

# Manufacturing Juggernaut, a data science project analyzing China's transition to advanced manufacturing, and its impact on U.S.-China trade relations.

05/15/2019

For background information, please check out:

[https://github.com/ssbfcboris1/Manufacturing\\_Juggernaut](https://github.com/ssbfcboris1/Manufacturing_Juggernaut)  
([https://github.com/ssbfcboris1/Manufacturing\\_Juggernaut](https://github.com/ssbfcboris1/Manufacturing_Juggernaut))

The following are a few data-visualization graphs from my initial research:

```
In [3]: 1 import numpy as np
        2 import pandas as pd
        3 import matplotlib as mpl
        4 import matplotlib.pyplot as plt
        5 import datetime
        6 import random
        7 %matplotlib inline
```

```
In [42]: 1 wb_4_mfg = pd.read_csv('D:\\Boris\\Manufacturing Juggernaut\\World Bank, tota
```

```
In [44]: 1 wb_4_mfg.fillna(0, inplace=True)
        2 wb_4_mfg = wb_4_mfg.transpose()
```

```
In [45]: 1 wb_4_mfg.head()
```

...

```
In [46]: 1 wb_4_mfg.columns = ['CHN', 'DEU', 'JPN', 'USA']
        2 wb_4_mfg.drop(index='Country Code', inplace=True)
        3 wb_4_mfg.head()
```

```
Out[46]:
```

		CHN	DEU	JPN	USA
<b>2000</b>	0	4.04199e+11	1.10254e+12	1.54368e+12	
<b>2001</b>	0	3.99993e+11	9.14666e+11	1.46647e+12	
<b>2002</b>	0	4.15358e+11	8.59389e+11	1.46026e+12	
<b>2003</b>	0	5.02691e+11	9.38495e+11	1.51778e+12	
<b>2004</b>	6.25224e+11	5.71733e+11	1.02719e+12	1.6057e+12	

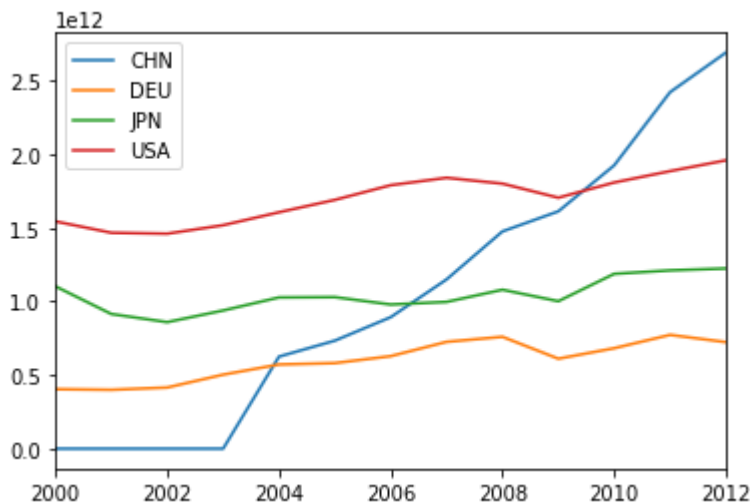
## 1. The World Bank 2000-2012 data on value-added

## manufacturing output by four leading industrialized countries: Germany, Japan, China, the U.S.

[https://data.worldbank.org/indicator/NV.IND.MANF.CD?end=2012&locations=CN-DE-JP-US&name\\_desc=true&start=2000](https://data.worldbank.org/indicator/NV.IND.MANF.CD?end=2012&locations=CN-DE-JP-US&name_desc=true&start=2000) ([https://data.worldbank.org/indicator/NV.IND.MANF.CD?end=2012&locations=CN-DE-JP-US&name\\_desc=true&start=2000](https://data.worldbank.org/indicator/NV.IND.MANF.CD?end=2012&locations=CN-DE-JP-US&name_desc=true&start=2000))

```
In [47]: 1 wb_4_mfg.plot.line()
```

```
Out[47]: <matplotlib.axes._subplots.AxesSubplot at 0xa212a58>
```



**Notes:** In 2004, China's total manufacturing output surpassed that of Germany; before 2007, it edged out Japan as the second-largest manufacturing country. Not long after the 2008 financial crisis, China overtook the U.S. as the world's largest producer of physical goods.

```
In [48]: 1 wb_4_mfg.corr()
2
3 plt.matshow(wb_4_mfg.corr())
4 plt.xticks(range(len(wb_4_mfg.columns)), wb_4_mfg.columns)
5 plt.yticks(range(len(wb_4_mfg.columns)), wb_4_mfg.columns)
6 plt.colorbar()
7 plt.show()
```

...

```
In [49]: 1 wb_4_hi_tech = pd.read_csv('D:\\Boris\\Manufacturing Juggernaut\\World Bank,
```

