In [11]:
```
import pandas as pd
import matplotlib.pyplot as plt
import statsmodels.formula.api as smf
import numpy as np
import wooldridge as woo
import seaborn as sns
import statsmodels.api as sm
```

In [96]:
```
df = pd.read_excel("430_Data_Cleaned.xlsx", index_col = "Country")
df
```

Out[96]:

Country	life_expectancy	adult_mortality	infant_deaths	alcohol	percentage_expenditure	hepatitis_b	bmi	under_five_deaths	polio	total_
Afghanistan	59.5	272	69	0.01	78.184215	67.0	17.6	93	67	
Albania	76.9	86	0	5.14	412.443356	99.0	55.8	1	99	
Algeria	75.1	113	21	0.66	555.926083	95.0	56.1	24	95	
Angola	56.0	358	72	8.24	256.122524	75.0	21.5	110	75	
Antigua and Barbuda	75.9	134	0	8.18	2156.229842	98.0	45.7	0	97	
...	...	...	...	...	...	...	...	...	...	
Venezuela (Bolivarian Republic of)	73.7	161	9	6.70	0.000000	81.0	6.4	10	73	
Viet Nam	75.6	13	29	4.12	0.000000	97.0	15.3	36	97	
Yemen	64.7	236	36	0.04	0.000000	67.0	38.7	46	68	
Zambia	59.2	349	29	2.59	196.915250	78.0	21.7	43	7	
Zimbabwe	56.6	429	26	6.09	92.602336	97.0	3.3	39	95	

183 rows × 14 columns

In [45]:
```
col = list(df.columns)
col
```

Out[45]:
```
['life_expectancy',
 'adult_mortality',
 'infant_deaths',
 'alcohol',
 'percentage_expenditure',
 'hepatitis_b',
 'bmi',
 'under-five_deaths',
 'polio',
 'total_expenditure',
 'diphtheria',
 'hiv/aids',
 'gdp',
 'schooling']
```

In [26]:
```
df.isnull().any()
```

Out[26]:
```
life_expectancy           False
adult_mortality           False
infant_deaths             False
alcohol                    True
percentage_expenditure    False
hepatitis_b                True
bmi                        True
under-five_deaths         False
polio                     False
total_expenditure          True
diphtheria                False
hiv/aids                  False
gdp                        True
schooling                  True
dtype: bool
```

In [46]:
```
df.life_expectancy
```

Out[46]:
```
Country
Afghanistan                             59.5
Albania                                 76.9
Algeria                                 75.1
Angola                                  56.0
Antigua and Barbuda                     75.9
                                        ...
Venezuela (Bolivarian Republic of)      73.7
Viet Nam                                75.6
Yemen                                   64.7
Zambia                                  59.2
Zimbabwe                                56.6
Name: life_expectancy, Length: 183, dtype: float64
```

In [27]:
```
df.isnull().sum()
```

Out[27]:
```
life_expectancy            0
adult_mortality            0
infant_deaths              0
alcohol                    1
percentage_expenditure     0
hepatitis_b               13
bmi                        2
under-five_deaths          0
polio                      0
total_expenditure          2
diphtheria                 0
hiv/aids                   0
gdp                       29
schooling                 10
dtype: int64
```

In [28]:
```
df.describe()
```

Out[28]:

	life_expectancy	adult_mortality	infant_deaths	alcohol	percentage_expenditure	hepatitis_b	bmi	under-five_deaths	polio	t
count	183.000000	183.000000	183.000000	182.000000	183.000000	170.000000	181.000000	183.000000	183.000000	
mean	70.916940	148.792350	26.338798	4.138187	1011.471726	82.635294	40.099448	35.562842	83.939891	
std	8.562151	108.617944	96.811105	4.272119	2273.787938	24.861199	20.775655	127.826312	24.120387	
min	49.700000	2.000000	0.000000	0.010000	0.000000	2.000000	2.100000	0.000000	3.000000	
25%	64.500000	66.500000	0.000000	0.010000	32.597328	81.000000	21.900000	0.000000	83.000000	
50%	73.200000	138.000000	3.000000	2.890000	196.915250	94.000000	45.900000	3.000000	94.000000	
75%	76.500000	215.500000	19.500000	7.785000	847.322649	97.000000	58.500000	23.500000	98.000000	
max	88.000000	513.000000	1100.000000	16.350000	18379.329740	99.000000	76.200000	1400.000000	99.000000	

In [29]:
```
# do we need harvey collier?
```

In [18]:
```
pip install rpy2
```

```
Requirement already satisfied: rpy2 in /Users/rheasethi/opt/anaconda3/lib/python3.9/site-packages (3.5.
5)
Requirement already satisfied: jinja2 in /Users/rheasethi/opt/anaconda3/lib/python3.9/site-packages (fr
om rpy2) (2.11.3)
Requirement already satisfied: pytz in /Users/rheasethi/opt/anaconda3/lib/python3.9/site-packages (from
rpy2) (2021.3)
Requirement already satisfied: tzlocal in /Users/rheasethi/opt/anaconda3/lib/python3.9/site-packages (f
rom rpy2) (4.2)
Requirement already satisfied: cffi>=1.10.0 in /Users/rheasethi/opt/anaconda3/lib/python3.9/site-packag
es (from rpy2) (1.15.0)
Requirement already satisfied: pycparser in /Users/rheasethi/opt/anaconda3/lib/python3.9/site-packages
(from cffi>=1.10.0->rpy2) (2.21)
Requirement already satisfied: MarkupSafe>=0.23 in /Users/rheasethi/opt/anaconda3/lib/python3.9/site-pa
ckages (from jinja2->rpy2) (2.0.1)
Requirement already satisfied: pytz-deprecation-shim in /Users/rheasethi/opt/anaconda3/lib/python3.9/si
te-packages (from tzlocal->rpy2) (0.1.0.post0)
Requirement already satisfied: tzdata in /Users/rheasethi/opt/anaconda3/lib/python3.9/site-packages (fr
om pytz-deprecation-shim->tzlocal->rpy2) (2022.5)
Note: you may need to restart the kernel to use updated packages.
```

In [19]:
```
import rpy2

import warnings
warnings.filterwarnings('ignore')

from rpy2.robjects import pandas2ri
import rpy2.rinterface as rinterface
pandas2ri.activate()

%load_ext rpy2.ipython
```

In [ ]:
```
# adult_mortality + infant_deaths + alcohol + percentage_expenditure + hepatitis_b + bmi + under-five_de
```

In [100]:
```
model = smf.ols('life_expectancy ~ adult_mortality', data = df)
reg = model.fit()
reg.params
```

Out[100]:
```
Intercept          79.451273
adult_mortality    -0.057357
dtype: float64
```

In [101]:
```
model2 = smf.ols('life_expectancy ~ infant_deaths', data = df)
reg2 = model2.fit()
reg2.params
```

Out[101]:
```
Intercept        71.434985
infant_deaths    -0.019669
dtype: float64
```

In [102]:
```
model3 = smf.ols('life_expectancy ~ alcohol', data = df)
reg3 = model3.fit()
reg3.params
```

Out[102]:
```
Intercept    66.767526
alcohol       1.022519
dtype: float64
```

In [103]:
```
model4 = smf.ols('life_expectancy ~ percentage_expenditure', data = df)
reg4 = model4.fit()
reg4.params
```

Out[103]:
```
Intercept                69.245494
percentage_expenditure    0.001652
dtype: float64
```

In [104]:
```
model5 = smf.ols('life_expectancy ~ hepatitis_b', data = df)
reg5 = model5.fit()
reg5.params
```

Out[104]:
```
Intercept      64.733057
hepatitis_b     0.071774
dtype: float64
```

In [105]:
```
model6 = smf.ols('life_expectancy ~ bmi', data = df)
reg6 = model6.fit()
reg6.params
```

Out[105]:
```
Intercept    62.278638
bmi           0.218540
dtype: float64
```

In [106]:
```
model7 = smf.ols('life_expectancy ~ under_five_deaths', data = df)
reg7 = model7.fit()
reg7.params
```

Out[106]:
```
Intercept           71.510258
under_five_deaths   -0.016684
dtype: float64
```

In [107]:
```
model8 = smf.ols('life_expectancy ~ polio', data = df)
reg8 = model8.fit()
reg8.params
```

Out[107]:
```
Intercept    58.501361
polio         0.147910
dtype: float64
```

In [108]:
```
model9 = smf.ols('life_expectancy ~ total_expenditure', data = df)
reg9 = model9.fit()
reg9.params
```

Out[108]:
```
Intercept            66.546236
total_expenditure     0.715904
dtype: float64
```

In [109]:
```
model10 = smf.ols('life_expectancy ~ diphtheria', data = df)
reg10 = model10.fit()
reg10.params
```

Out[109]:
```
Intercept     54.783967
diphtheria     0.187796
dtype: float64
```

In [110]:
```
model11 = smf.ols('life_expectancy ~ hiv_aids', data = df)
reg11 = model11.fit()
reg11.params
```

Out[110]:
```
Intercept    73.487502
hiv_aids     -2.773660
dtype: float64
```

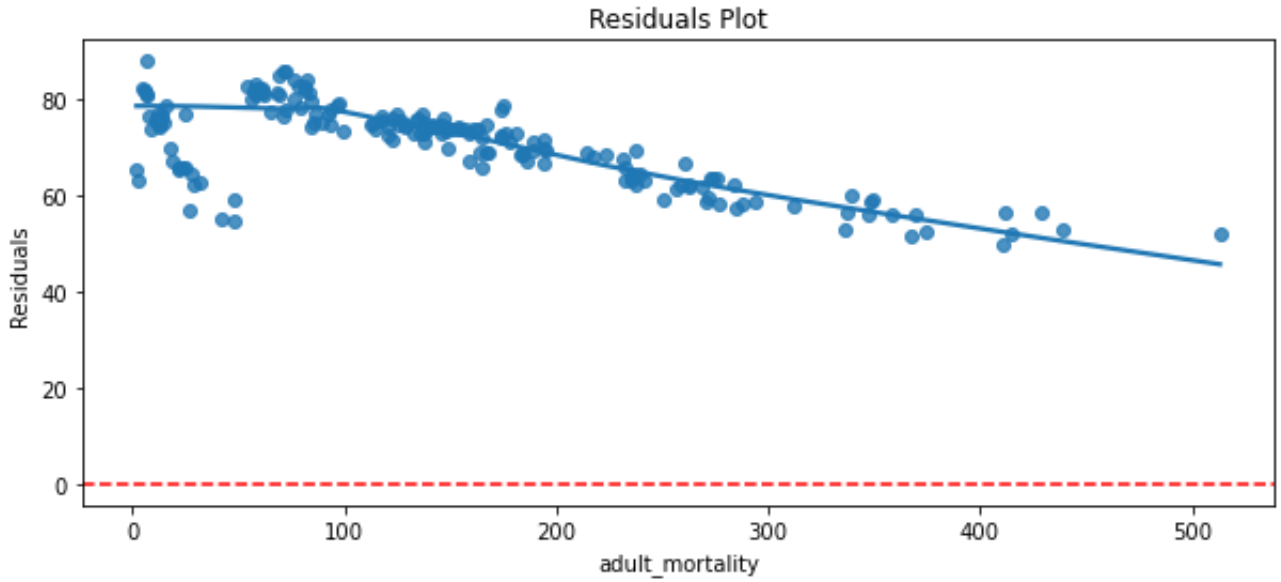
In [111]:
```
model12 = smf.ols('life_expectancy ~ gdp', data = df)
reg12 = model12.fit()
reg12.params
```

Out[111]:
```
Intercept    68.345096
gdp           0.000266
dtype: float64
```

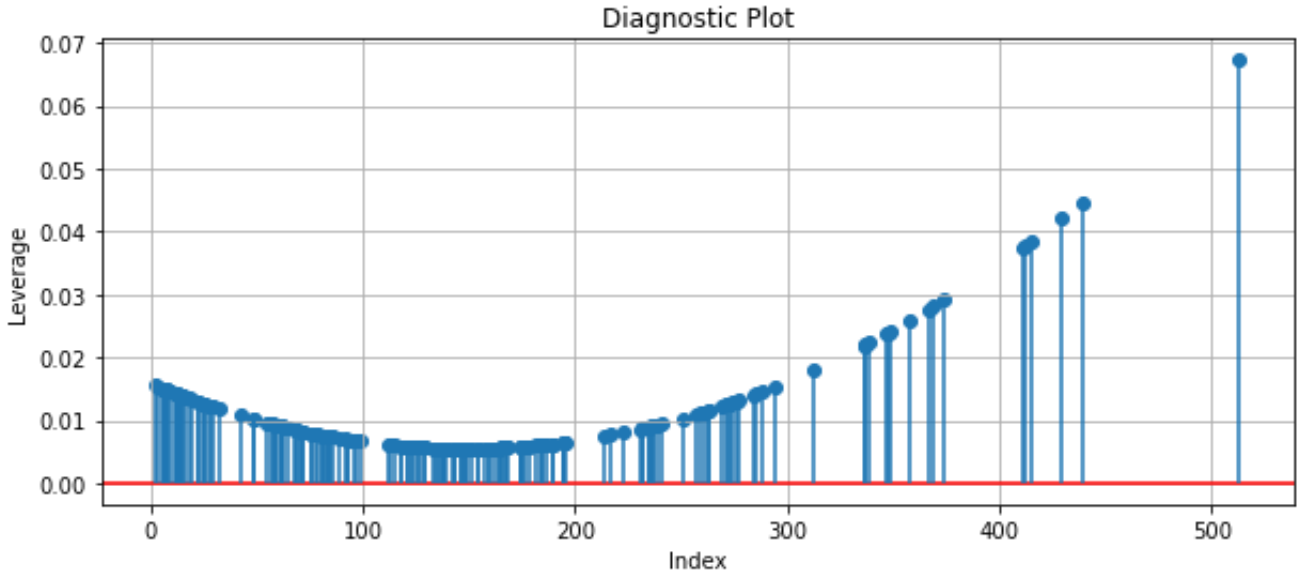
In [112]:
```
model13 = smf.ols('life_expectancy ~ schooling', data = df)
reg13 = model13.fit()
reg13.params
```

Out[112]:
```
Intercept    41.821061
schooling     2.293171
dtype: float64
```

In [53]:
```
# model = smf.ols('life_expectancy ~ adult_mortality', data = df)
### reg = model.fit()

plt.figure(figsize = (10, 4))
sns.regplot(x = df.adult_mortality, y = df.life_expectancy, lowess = True)
plt.axhline(0, linestyle = '--', color = "red")
plt.ylabel("Residuals")
plt.title("Residuals Plot")
plt.show()
```



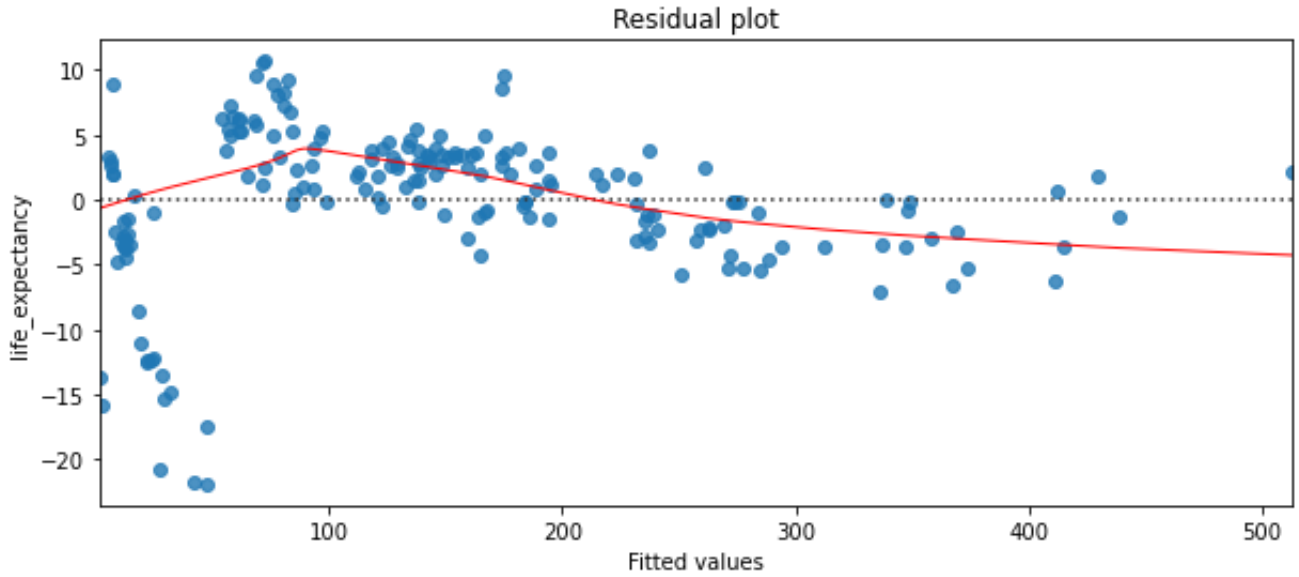
In [57]:
```
# leverage = reg.get_influence().hat_matrix_diag

###plt.figure(figsize = (10, 4))
plt.scatter(df.adult_mortality, leverage)
plt.axhline(0, color = 'red')
plt.vlines(x = df.adult_mortality, ymin = 0, ymax = leverage)
plt.xlabel('Index')
plt.ylabel('Leverage')
plt.title("Diagnostic Plot")
plt.grid()
```



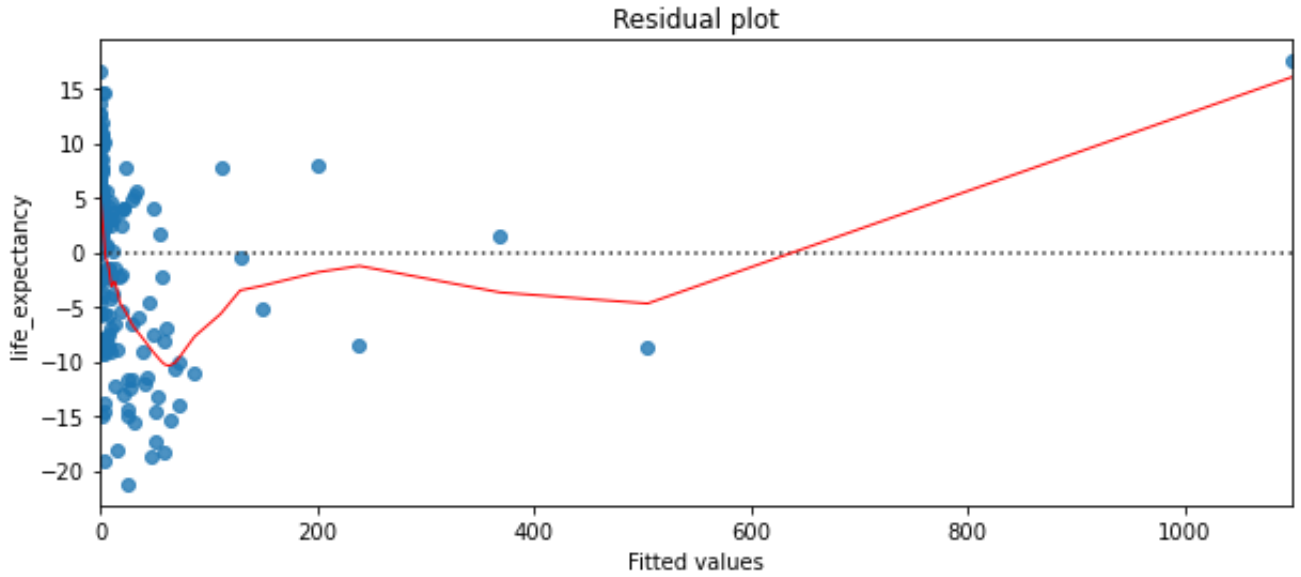
In [ ]:
```
# adult_mortality + infant_deaths + alcohol + percentage_expenditure + hepatitis_b + bmi + under-five_de
```

In [ ]:
```
# Outliers
```

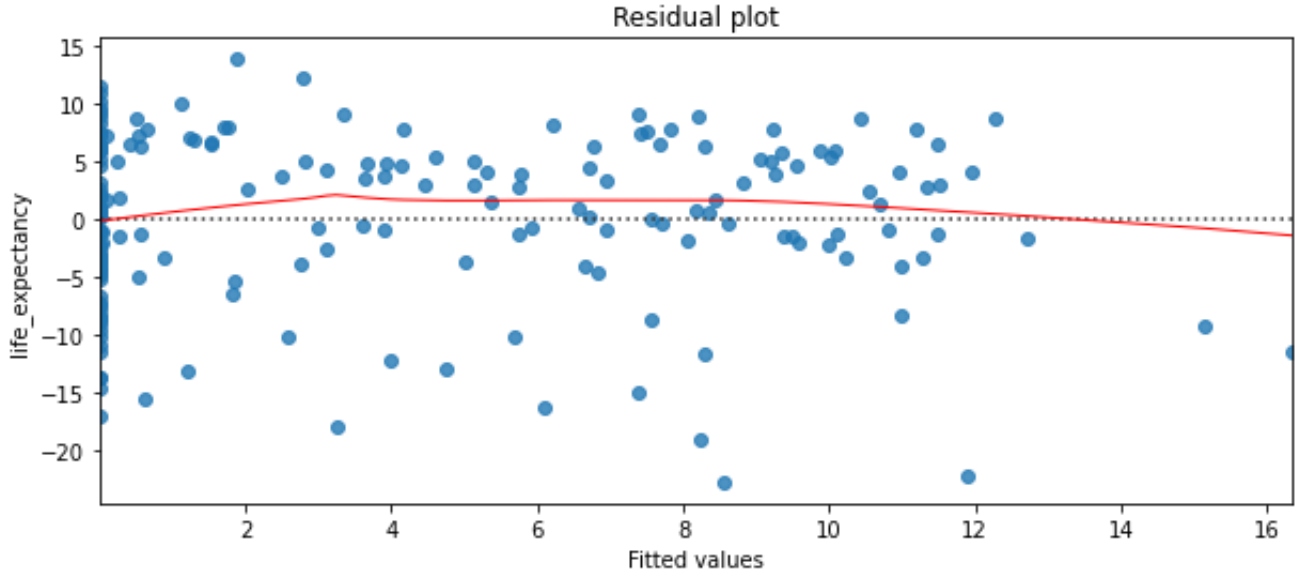
In [59]:
```
plt.figure(figsize = (10, 4))
sns.residplot(x = 'adult_mortality', y = 'life_expectancy', data = df,lowess=True,
                                    line_kws={'color': 'red', 'lw': 1, 'alpha': 1})
plt.xlabel("Fitted values")
plt.title('Residual plot')
plt.show()
```



