import the most value from

In [140]:
```
grouped1=exp.groupby("country")["value"].sum().reset_index()
grouped2=imp.groupby("country")["value"].sum().reset_index()
grouped=grouped1.merge(grouped2,on="country")
grouped.rename(columns={"value_x":"export_to","value_y":"import_from"},inplace=True)
grouped=grouped.sort_values("import_from",ascending=False).head(50)

grouped.plot(figsize=(15,5),kind="bar",x="country",y=["import_from","export_to"],xlabel="",stacked=True)
plt.title("Import vs export for 20 countries that contribute to the highest export to India")
plt.show()
```