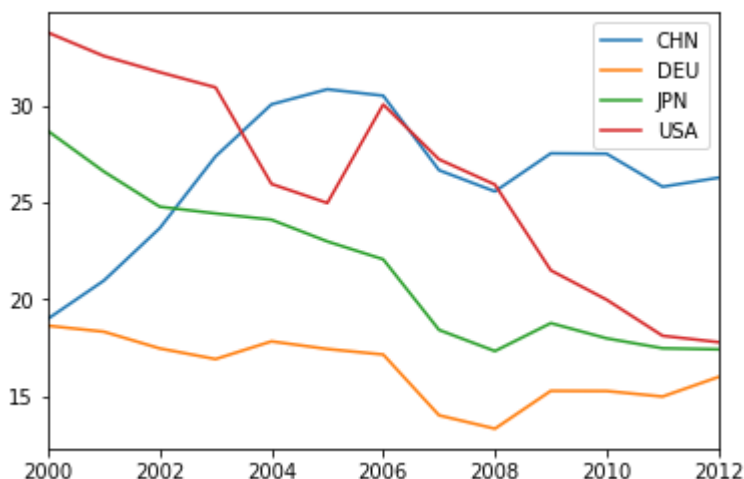
```
In [50]: 1 wb_4_hi_tech = wb_4_hi_tech.transpose()
2
3 wb_4_hi_tech.columns = ['CHN', 'DEU', 'JPN', 'USA']
4
5 wb_4_hi_tech.drop(index='Country Code', inplace=True)
6
```

## 2. The World Bank 2000-2012 data on high-technology % of manufactured exports: Germany, Japan, China, the U.S.

[https://data.worldbank.org/indicator/NV.IND.MANF.CD?end=2012&locations=CN-DE-JP-US&name\\_desc=true&start=2000](https://data.worldbank.org/indicator/NV.IND.MANF.CD?end=2012&locations=CN-DE-JP-US&name_desc=true&start=2000) ([https://data.worldbank.org/indicator/NV.IND.MANF.CD?end=2012&locations=CN-DE-JP-US&name\\_desc=true&start=2000](https://data.worldbank.org/indicator/NV.IND.MANF.CD?end=2012&locations=CN-DE-JP-US&name_desc=true&start=2000))

```
In [51]: 1 wb_4_hi_tech.plot.line()
```

```
Out[51]: <matplotlib.axes._subplots.AxesSubplot at 0xa272be0>
```



**Notes:** The above chart demonstrates China's attempt at upgrading its manufacturing capability from low-cost, labor intensive contract work to the high value-added, high-tech end of the spectrum.

```
In [52]: 1 oecd_svce = pd.read_csv('D:\\Boris\\Manufacturing Juggernaut\\OECD services e
```

```
In [ ]: 1 oecd_svce.head()
```

```
In [53]: 1 big4 = ['DEU', 'JPN', 'USA', 'CHN']
2 oecd_4_svce = oecd_svce.loc[oecd_svce['LOCATION'].isin(big4)]
3 oecd_4_svce.head()
```

...

```
In [54]: 1 oecd_4_svce_P = oecd_4_svce.pivot_table(index='TIME', columns='LOCATION').res
2
3 oecd_4_svce_P.drop(['TIME'], axis=1, inplace=True)
4
5 oecd_4_svce_P.corr()
```

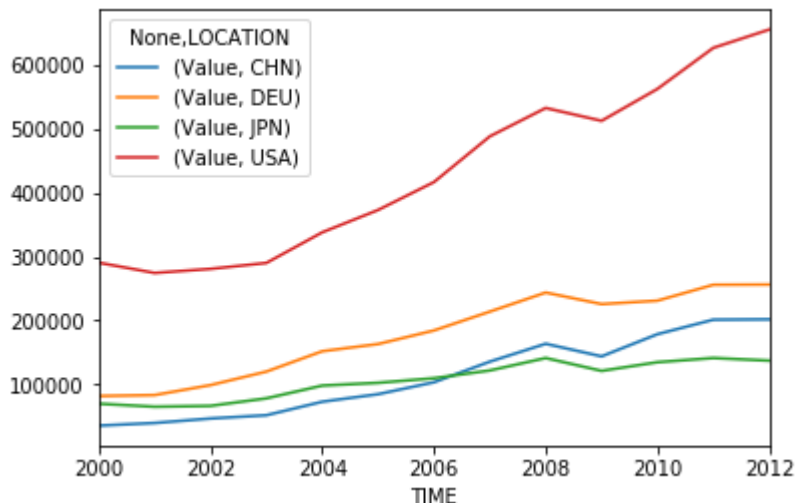
...

### 3. OECD 2000-2012 data on the annual export of services by the U.S., Germany, Japan, and China

<https://data.oecd.org/ict/ict-goods-exports.htm#indicator-chart> (<https://data.oecd.org/ict/ict-goods-exports.htm#indicator-chart>) (search key words: trade in services)

```
In [55]: 1 oecd_4_svce.pivot_table(index='TIME', columns='LOCATION').plot.line()
```

Out[55]: <matplotlib.axes.\_subplots.AxesSubplot at 0xa2f7898>



**Notes:** Data scientists in an increasingly "information economy," as well as Wall Street bankers and lawyers, Hollywood movie producers may find the above chart more reassuring. The U.S. remains by far the world's leader in exporting services. In 2012, its services export was more than Germany, Japan, and China's combined.

```
In [32]: 1 wb_4_exp_gdp = pd.read_csv('D:\\Boris\\Manufacturing Juggernaut\\World Bank,
```