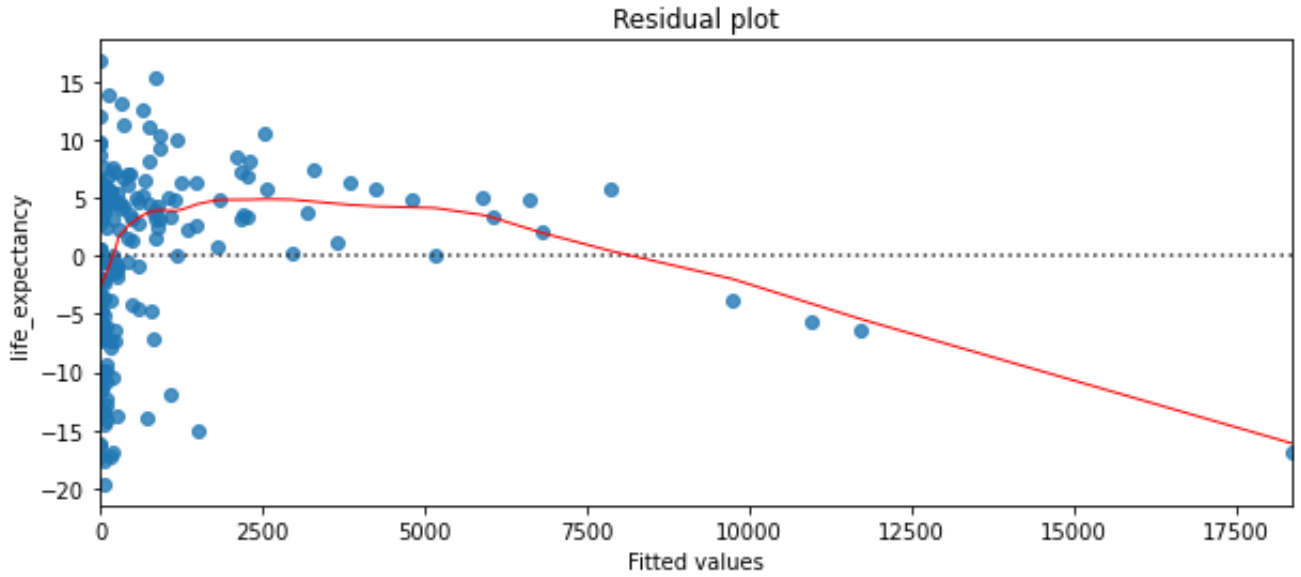
In [60]:
```
plt.figure(figsize = (10, 4))
sns.residplot(x = 'infant_deaths', y = 'life_expectancy', data = df,lowess=True,
                                    line_kws={'color': 'red', 'lw': 1, 'alpha': 1})
plt.xlabel("Fitted values")
plt.title('Residual plot')
plt.show()
```



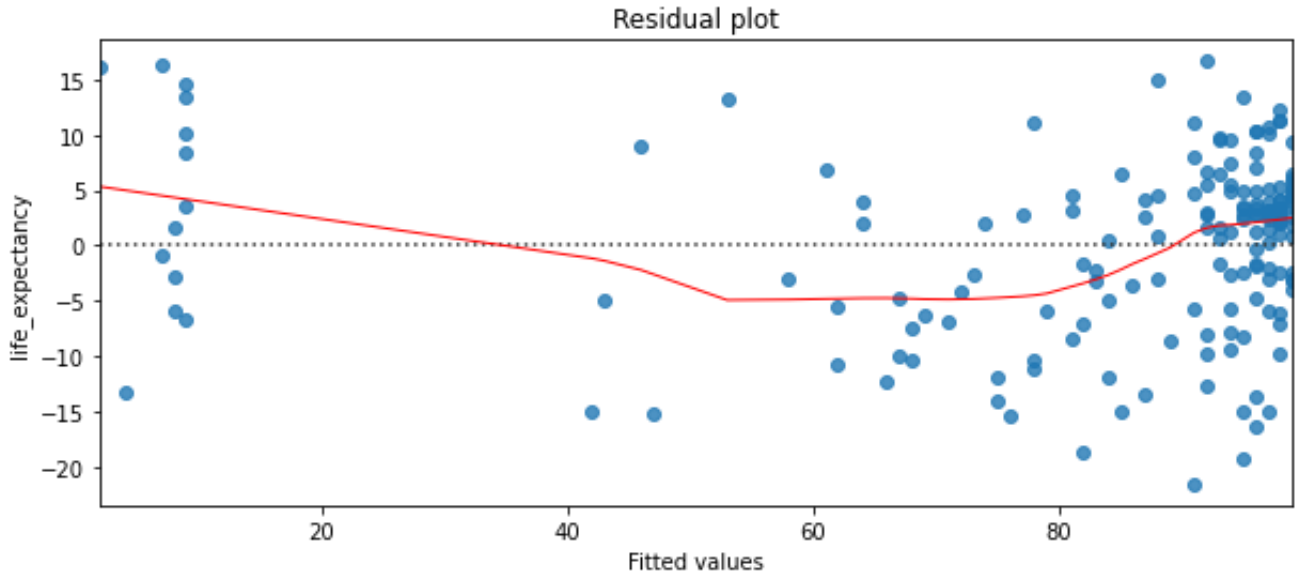
In [61]:
```
plt.figure(figsize = (10, 4))
sns.residplot(x = 'alcohol', y = 'life_expectancy', data = df,lowess=True,
                                    line_kws={'color': 'red', 'lw': 1, 'alpha': 1})
plt.xlabel("Fitted values")
plt.title('Residual plot')
plt.show()
```



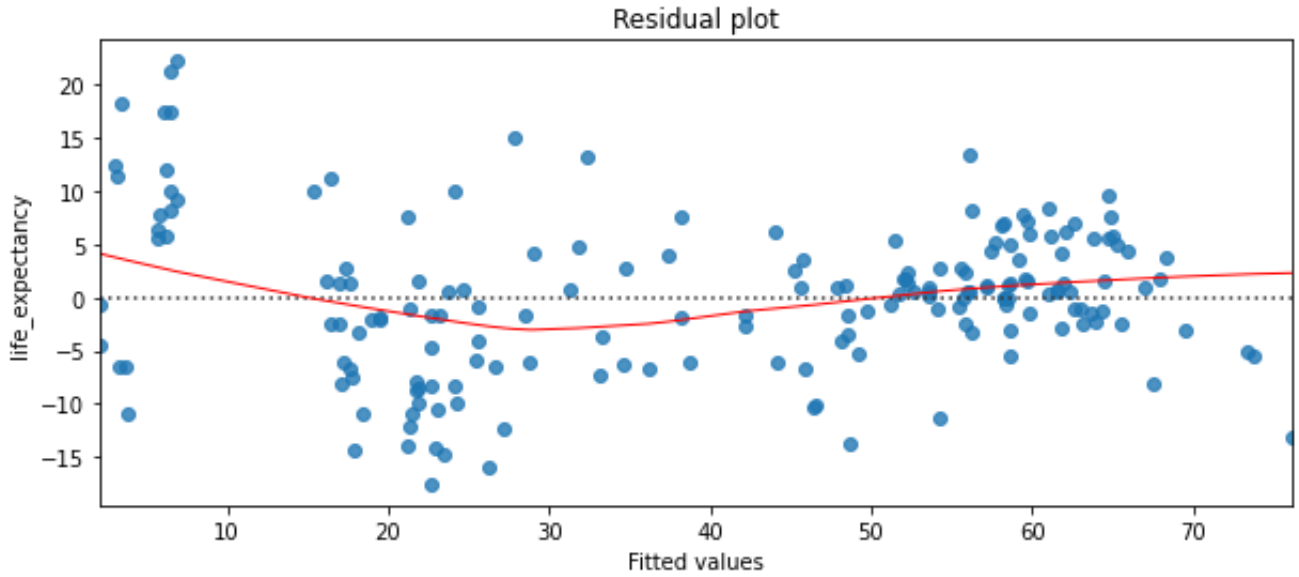
In [62]:
```
plt.figure(figsize = (10, 4))
sns.residplot(x = 'percentage_expenditure', y = 'life_expectancy', data = df,lowess=True,
                                    line_kws={'color': 'red', 'lw': 1, 'alpha': 1})
plt.xlabel("Fitted values")
plt.title('Residual plot')
plt.show()
```



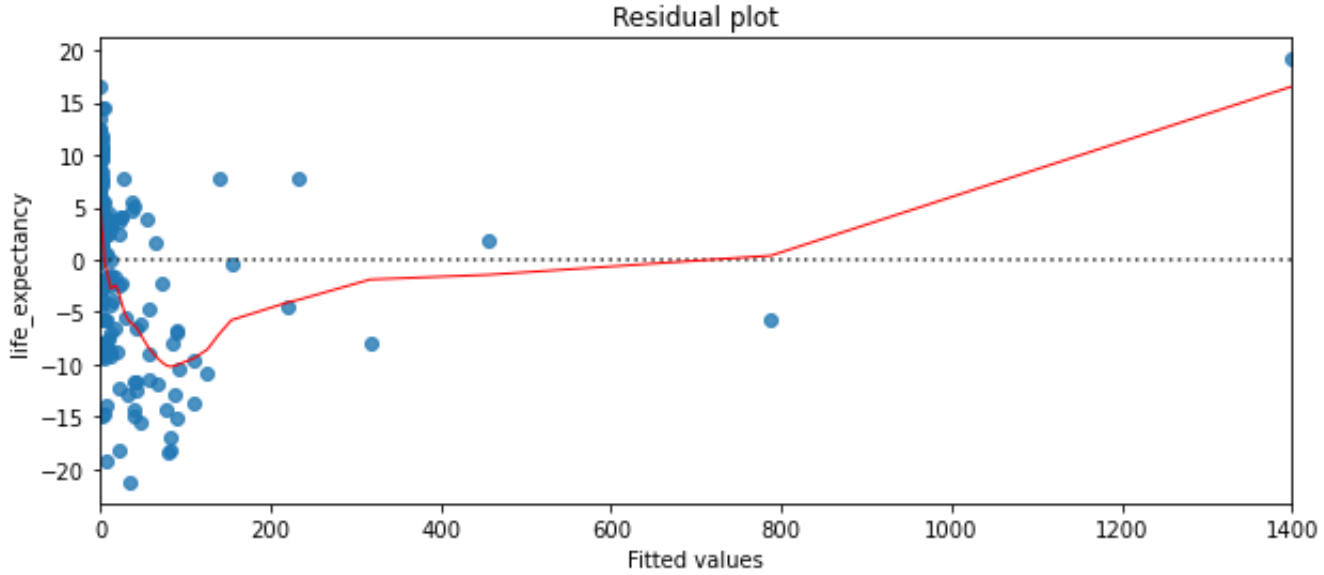
In [63]:
```
plt.figure(figsize = (10, 4))
sns.residplot(x = 'hepatitis_b', y = 'life_expectancy', data = df,lowess=True,
                                    line_kws={'color': 'red', 'lw': 1, 'alpha': 1})
plt.xlabel("Fitted values")
plt.title('Residual plot')
plt.show()
```



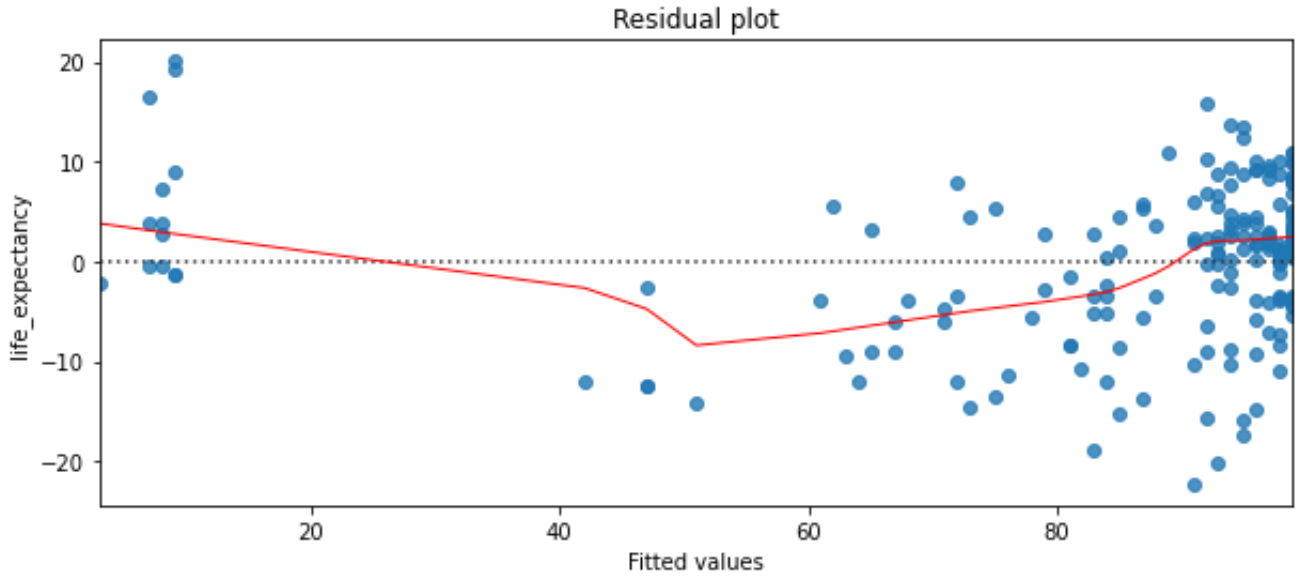
In [64]:
```
plt.figure(figsize = (10, 4))
sns.residplot(x = 'bmi', y = 'life_expectancy', data = df,lowess=True,
                                    line_kws={'color': 'red', 'lw': 1, 'alpha': 1})
plt.xlabel("Fitted values")
plt.title('Residual plot')
plt.show()
```



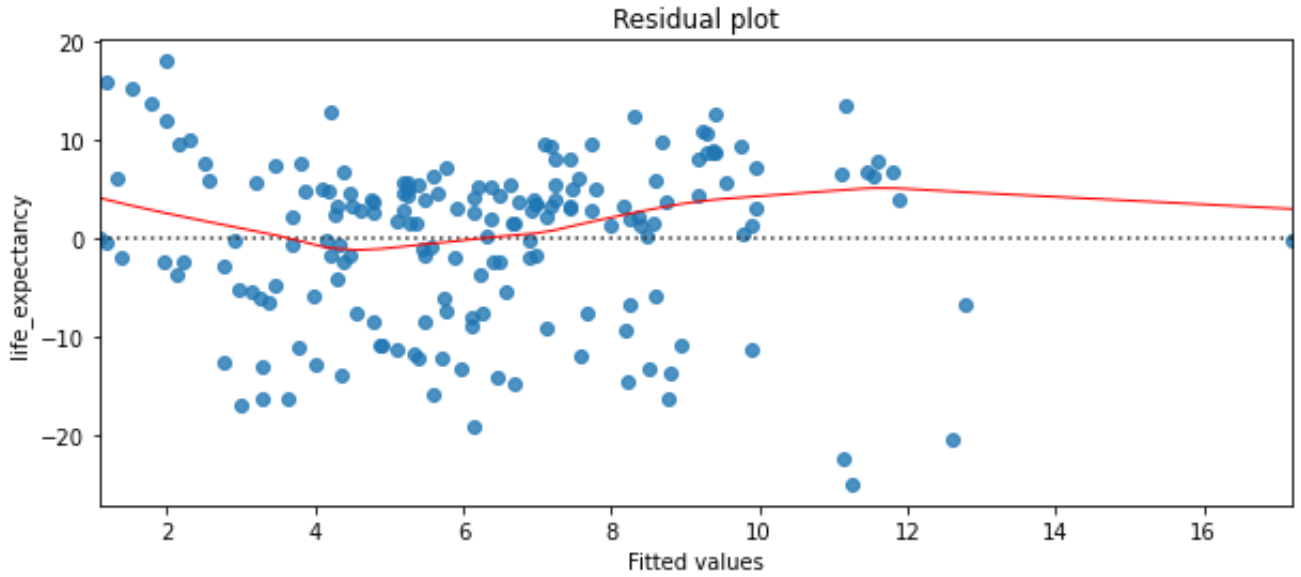
In [65]:
```
plt.figure(figsize = (10, 4))
sns.residplot(x = 'under-five_deaths', y = 'life_expectancy', data = df,lowess=True,
                                    line_kws={'color': 'red', 'lw': 1, 'alpha': 1})
plt.xlabel("Fitted values")
plt.title('Residual plot')
plt.show()
```



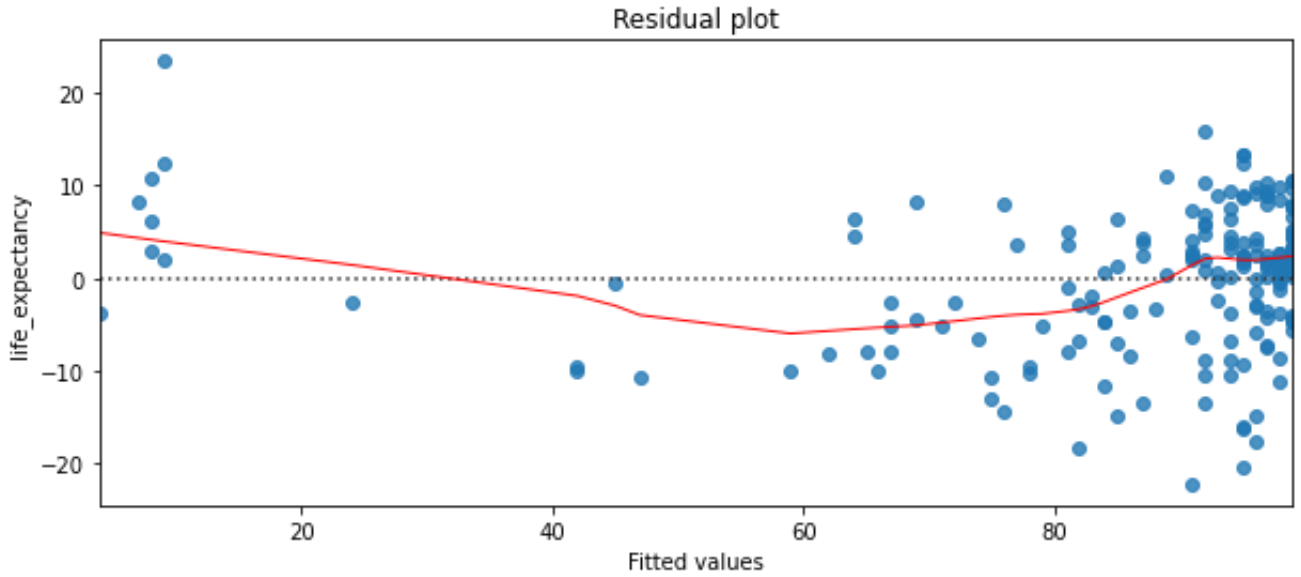
In [66]:
```
plt.figure(figsize = (10, 4))
sns.residplot(x = 'polio', y = 'life_expectancy', data = df,lowess=True,
                                    line_kws={'color': 'red', 'lw': 1, 'alpha': 1})
plt.xlabel("Fitted values")
plt.title('Residual plot')
plt.show()
```



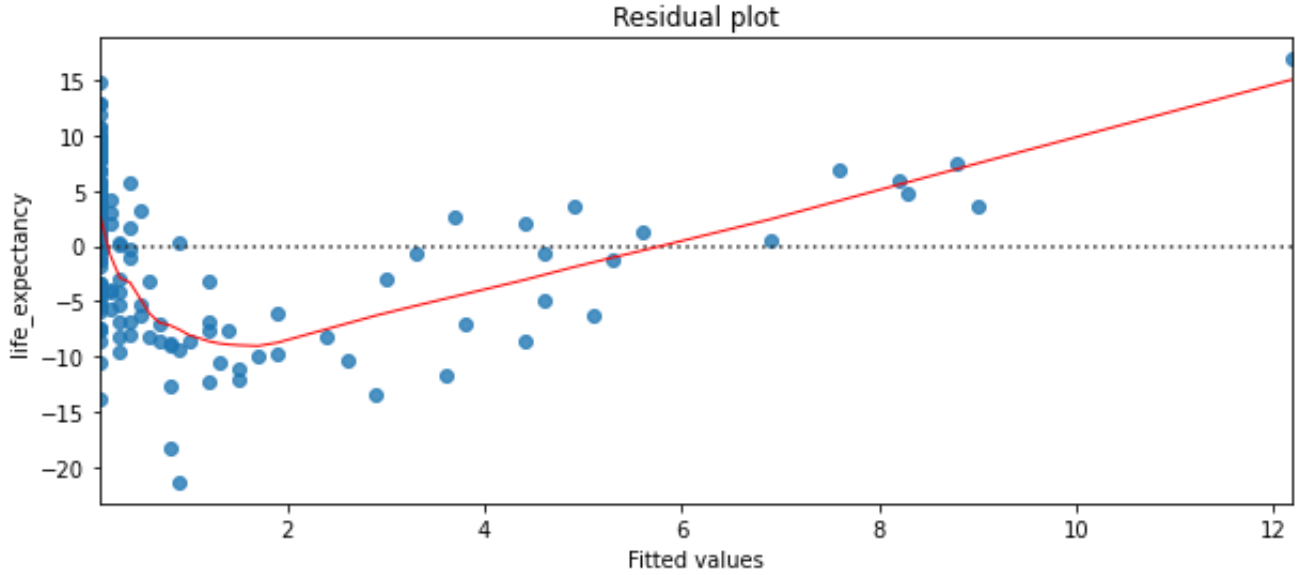
In [67]:
```
plt.figure(figsize = (10, 4))
sns.residplot(x = 'total_expenditure', y = 'life_expectancy', data = df,lowess=True,
                                    line_kws={'color': 'red', 'lw': 1, 'alpha': 1})
plt.xlabel("Fitted values")
plt.title('Residual plot')
plt.show()
```



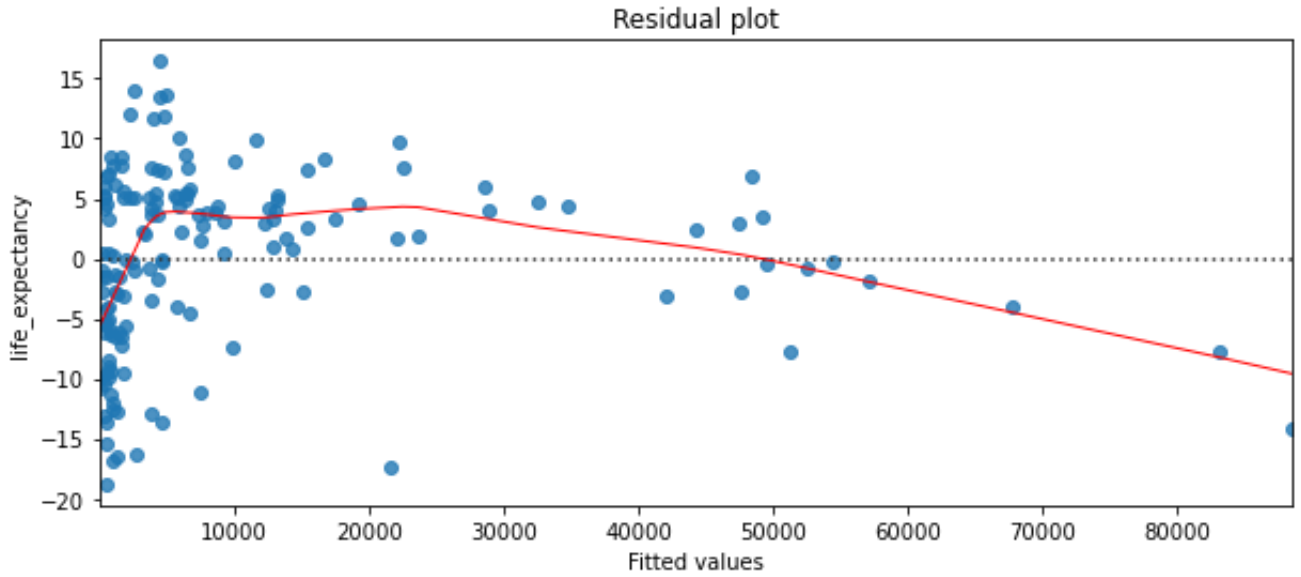
In [68]:
```
plt.figure(figsize = (10, 4))
sns.residplot(x = 'diphtheria', y = 'life_expectancy', data = df,lowess=True,
                                line_kws={'color': 'red', 'lw': 1, 'alpha': 1})
plt.xlabel("Fitted values")
plt.title('Residual plot')
plt.show()
```



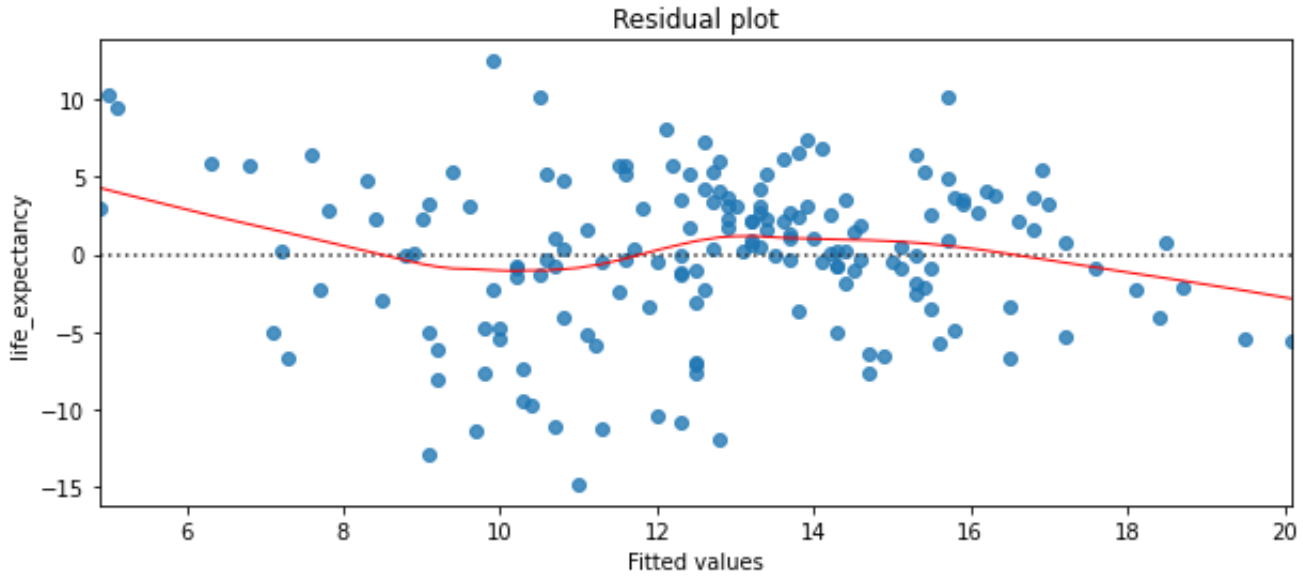
In [69]:
```
plt.figure(figsize = (10, 4))
sns.residplot(x = 'hiv/aids', y = 'life_expectancy', data = df,lowess=True,
                                line_kws={'color': 'red', 'lw': 1, 'alpha': 1})
plt.xlabel("Fitted values")
plt.title('Residual plot')
plt.show()
```



In [70]:
```
plt.figure(figsize = (10, 4))
sns.residplot(x = 'gdp', y = 'life_expectancy', data = df,lowess=True,
                                    line_kws={'color': 'red', 'lw': 1, 'alpha': 1})
plt.xlabel("Fitted values")
plt.title('Residual plot')
plt.show()
```



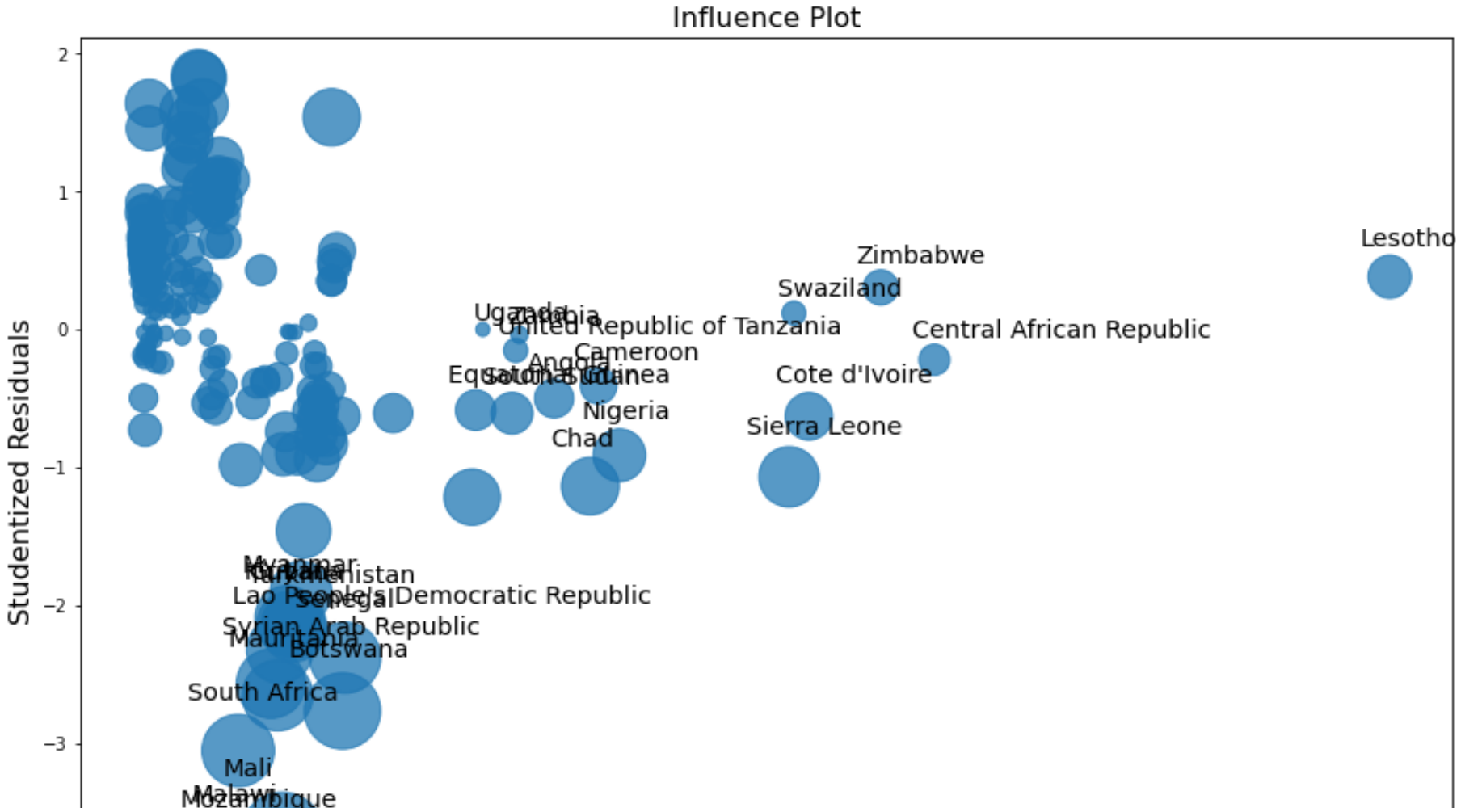
In [71]:
```
plt.figure(figsize = (10, 4))
sns.residplot(x = 'schooling', y = 'life_expectancy', data = df,lowess=True,
                                    line_kws={'color': 'red', 'lw': 1, 'alpha': 1})
plt.xlabel("Fitted values")
plt.title('Residual plot')
plt.show()
```

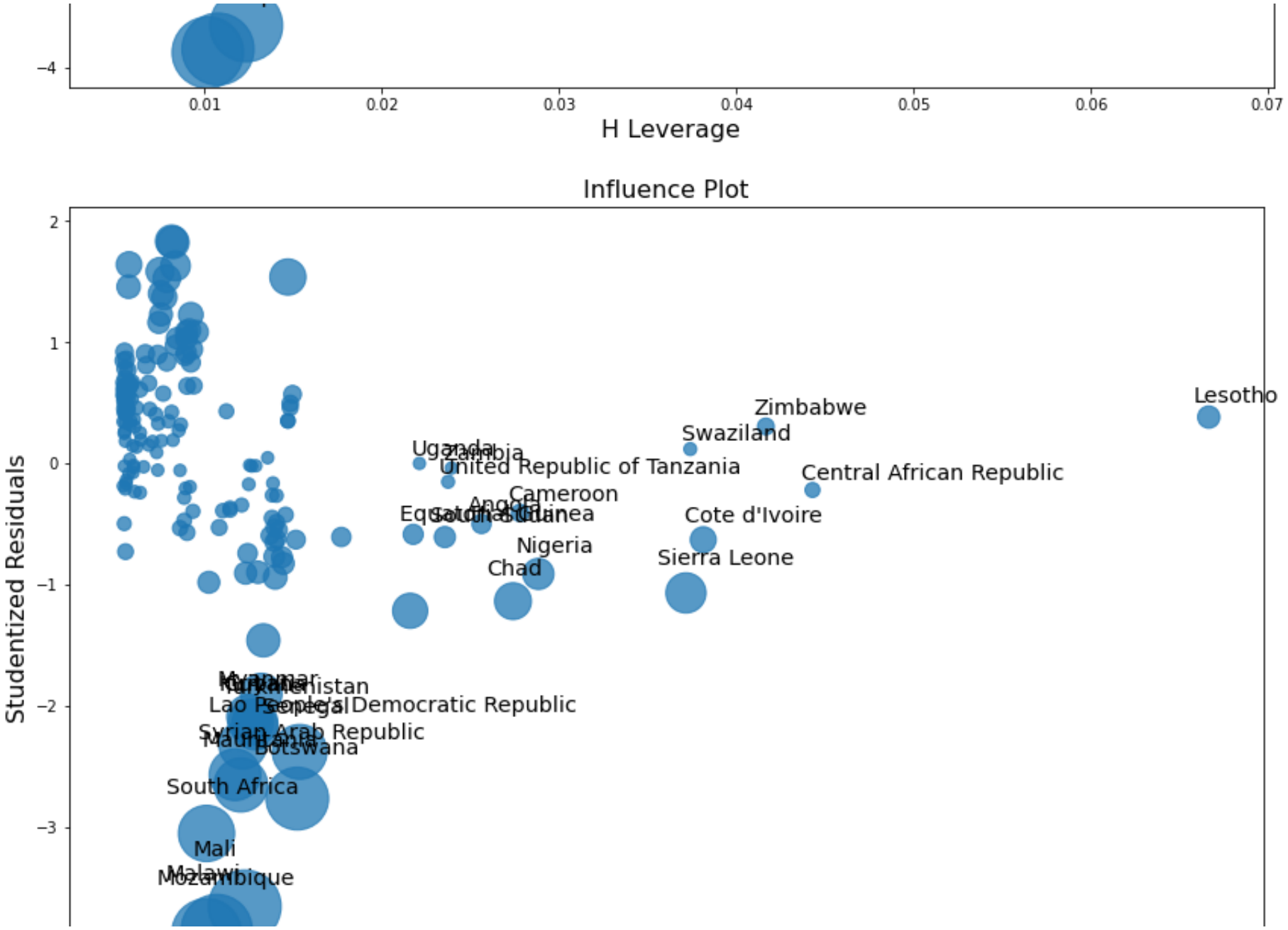


In [74]:
```
#plots for all predictors
```

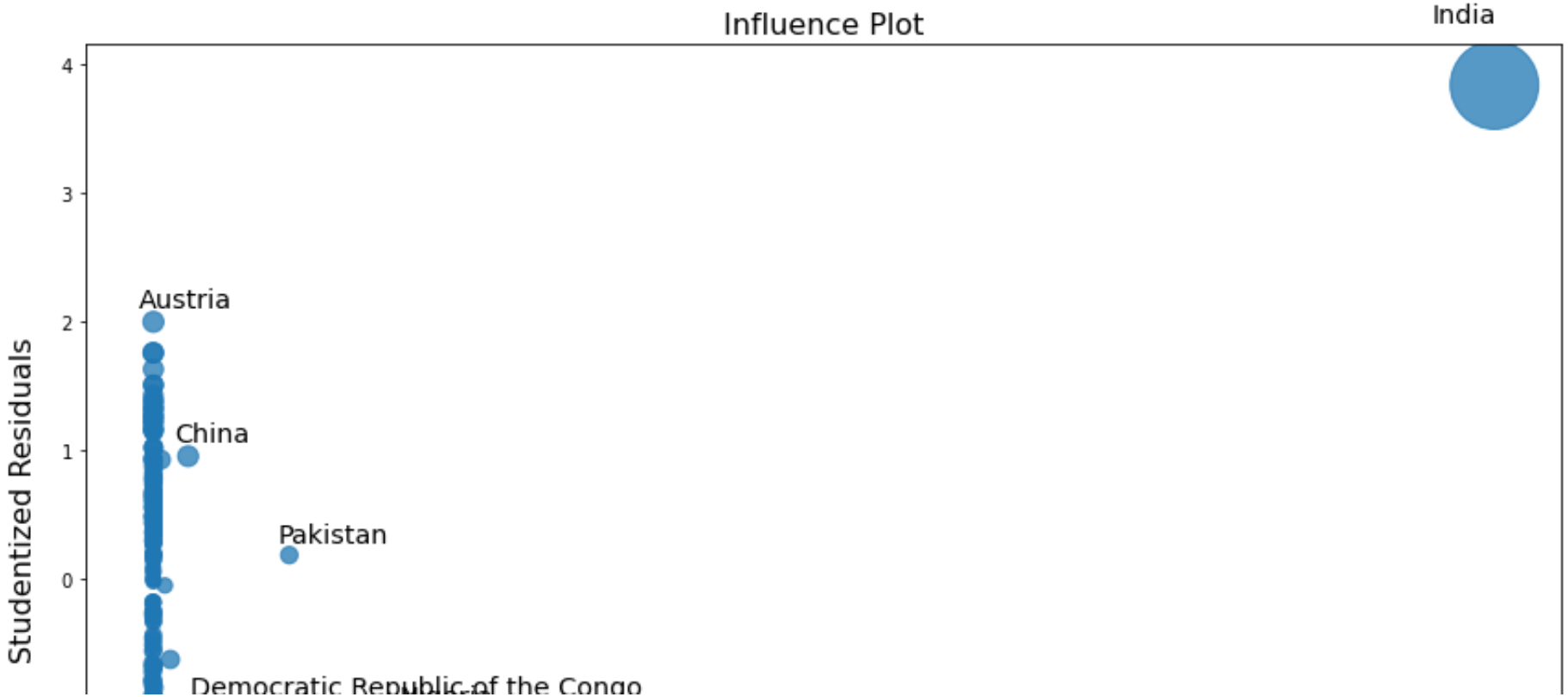
In [73]:
```
```

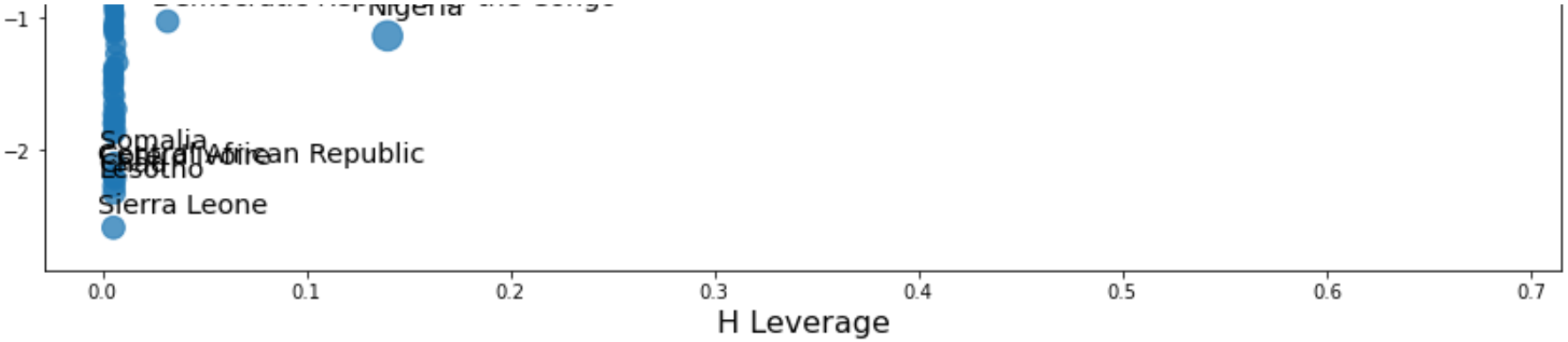
```
figd, ax = plt.subplots(figsize=(12,8))
figd = sm.graphics.influence_plot(reg, ax = ax, criterion="DFFITS")
figd.tight_layout(pad=1.0)

fige, ax = plt.subplots(figsize=(12,8))
fige = sm.graphics.influence_plot(reg, ax = ax, criterion="cooks")
fige.tight_layout(pad=1.0)
```