In [33]:

```
1 wb_4_exp_gdp
```

Out[33]:

	Country Code	2000	2001	2002	2003	2004	2005	2006	2007
0	CHN	20.893445	20.312146	22.644746	26.980757	31.061338	33.829858	36.035026	35.388179
1	DEU	30.829538	31.870679	32.574040	32.591483	35.448424	37.740454	41.190348	43.009912
2	JPN	10.624485	10.229099	11.018221	11.639293	12.972032	14.012441	15.872902	17.493317
3	USA	10.664643	9.666071	9.132386	9.037519	9.625368	9.996398	10.654792	11.497907

In [34]:

```
1 wb_4_exp_gdp_t = wb_4_exp_gdp.iloc[:,1:].T
2 wb_4_exp_gdp_t.columns = ['CHN', 'DEU', 'JPN', 'USA']
3 wb_4_exp_gdp_t
```

...

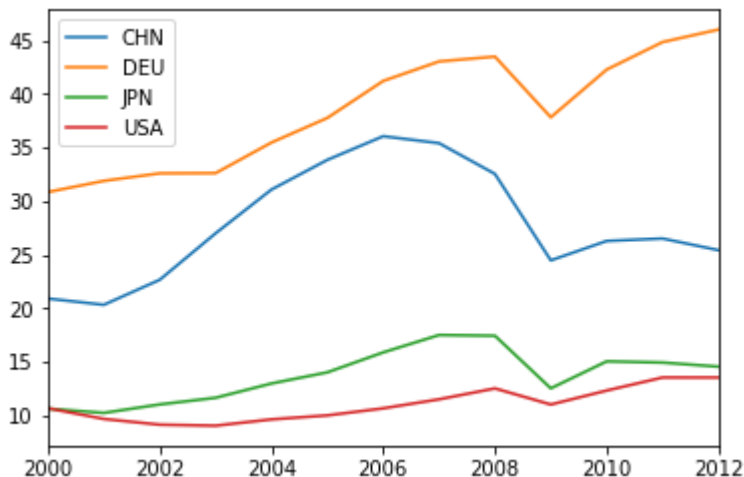
#### 4. The World Bank 2000-2012 data on the combined export of goods and services as percentage of GDP: Germany, Japan, China, the U.S.

[https://data.worldbank.org/indicator/NE.EXP.GNFS.ZS?end=2012&name\\_desc=true&start=2000](https://data.worldbank.org/indicator/NE.EXP.GNFS.ZS?end=2012&name_desc=true&start=2000)  
([https://data.worldbank.org/indicator/NE.EXP.GNFS.ZS?end=2012&name\\_desc=true&start=2000](https://data.worldbank.org/indicator/NE.EXP.GNFS.ZS?end=2012&name_desc=true&start=2000))

In [35]:

```
1 wb_4_exp_gdp_t.plot.line()
```

Out[35]: <matplotlib.axes.\_subplots.AxesSubplot at 0x67035f8>

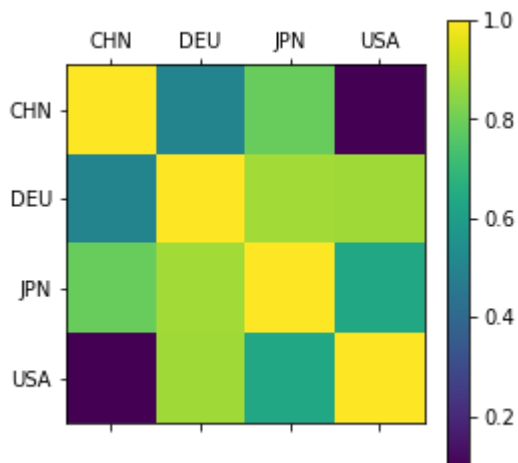


**Notes:** This chart may serve as a reality check to trade hawks in the Trump Administration. Its hardball negotiation tactics, and unilateral raising of tariff on Chinese import, may not put enough dent on the Chinese GDP growth to force the desired concession. Combined export of goods and services contributed to around 23% of China's GDP in 2012 (the latest figure, according to press reports, is 19%), indicating

**that the Chinese economy has grown to a mature stage, with a huge domestic market, rising size of the middle class, and enormous aggregate consumer spending that can theoretically generate enough demand for further GDP growth.**

In [30]:

```
1 wb_4_exp_gdp_t.corr()  
2  
3 plt.matshow(wb_4_exp_gdp_t.corr())  
4 plt.xticks(range(len(wb_4_exp_gdp_t.columns)), wb_4_exp_gdp_t.columns)  
5 plt.yticks(range(len(wb_4_exp_gdp_t.columns)), wb_4_exp_gdp_t.columns)  
6 plt.colorbar()  
7 plt.show()
```



**Notes: The above chart is based on the same World Bank "export as percentage of GDP" figures for each of the 4 countries under study. The Chinese and the U.S. numbers are the least correlated.**

In [ ]:

```
1
```