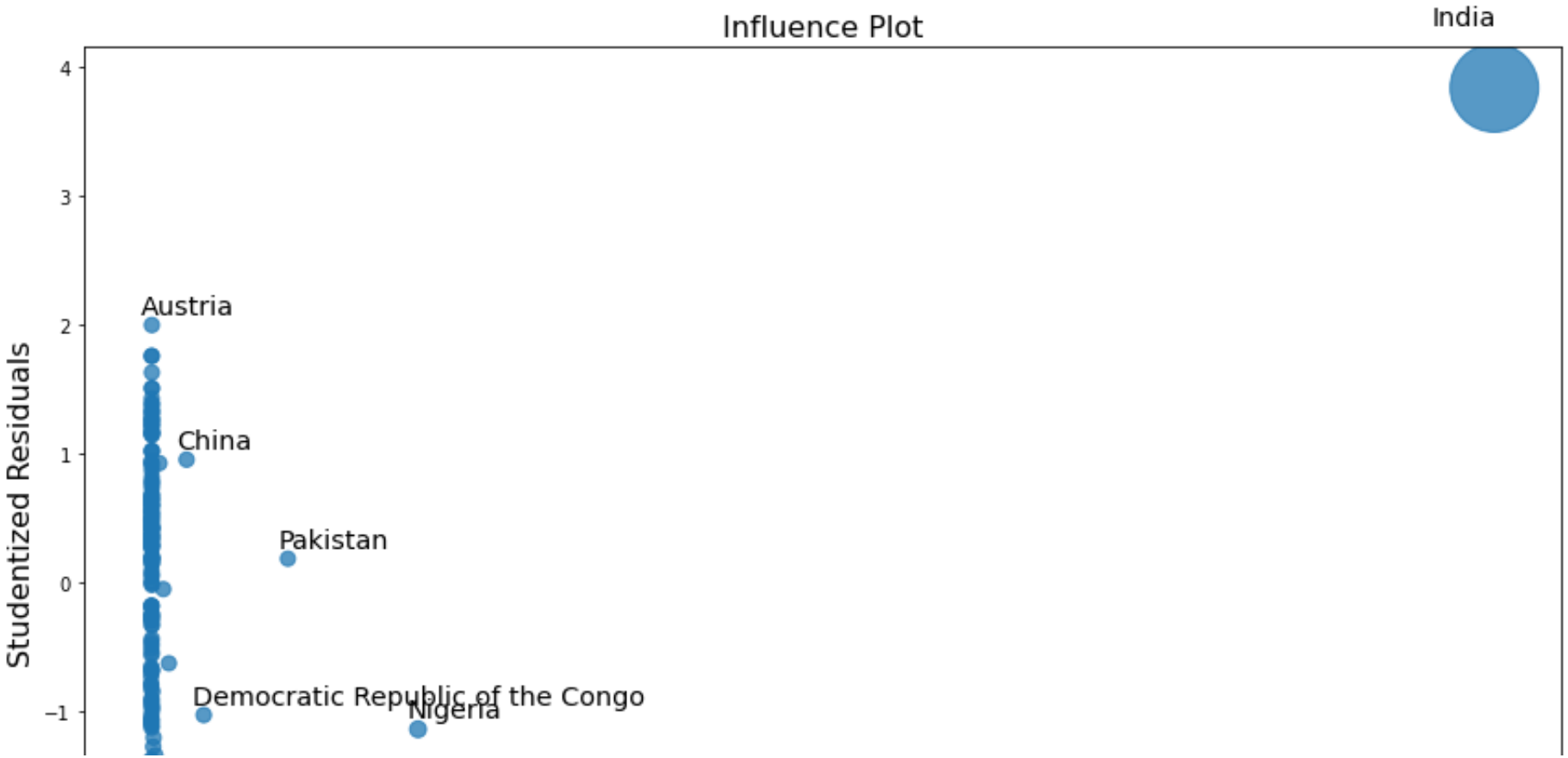


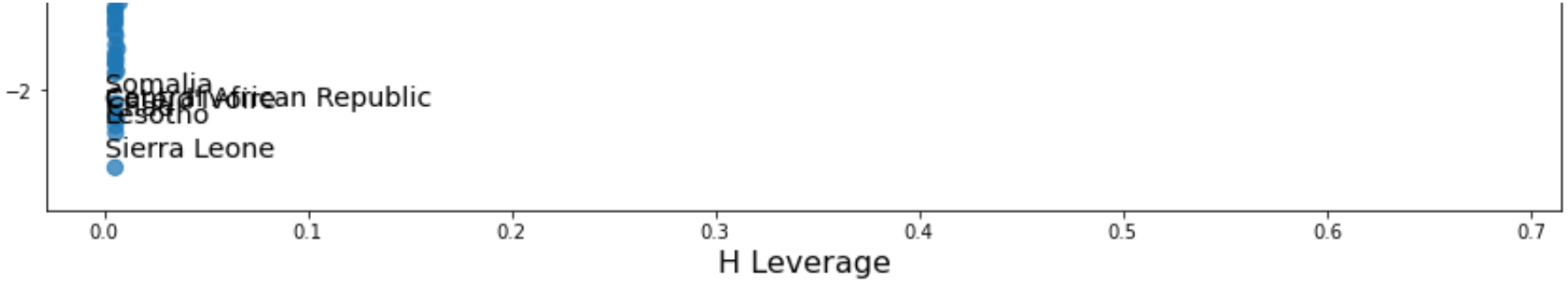

−4
0.01
0.02
0.03
0.04
0.05
0.06
0.07
H Leverage
Influence Plot
Studentized Residuals
2
1
0
−1
−2
−3
Lesotho
Zimbabwe
Swaziland
Uganda
Zambia
United Republic of Tanzania
Central African Republic
Cameroon
Angola
Cote d'Ivoire
Nigeria
Chad
Sierra Leone
Democratic Republic
Syrian Arab Republic
Botswana
South Africa
Mali
Malawi
Mozambique

In [113]:
```
figd, ax = plt.subplots(figsize=(12,8))
figd = sm.graphics.influence_plot(reg2, ax = ax, criterion="DFFITS")
figd.tight_layout(pad=1.0)

fige, ax = plt.subplots(figsize=(12,8))
fige = sm.graphics.influence_plot(reg2, ax = ax, criterion="cooks")
fige.tight_layout(pad=1.0)
```

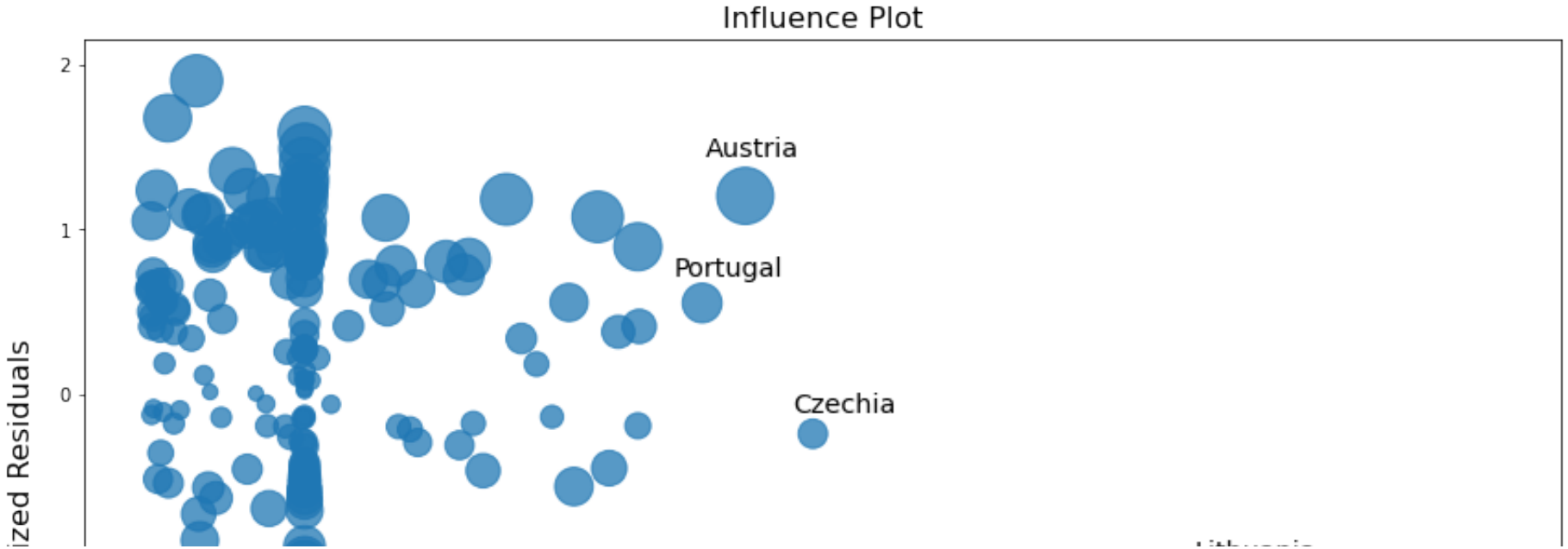


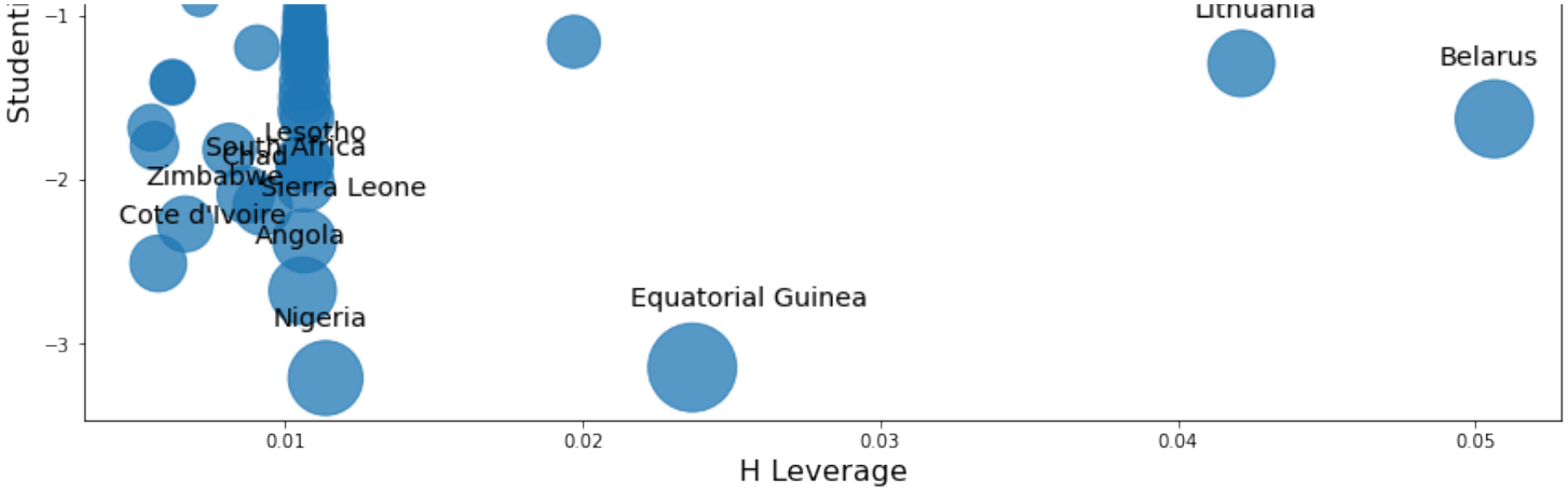

Nigeria
Somalia
Central African Republic
Lesotho
Sierra Leone
−1
−2
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
H Leverage

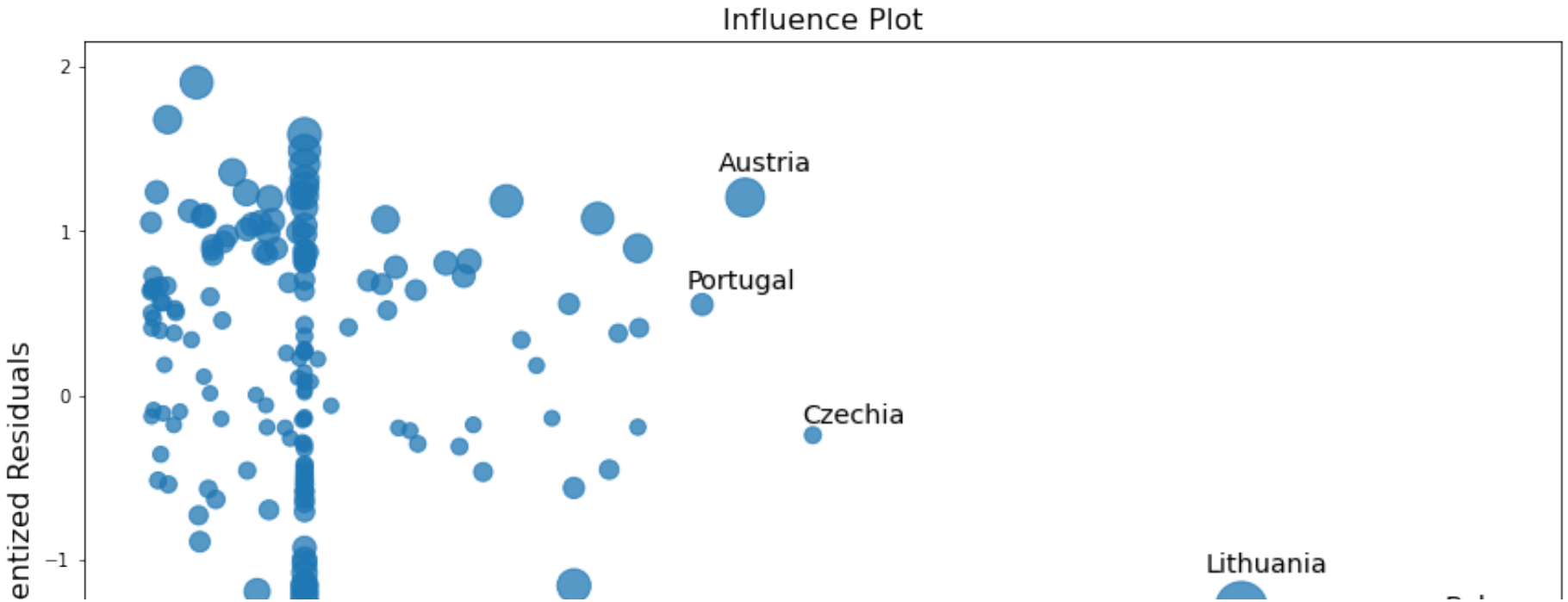

Influence Plot
India
Austria
China
Pakistan
Democratic Republic of the Congo
Nigeria
Studentized Residuals
4
3
2
1
0
−1

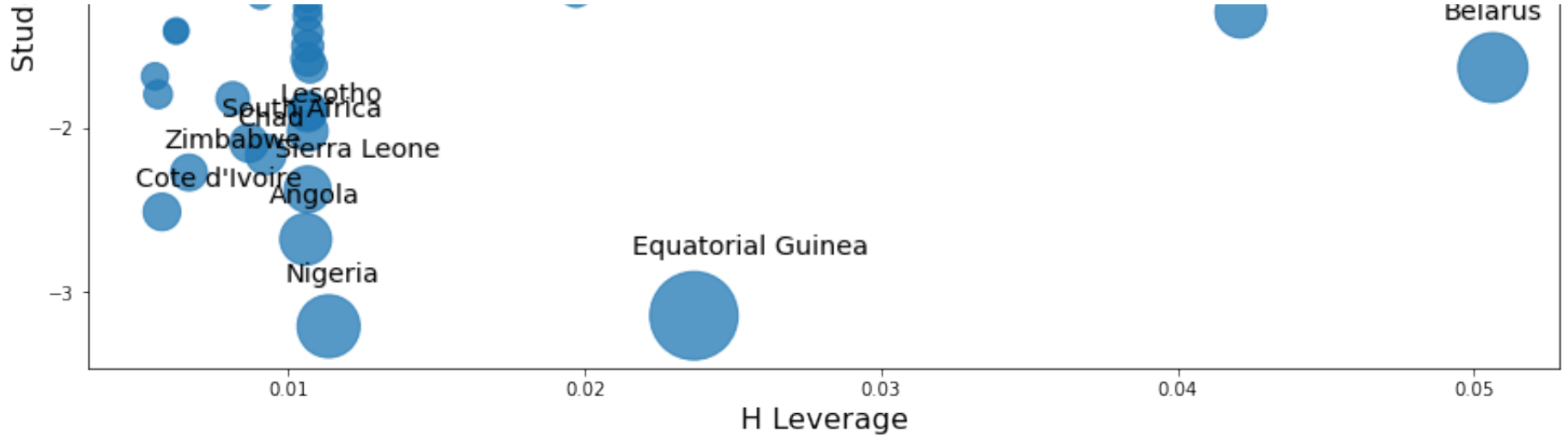


In [114]:
```
figd, ax = plt.subplots(figsize=(12,8))
figd = sm.graphics.influence_plot(reg3, ax = ax, criterion="DFFITS")
figd.tight_layout(pad=1.0)

fige, ax = plt.subplots(figsize=(12,8))
fige = sm.graphics.influence_plot(reg3, ax = ax, criterion="cooks")
fige.tight_layout(pad=1.0)
```

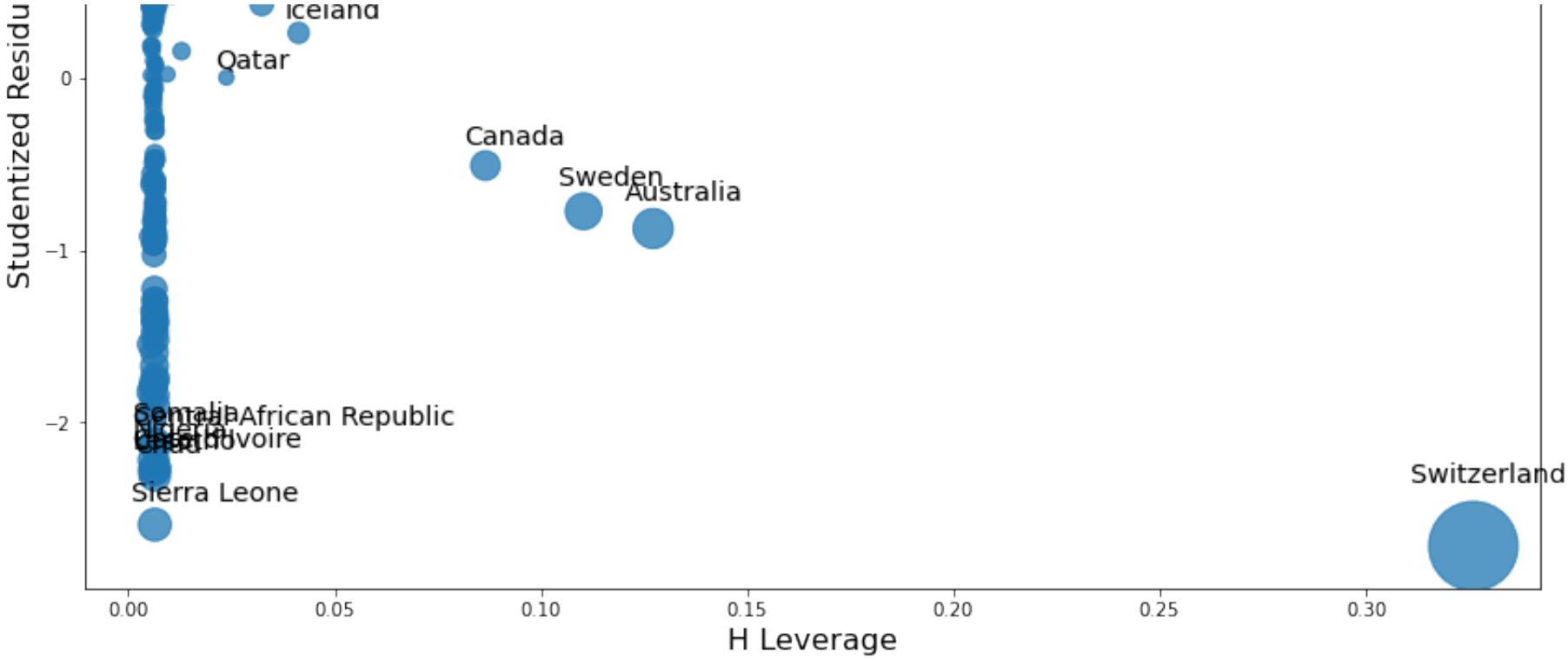



Studenti
−1
−2
−3
Lithuania
Belarus
Lesotho
South Africa
Chad
Zimbabwe
Sierra Leone
Cote d'Ivoire
Angola
Nigeria
Equatorial Guinea
0.01
0.02
0.03
0.04
0.05
H Leverage

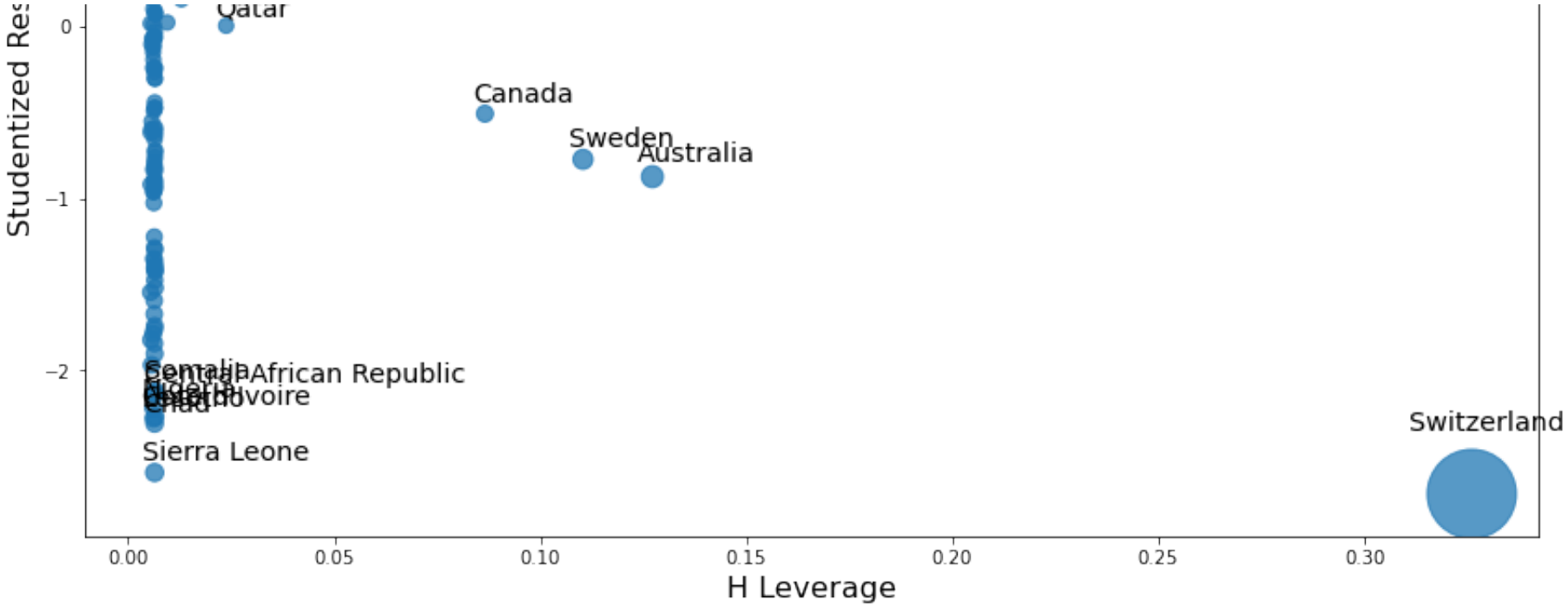

Influence Plot
2
1
0
−1
entized Residuals
Austria
Portugal
Czechia
Lithuania



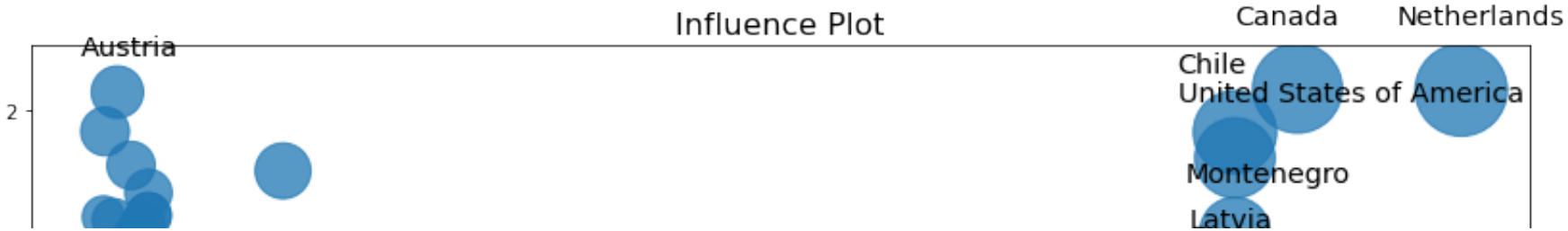
In [115]:
```
figd, ax = plt.subplots(figsize=(12,8))
figd = sm.graphics.influence_plot(reg4, ax = ax, criterion="DFFITS")
figd.tight_layout(pad=1.0)

fige, ax = plt.subplots(figsize=(12,8))
fige = sm.graphics.influence_plot(reg4, ax = ax, criterion="cooks")
fige.tight_layout(pad=1.0)
```

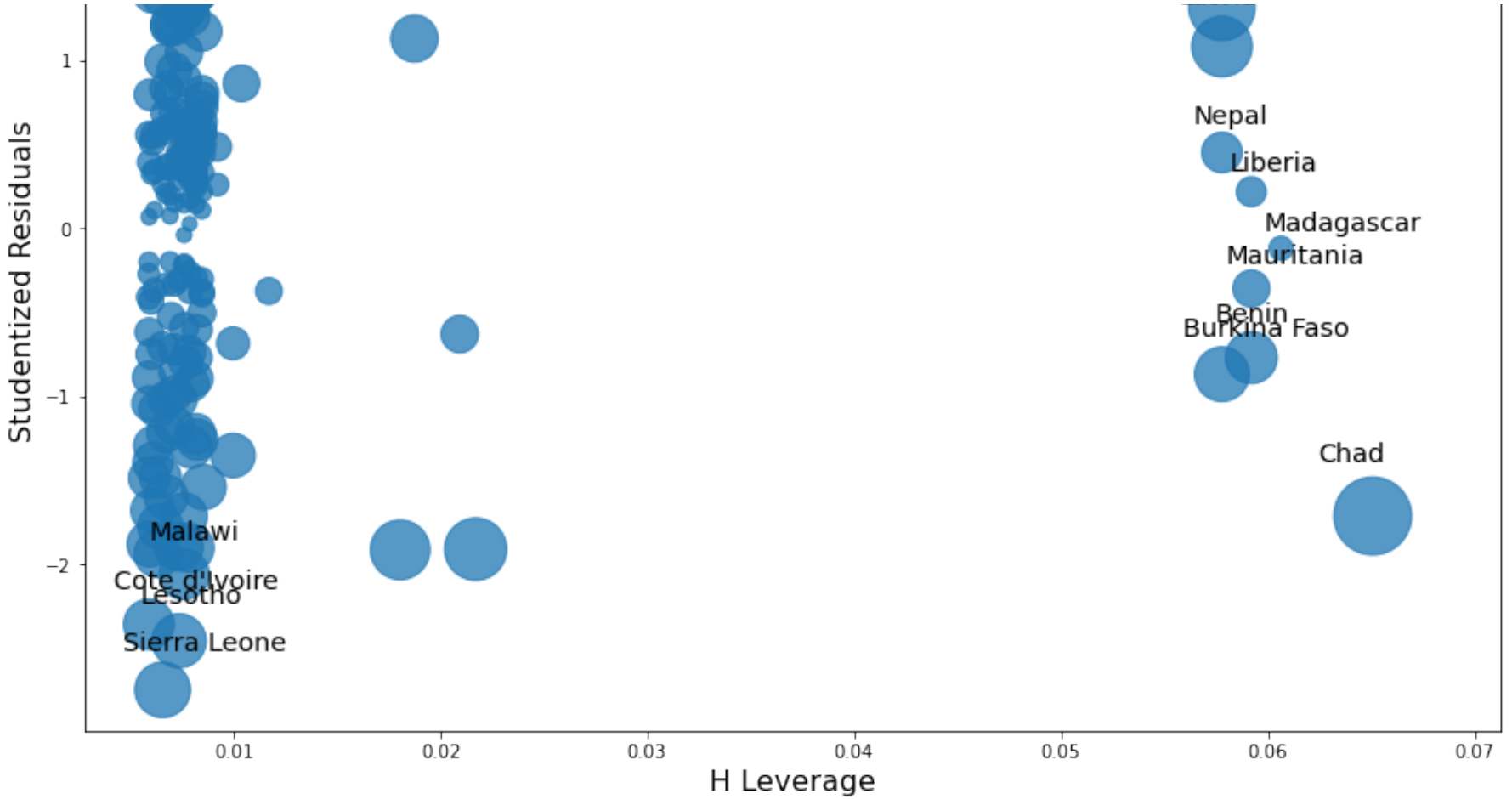

Iceland
Qatar
Canada
Sweden
Australia
Switzerland
Sierra Leone
African Republic
Studentized Residu
H Leverage
0
−1
−2
0.00
0.05
0.10
0.15
0.20
0.25
0.30

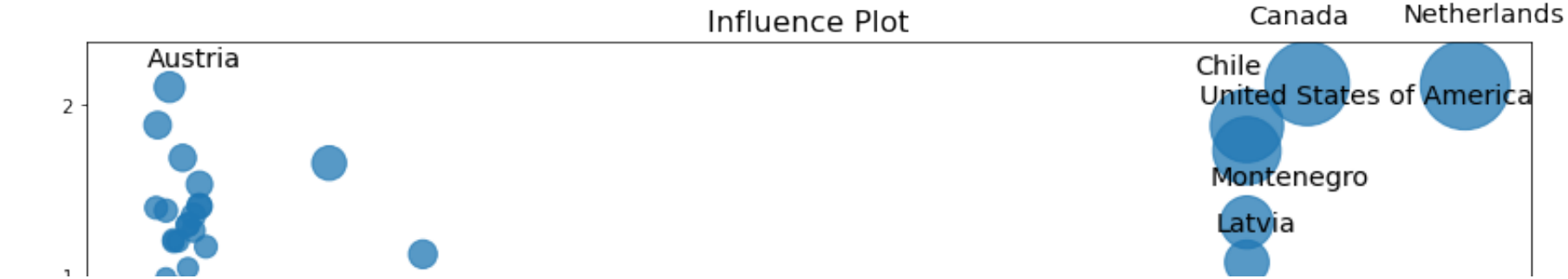

Influence Plot
United Kingdom of Great Britain and Northern Ireland
Germany
Austria
Finland
Ireland
Singapore
Iceland
2
1

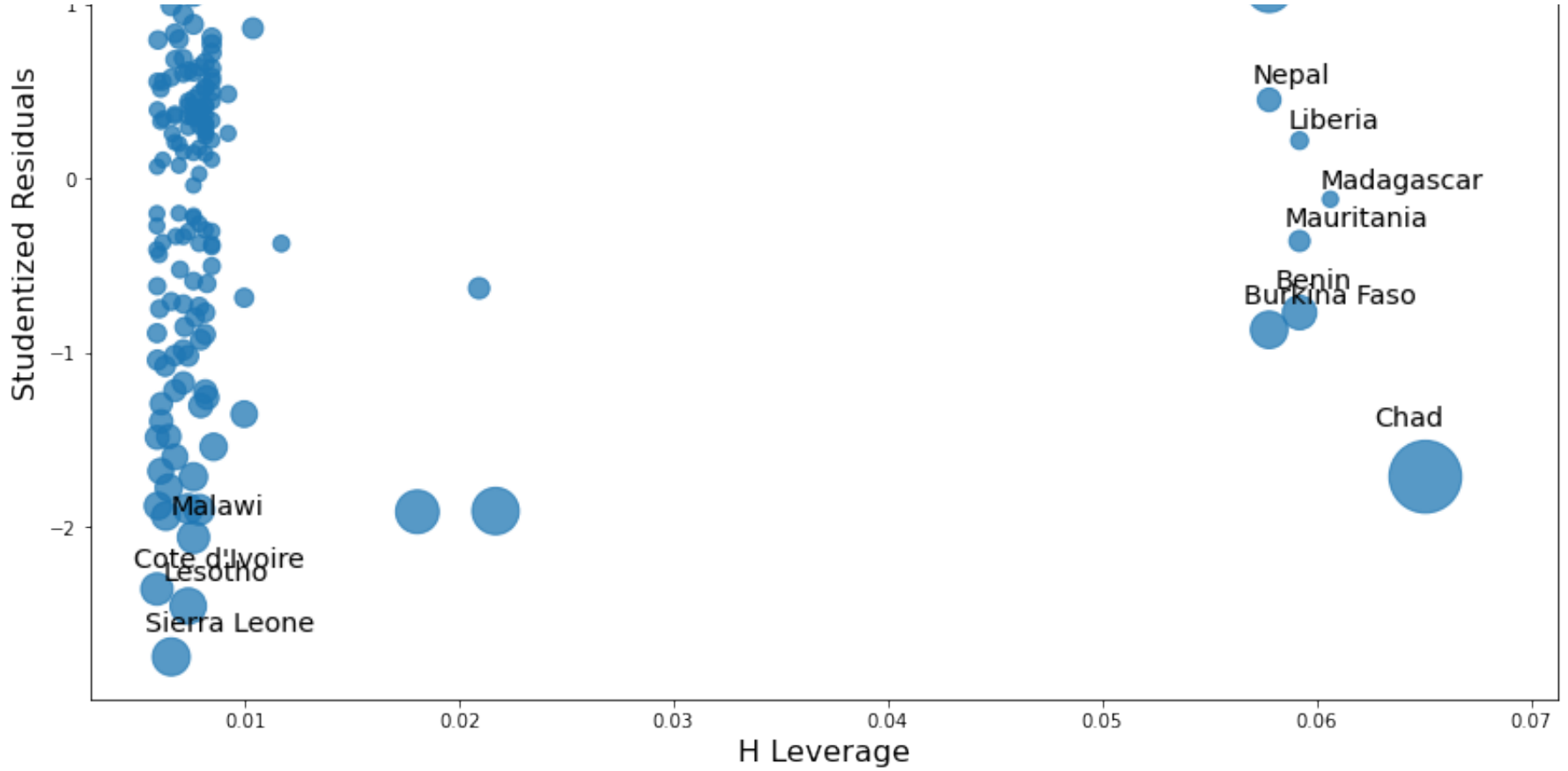


In [116]:
```
figd, ax = plt.subplots(figsize=(12,8))
figd = sm.graphics.influence_plot(reg5, ax = ax, criterion="DFFITS")
figd.tight_layout(pad=1.0)

fige, ax = plt.subplots(figsize=(12,8))
fige = sm.graphics.influence_plot(reg5, ax = ax, criterion="cooks")
fige.tight_layout(pad=1.0)
```



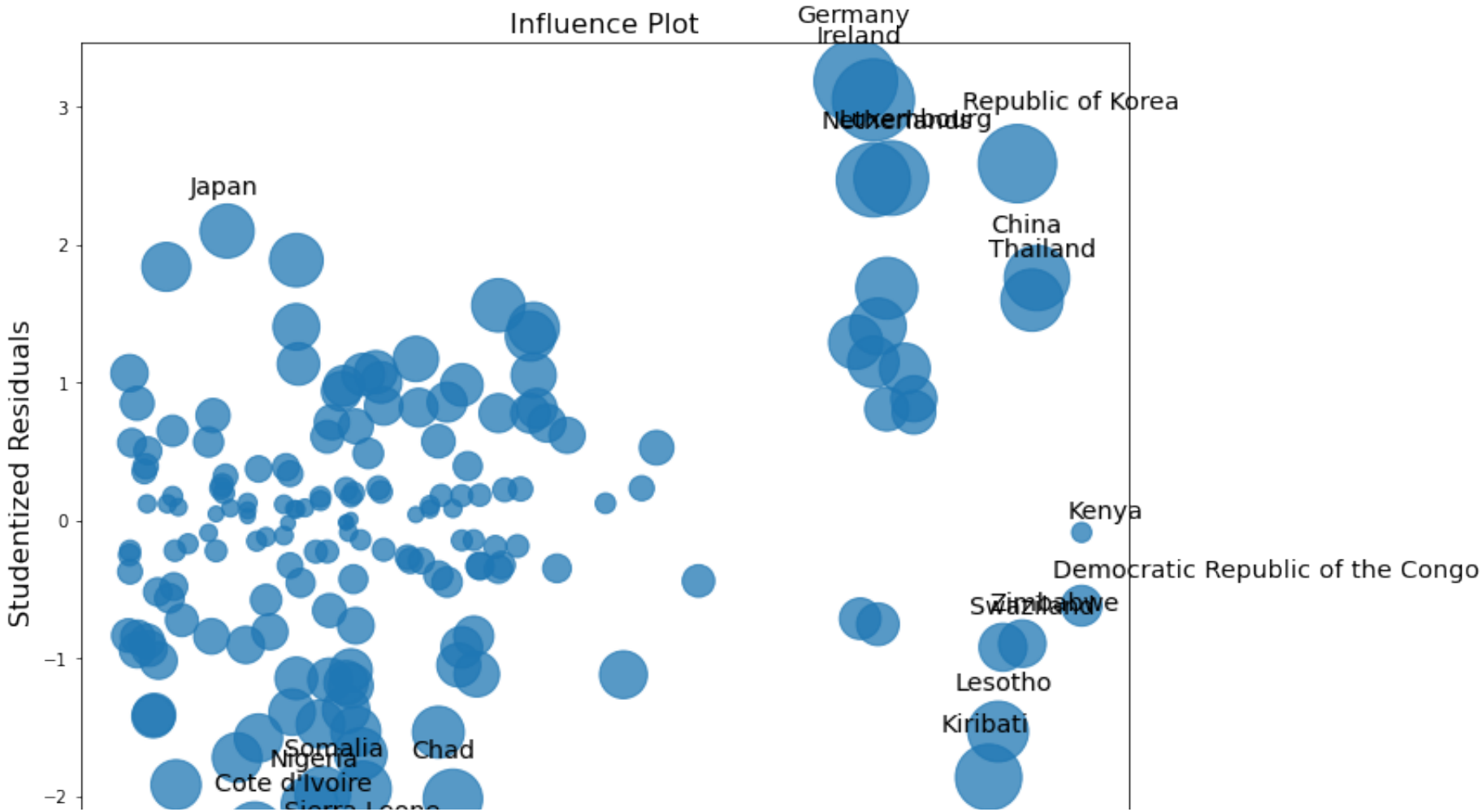

Studentized Residuals
H Leverage
Nepal
Liberia
Madagascar
Mauritania
Benin
Burkina Faso
Chad
Malawi
Cote d'Ivoire
Lesotho
Sierra Leone
1
0
−1
−2
0.01
0.02
0.03
0.04
0.05
0.06
0.07


Influence Plot
Canada
Netherlands
Austria
Chile
United States of America
Montenegro
Latvia
2
1

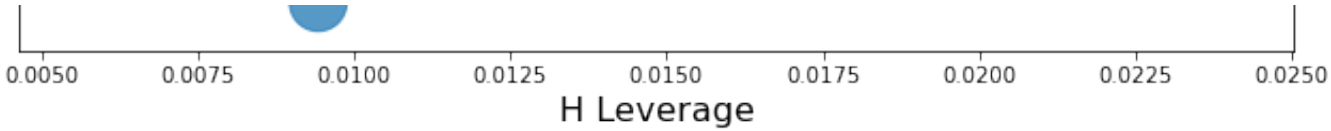

Studentized Residuals
H Leverage
Nepal
Liberia
Madagascar
Mauritania
Benin
Burkina Faso
Chad
Malawi
Cote d'Ivoire
Lesotho
Sierra Leone
1
0
−1
−2
0.01
0.02
0.03
0.04
0.05
0.06
0.07

In [117]:

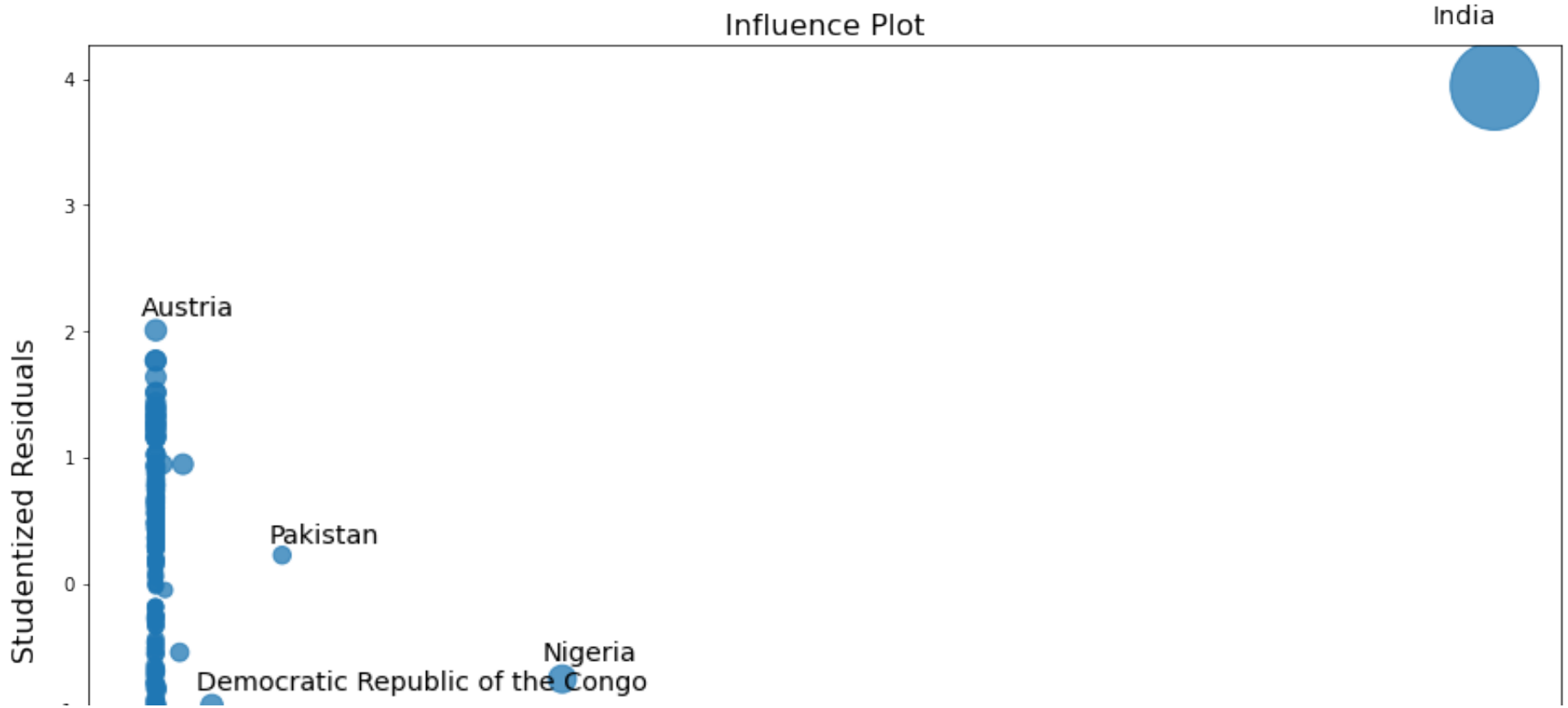
```
figd, ax = plt.subplots(figsize=(12,8))
figd = sm.graphics.influence_plot(reg6, ax = ax, criterion="DFFITS")
figd.tight_layout(pad=1.0)

fige, ax = plt.subplots(figsize=(12,8))
fige = sm.graphics.influence_plot(reg6, ax = ax, criterion="cooks")
fige.tight_layout(pad=1.0)
```

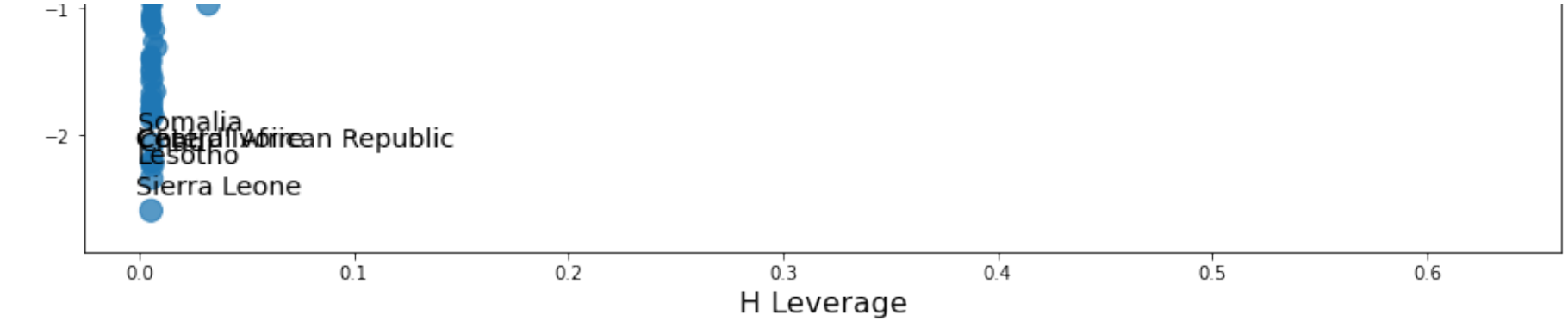


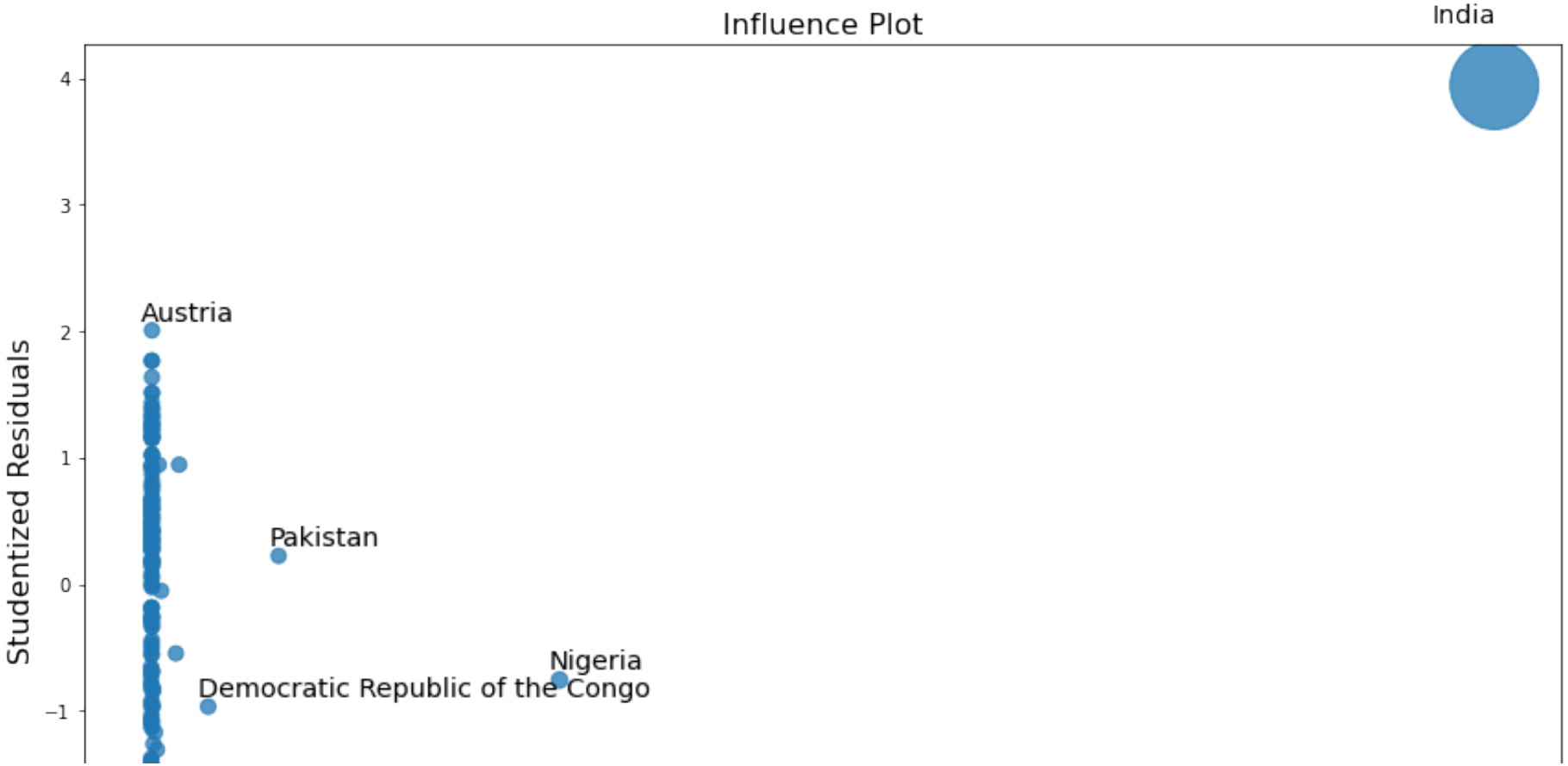

Sierra Leone
0.0050
0.0075
0.0100
0.0125
0.0150
0.0175
0.0200
0.0225
0.0250
H Leverage
Influence Plot
Studentized Residuals
3
2
1
0
−1
−2
Germany
Ireland
Republic of Korea
Japan
China
Thailand
Kenya
Democratic Republic of the Congo
Lesotho
Kiribati
Somalia
Chad
Nigeria
Cote d'Ivoire
Sierra Leone

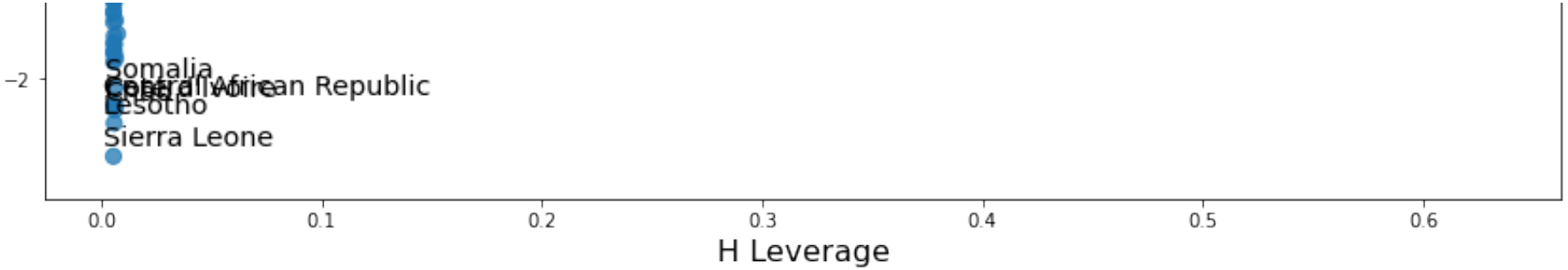


In [118]:
```
figd, ax = plt.subplots(figsize=(12,8))
figd = sm.graphics.influence_plot(reg7, ax = ax, criterion="DFFITS")
figd.tight_layout(pad=1.0)

fige, ax = plt.subplots(figsize=(12,8))
fige = sm.graphics.influence_plot(reg7, ax = ax, criterion="cooks")
fige.tight_layout(pad=1.0)
```

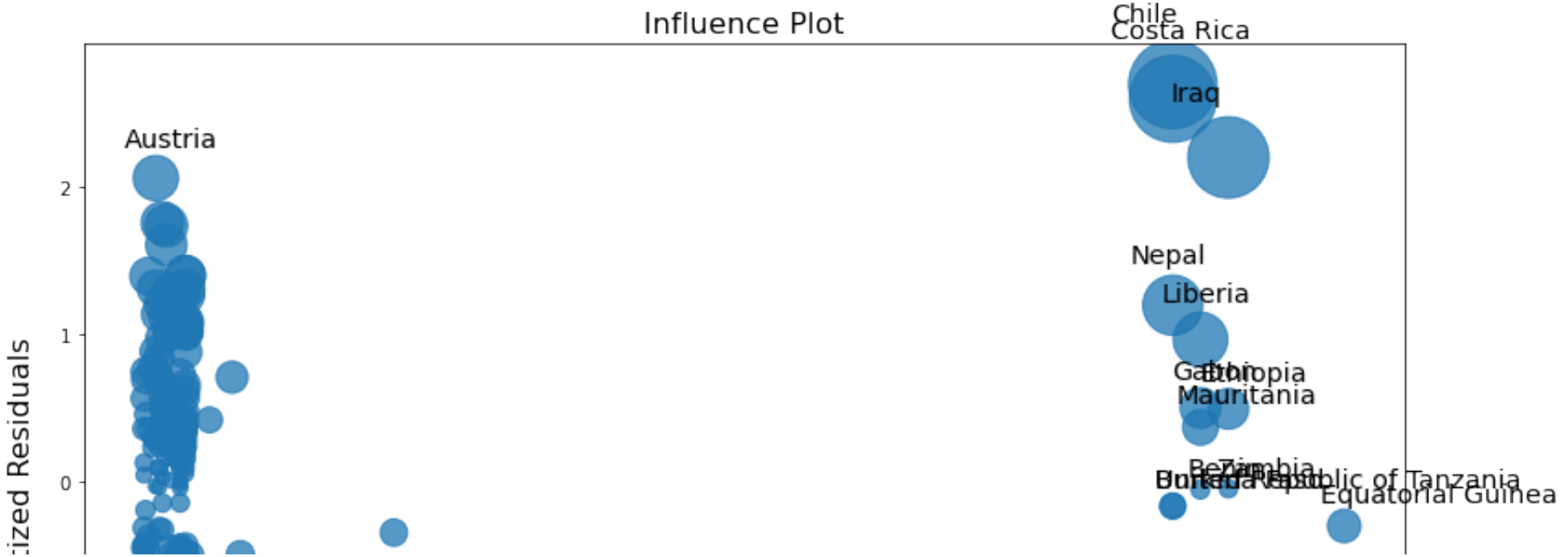


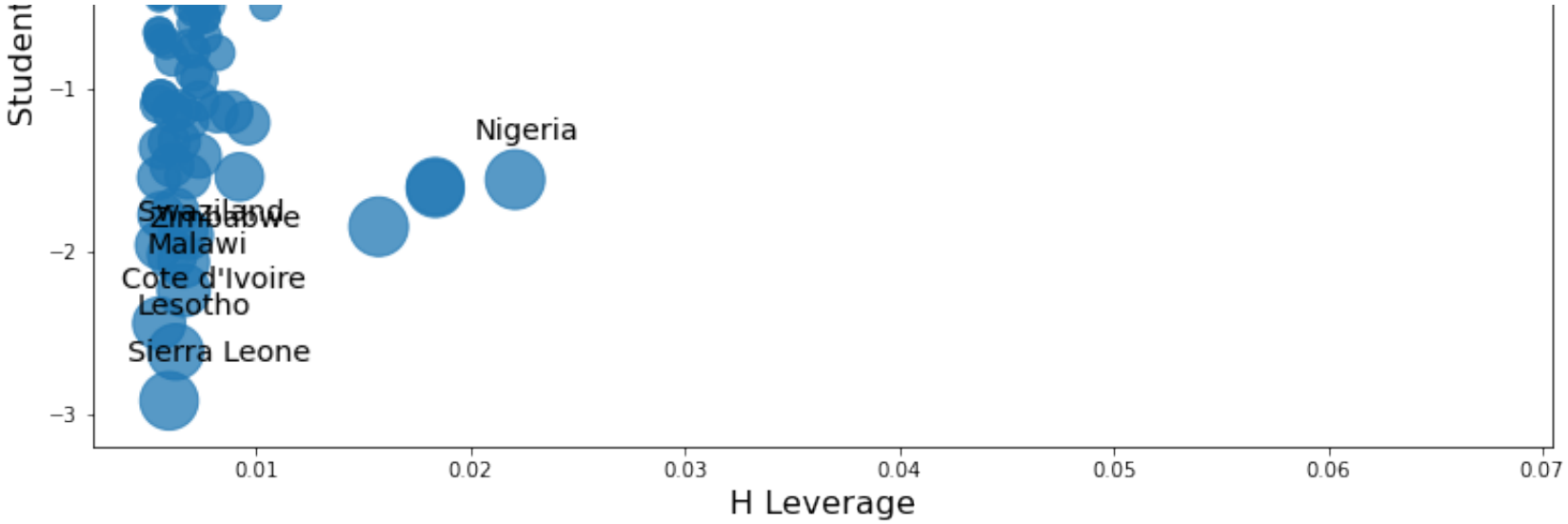

−1
−2
Somalia
Central African Republic
Lesotho
Sierra Leone
0.0
0.1
0.2
0.3
0.4
0.5
0.6
H Leverage

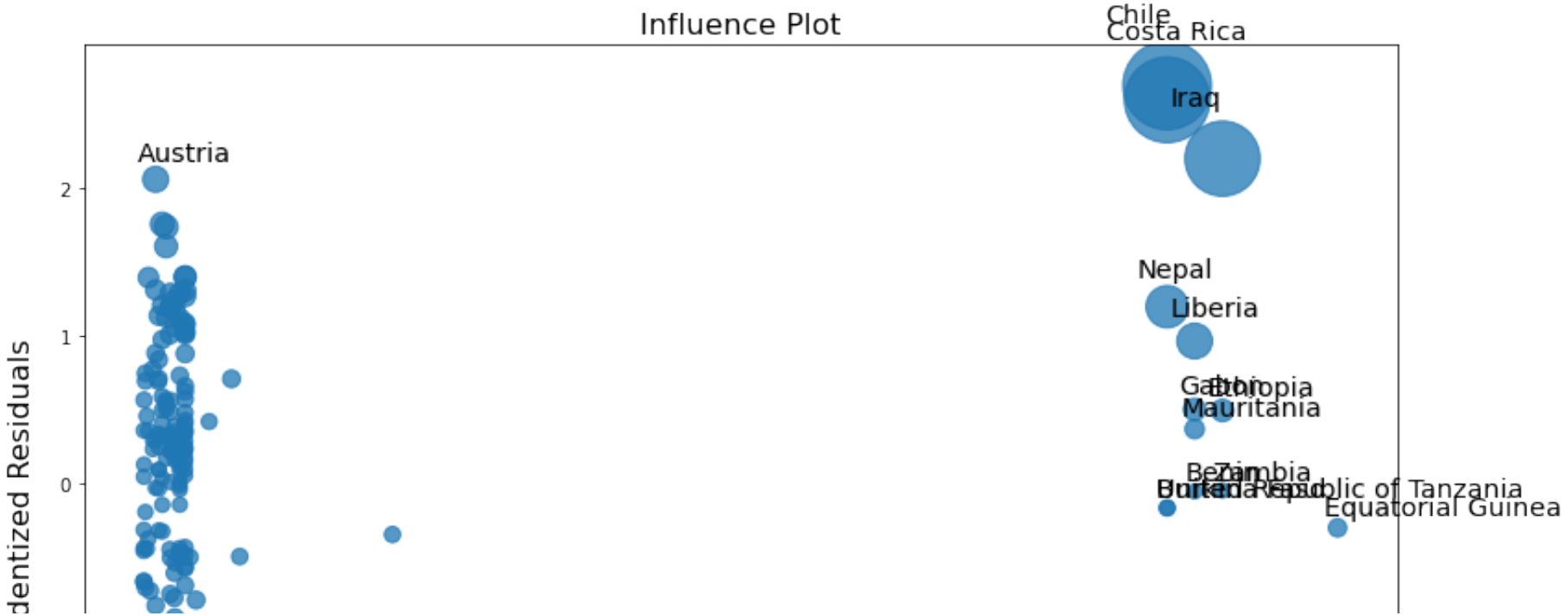

Influence Plot
India
Austria
Pakistan
Nigeria
Democratic Republic of the Congo
Studentized Residuals
4
3
2
1
0
−1

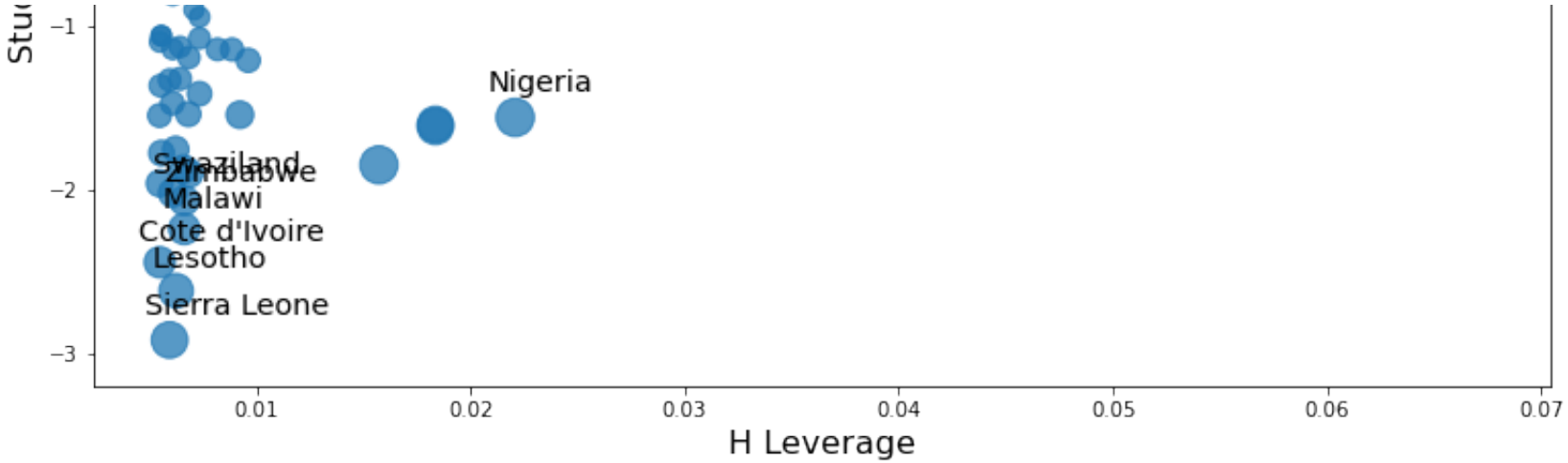


In [119]:
```
figd, ax = plt.subplots(figsize=(12,8))
figd = sm.graphics.influence_plot(reg8, ax = ax, criterion="DFFITS")
figd.tight_layout(pad=1.0)

fige, ax = plt.subplots(figsize=(12,8))
fige = sm.graphics.influence_plot(reg8, ax = ax, criterion="cooks")
fige.tight_layout(pad=1.0)
```

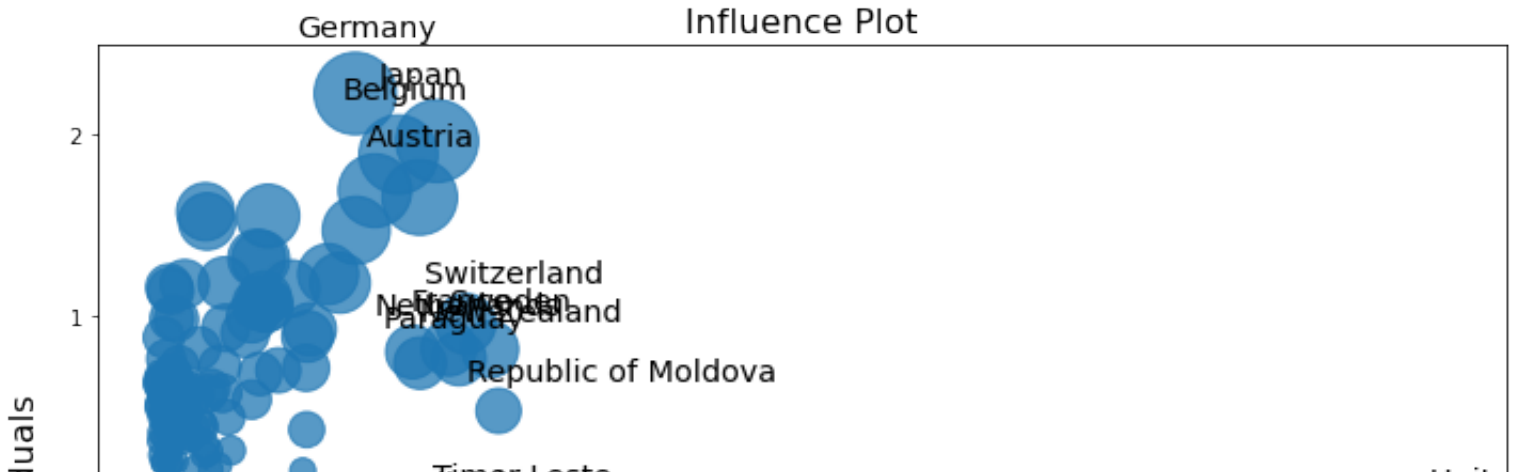


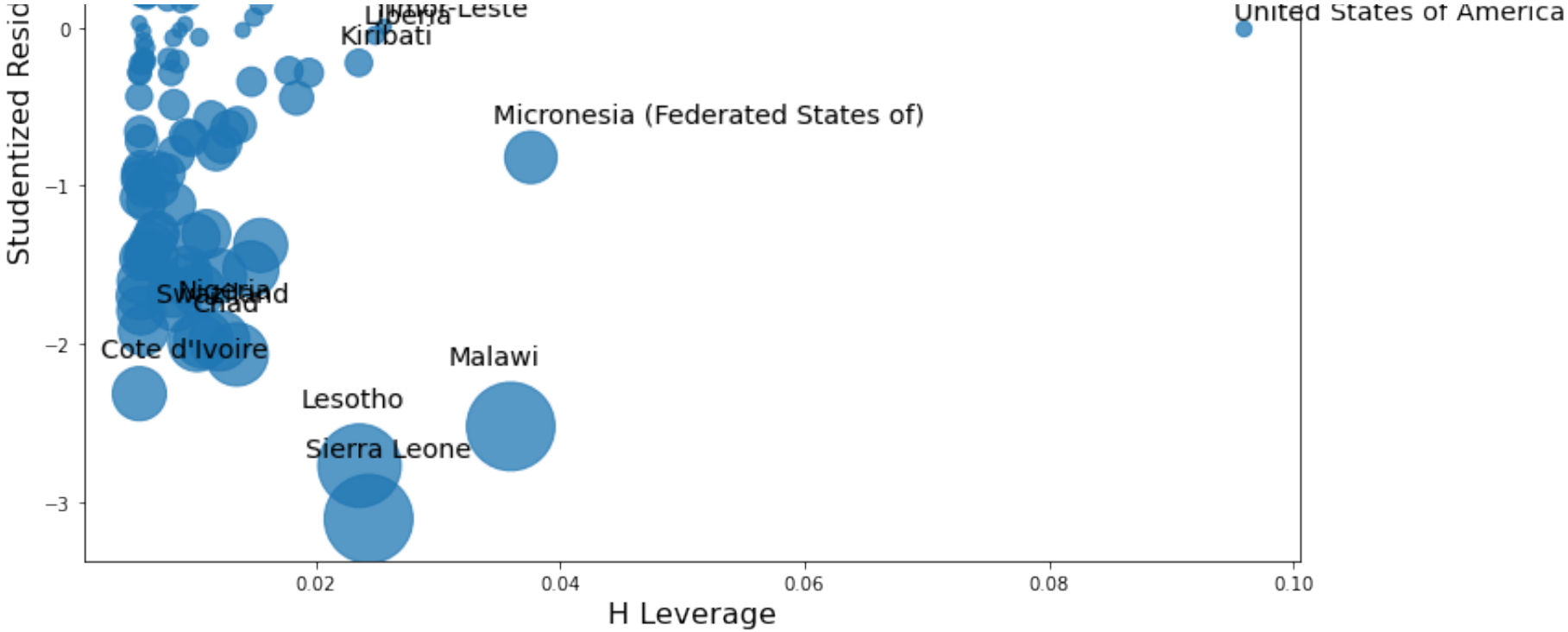

Nigeria
Swaziland
Zimbabwe
Malawi
Cote d'Ivoire
Lesotho
Sierra Leone
−1
−2
−3
0.01
0.02
0.03
0.04
0.05
0.06
0.07
H Leverage

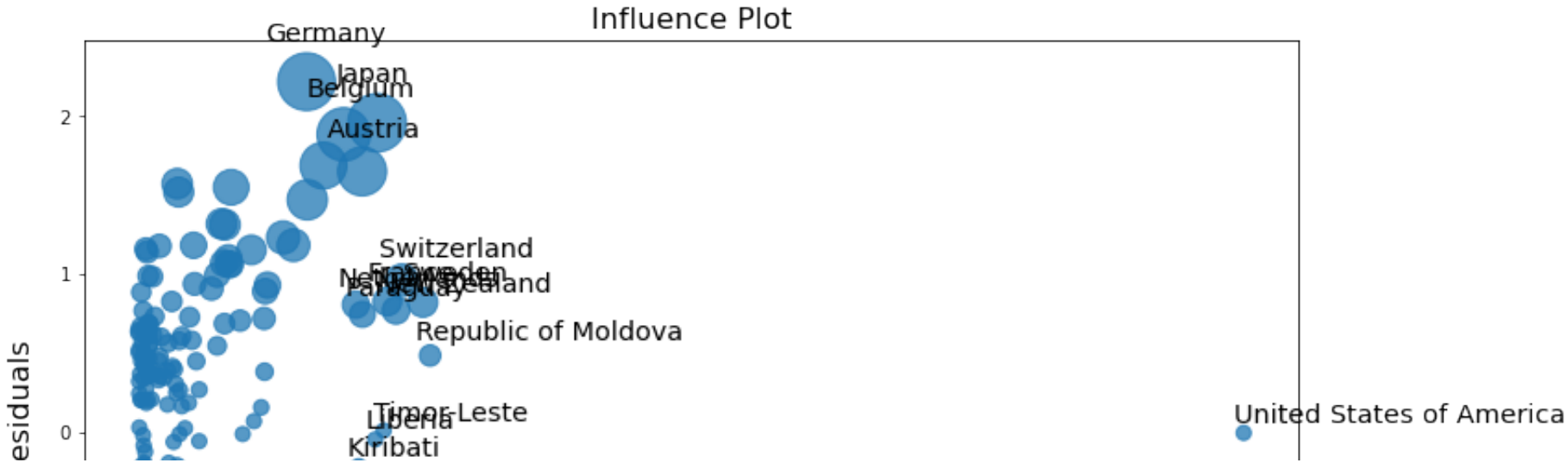

Influence Plot
Chile
Costa Rica
Iraq
Austria
Nepal
Liberia
Mauritania
Equatorial Guinea
2
1
0
dentized Residuals

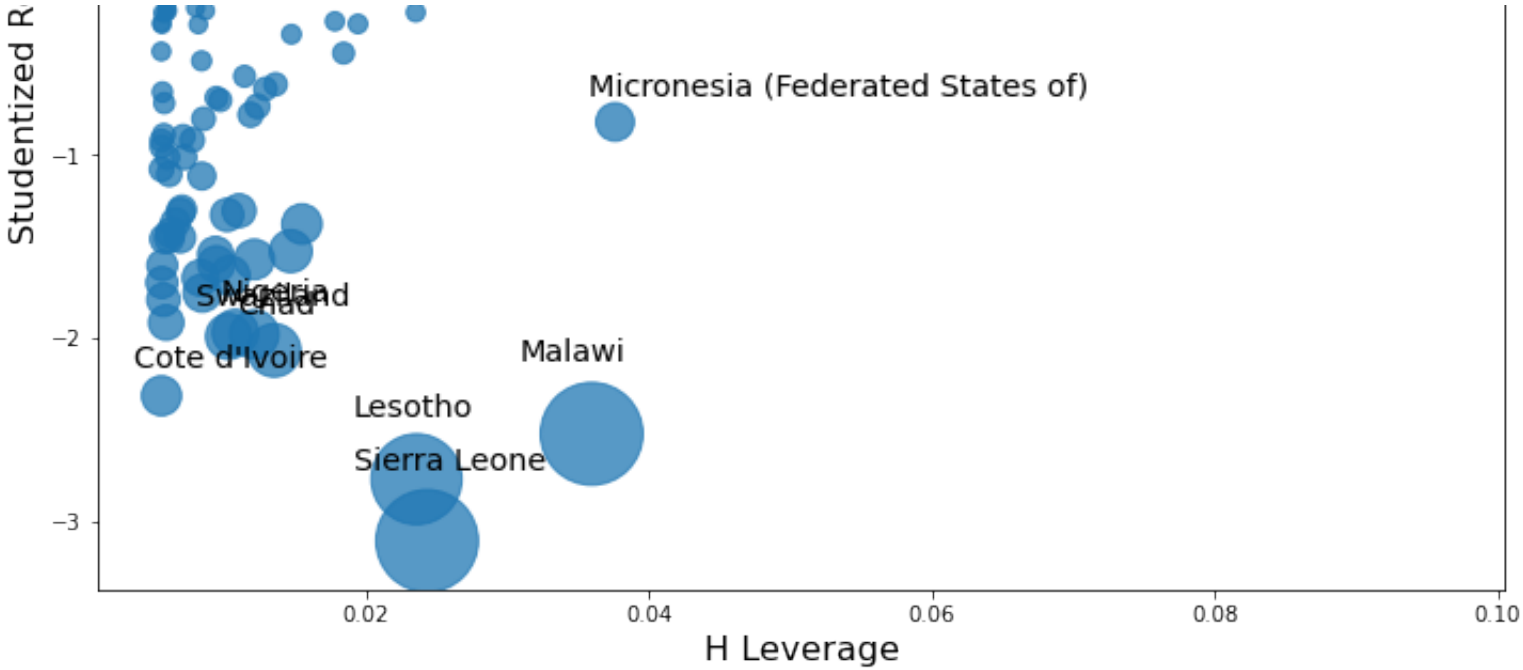


In [120]:
```
figd, ax = plt.subplots(figsize=(12,8))
figd = sm.graphics.influence_plot(reg9, ax = ax, criterion="DFFITS")
figd.tight_layout(pad=1.0)

fige, ax = plt.subplots(figsize=(12,8))
fige = sm.graphics.influence_plot(reg9, ax = ax, criterion="cooks")
fige.tight_layout(pad=1.0)
```

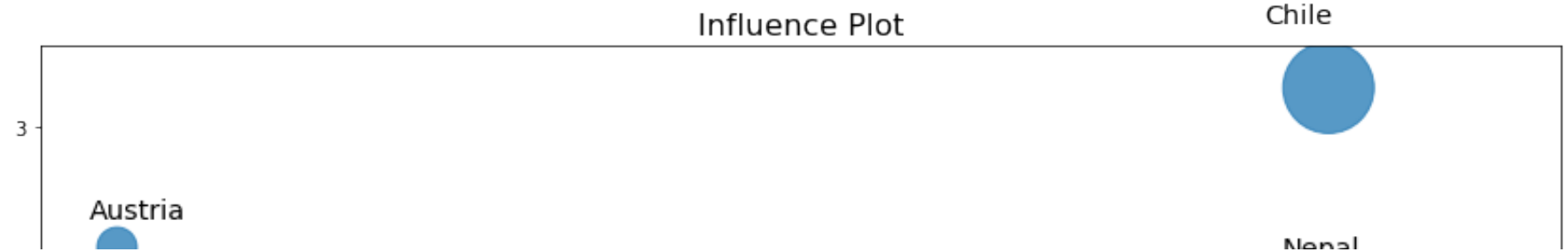


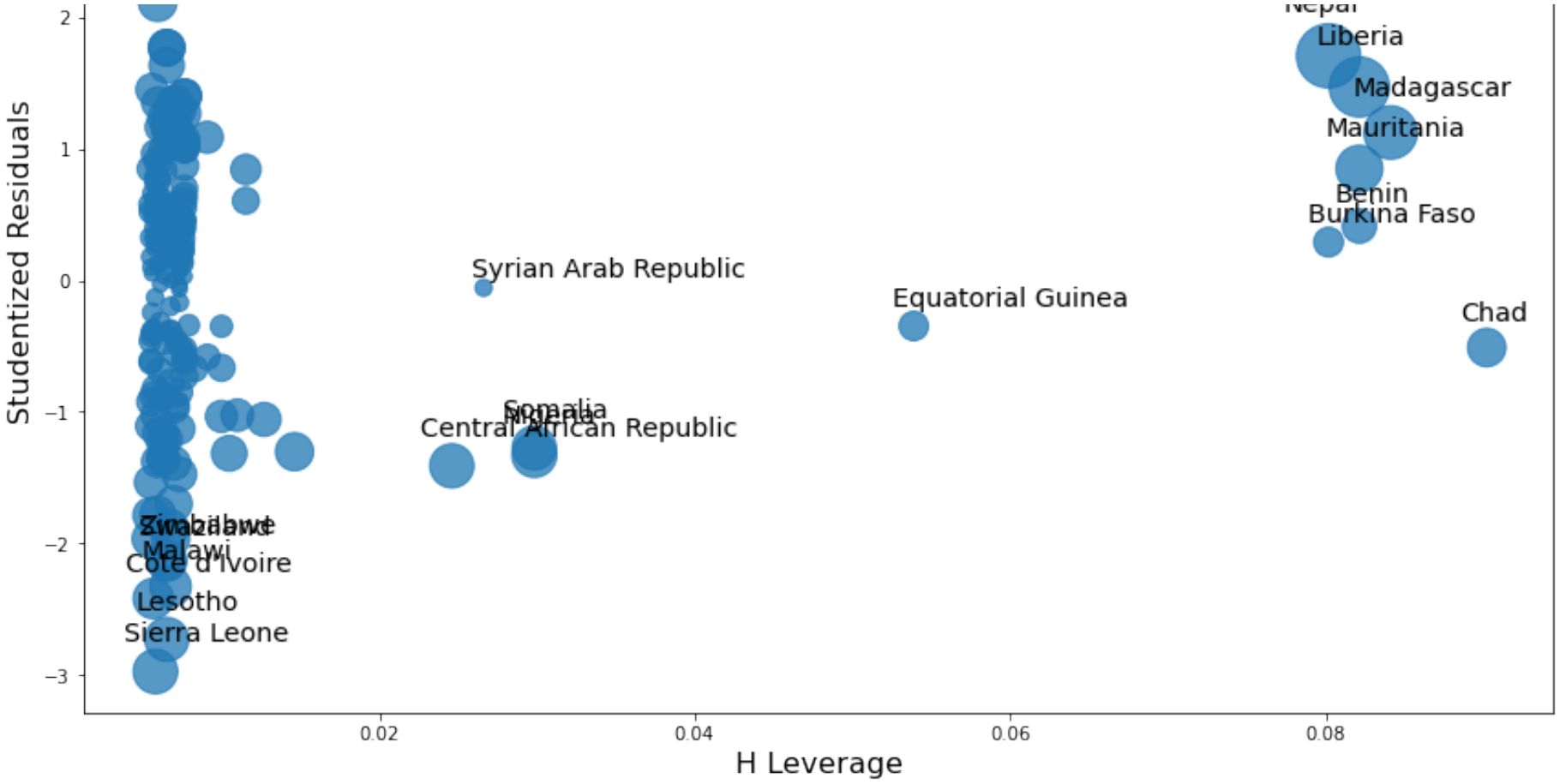

Studentized Resid
H Leverage
Micronesia (Federated States of)
United States of America
Kiribati
Chad
Cote d'Ivoire
Malawi
Lesotho
Sierra Leone
0
−1
−2
−3
0.02
0.04
0.06
0.08
0.10

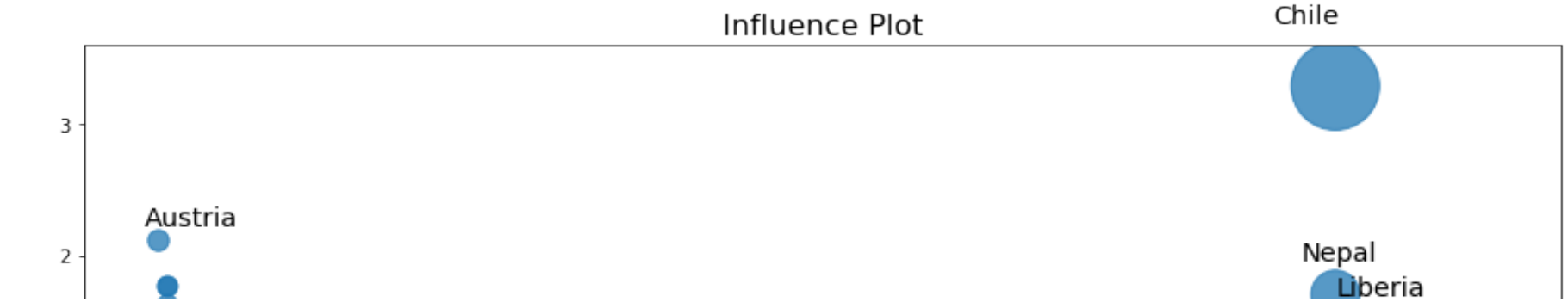

Influence Plot
Germany
Japan
Belgium
Austria
Switzerland
Republic of Moldova
Timor-Leste
Liberia
Kiribati
United States of America
2
1
0

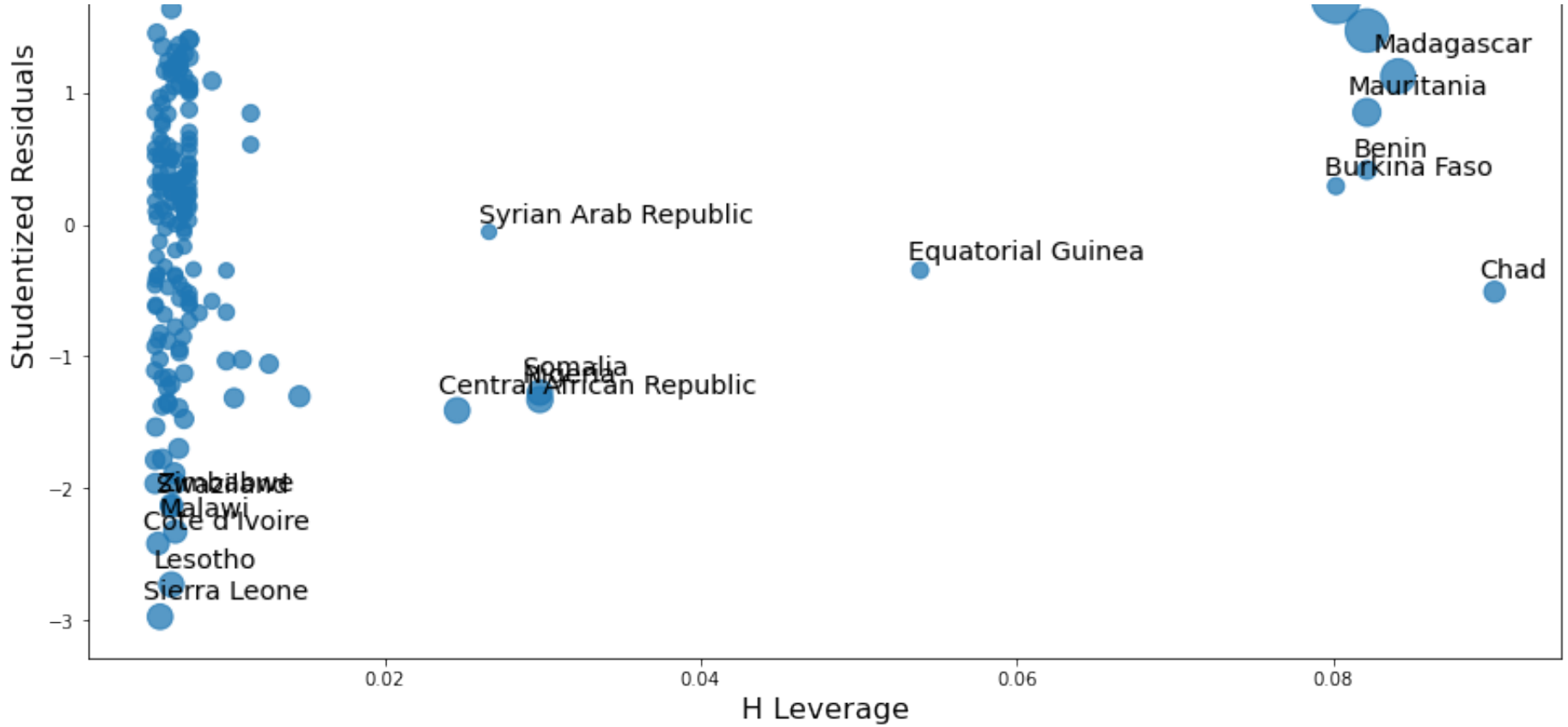


In [121]:
```
figd, ax = plt.subplots(figsize=(12,8))
figd = sm.graphics.influence_plot(reg10, ax = ax, criterion="DFFITS")
figd.tight_layout(pad=1.0)

fige, ax = plt.subplots(figsize=(12,8))
fige = sm.graphics.influence_plot(reg10, ax = ax, criterion="cooks")
fige.tight_layout(pad=1.0)
```

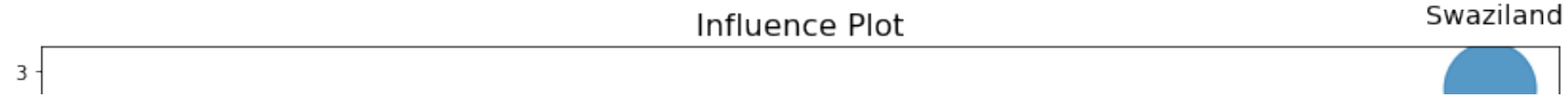


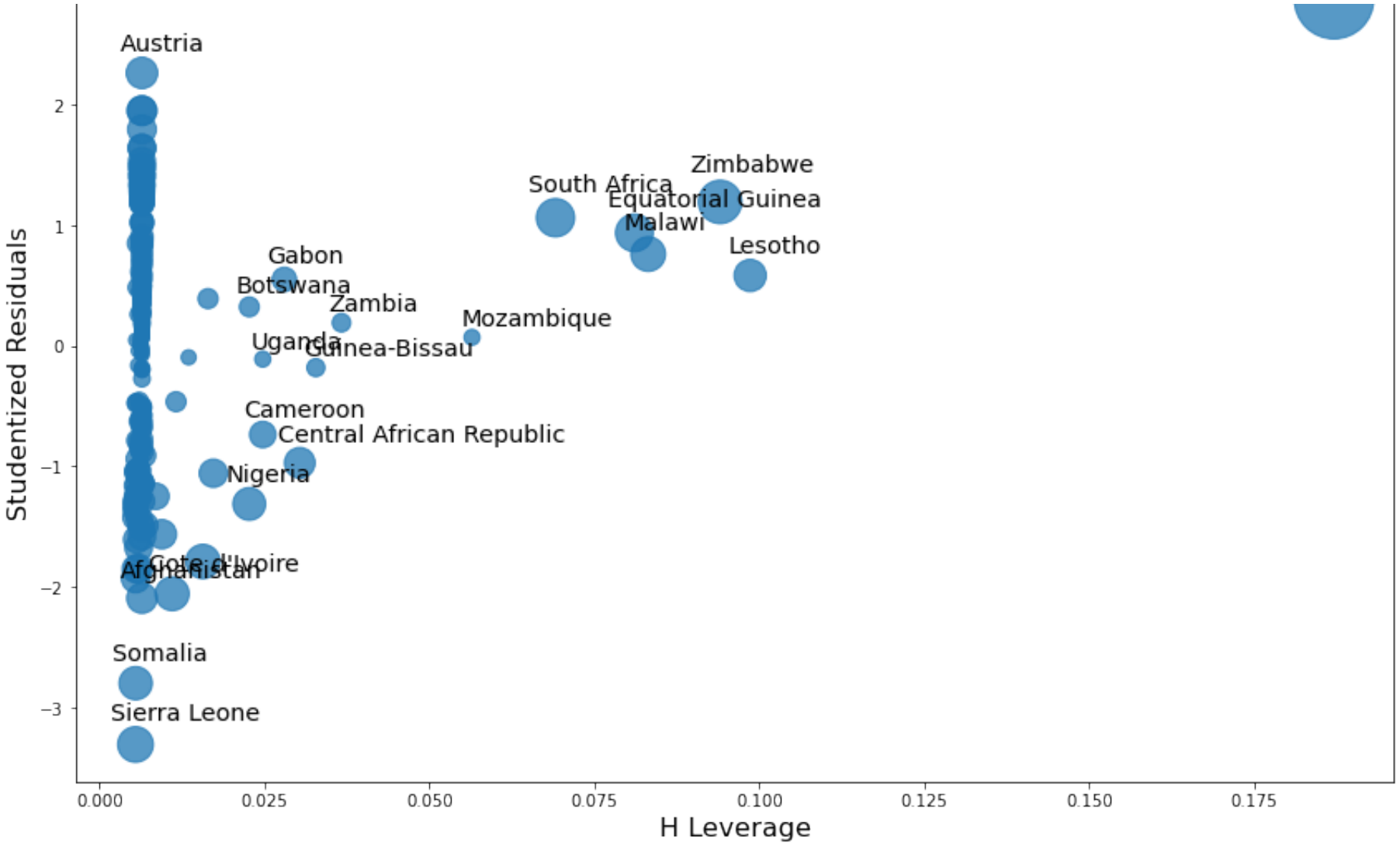

Studentized Residuals
H Leverage
Liberia
Madagascar
Mauritania
Benin
Burkina Faso
Chad
Equatorial Guinea
Syrian Arab Republic
Somalia
Central African Republic
Malawi
Côte d'Ivoire
Lesotho
Sierra Leone

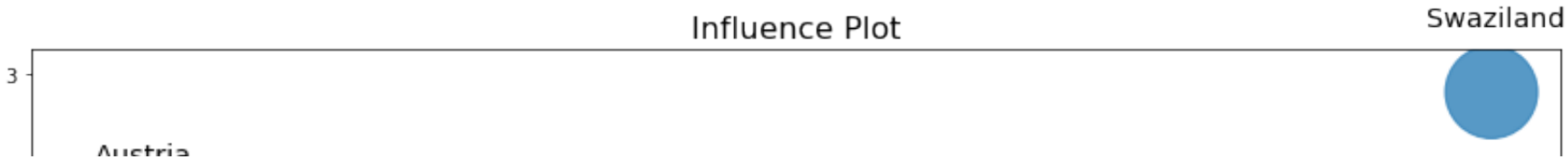

Influence Plot
Chile
Austria
Nepal
Liberia

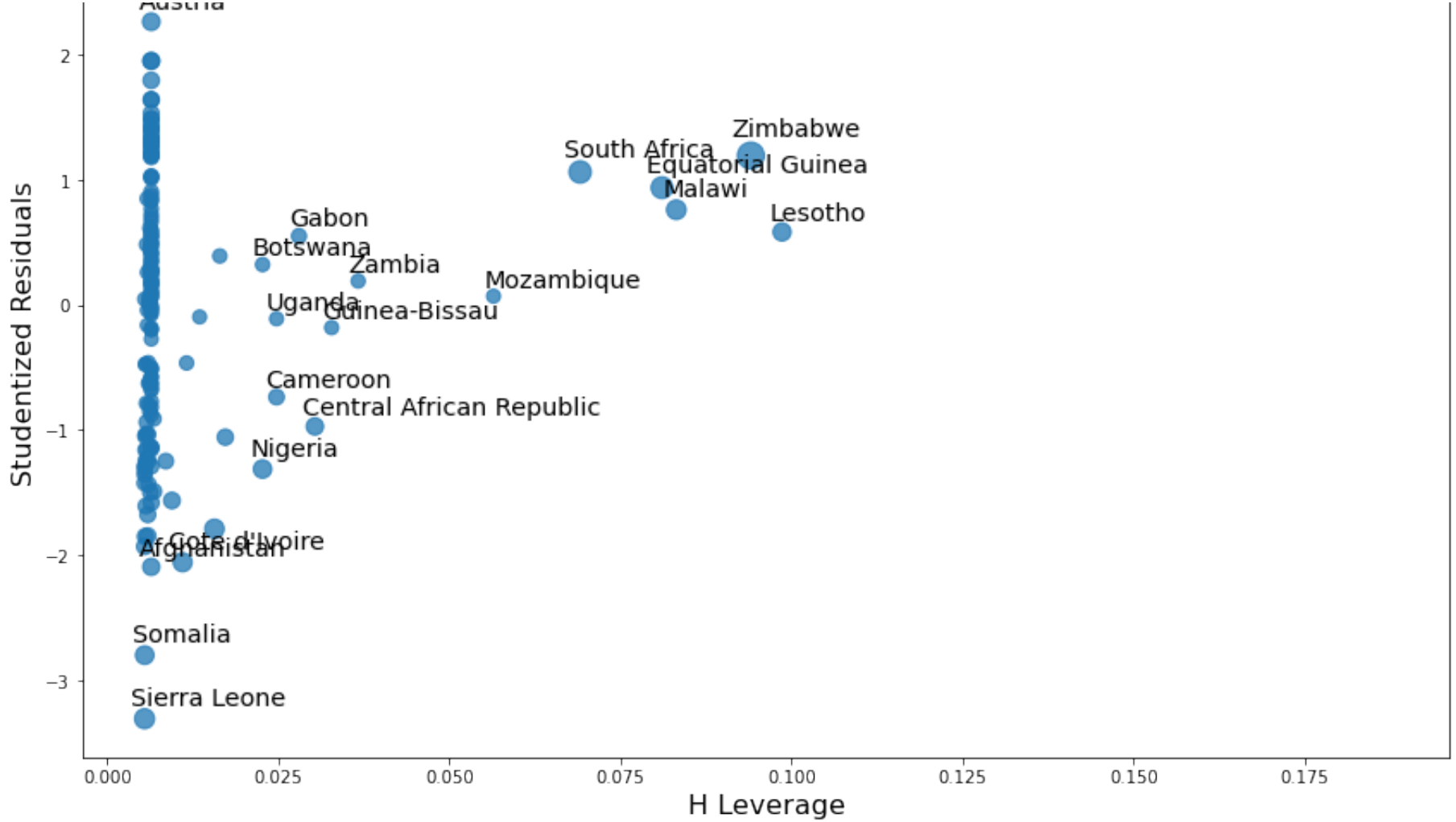


In [122]:
```
figd, ax = plt.subplots(figsize=(12,8))
figd = sm.graphics.influence_plot(reg11, ax = ax, criterion="DFFITS")
figd.tight_layout(pad=1.0)

fige, ax = plt.subplots(figsize=(12,8))
fige = sm.graphics.influence_plot(reg11, ax = ax, criterion="cooks")
fige.tight_layout(pad=1.0)
```



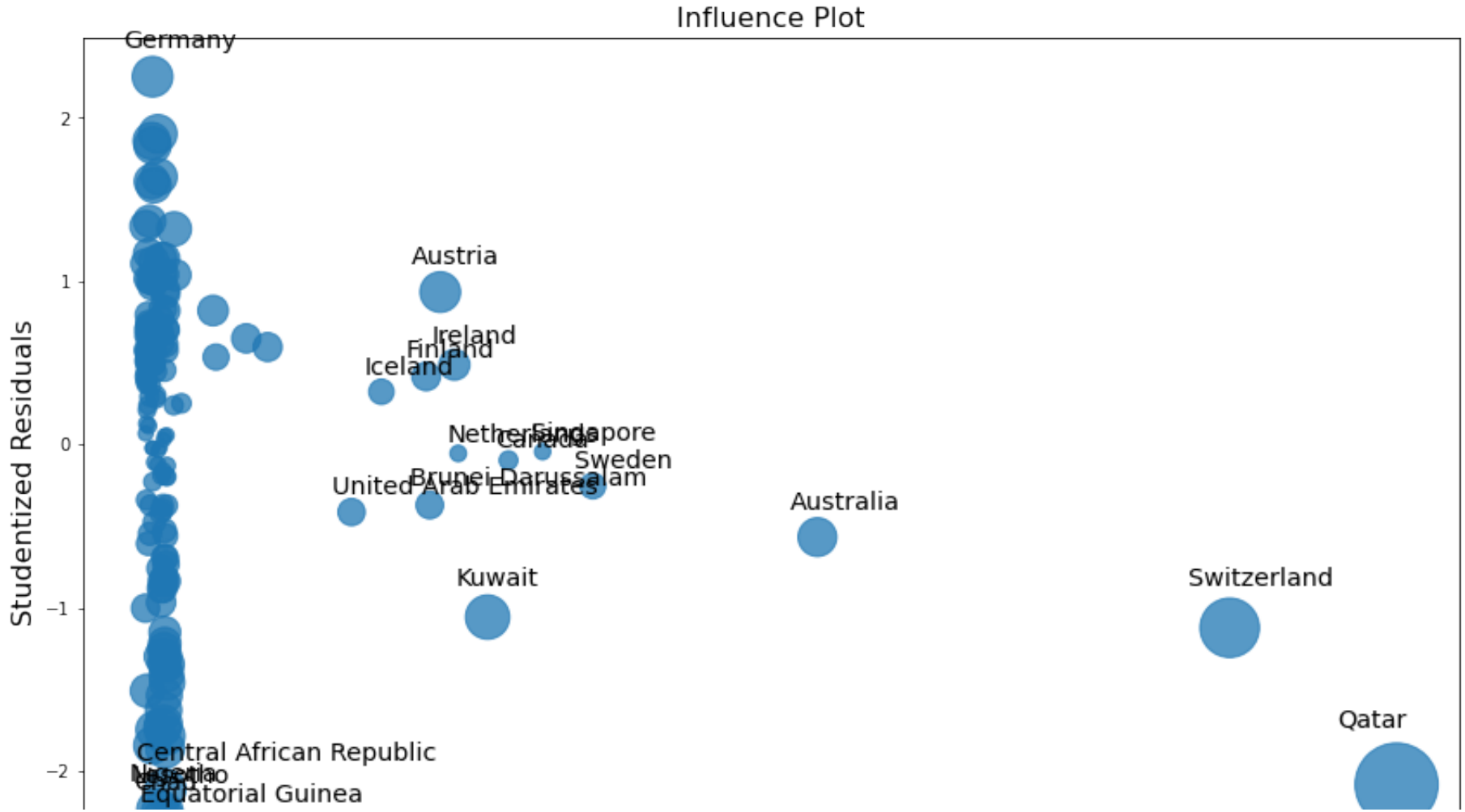

Austria
Zimbabwe
South Africa
Equatorial Guinea
Malawi
Lesotho
Gabon
Botswana
Zambia
Mozambique
Uganda
Guinea-Bissau
Cameroon
Central African Republic
Nigeria
Cote d'Ivoire
Afghanistan
Somalia
Sierra Leone
Studentized Residuals
H Leverage
2
1
0
−1
−2
−3
0.000
0.025
0.050
0.075
0.100
0.125
0.150
0.175

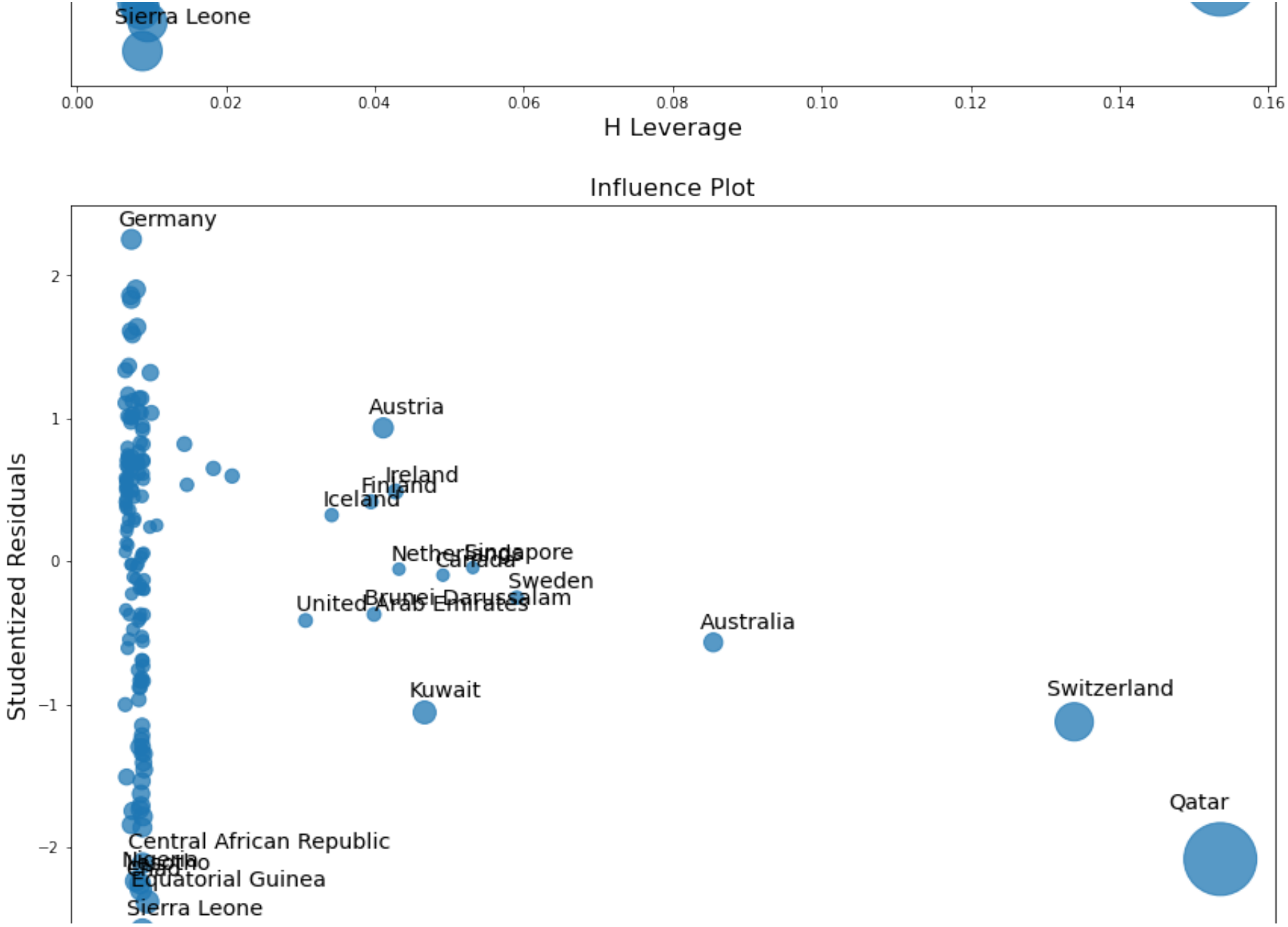

Influence Plot
Swaziland
3
Austria

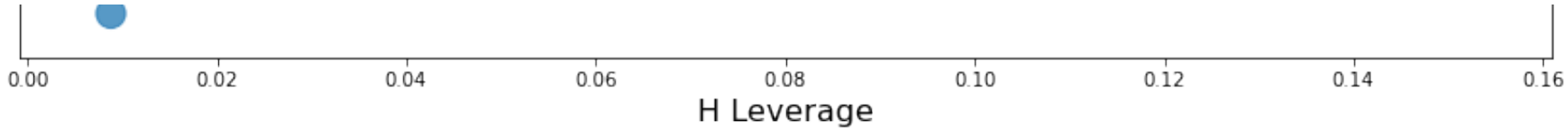

Studentized Residuals
H Leverage
Zimbabwe
South Africa
Equatorial Guinea
Malawi
Lesotho
Gabon
Botswana
Zambia
Mozambique
Uganda
Guinea-Bissau
Cameroon
Central African Republic
Nigeria
Afghanistan
Somalia
Sierra Leone
2
1
0
−1
−2
−3
0.000
0.025
0.050
0.075
0.100
0.125
0.150
0.175

In [123]:

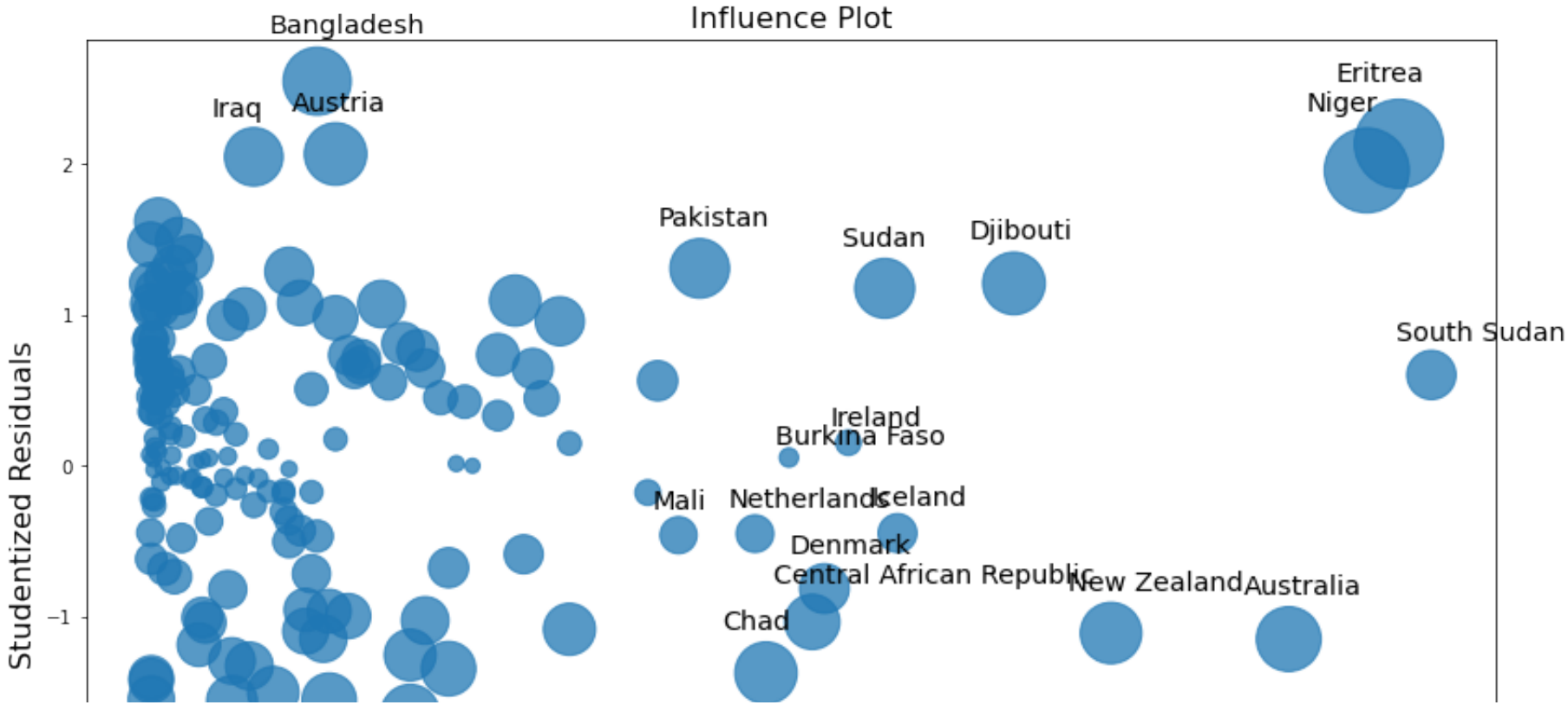
```
figd, ax = plt.subplots(figsize=(12,8))
figd = sm.graphics.influence_plot(reg12, ax = ax, criterion="DFFITS")
figd.tight_layout(pad=1.0)

fige, ax = plt.subplots(figsize=(12,8))
fige = sm.graphics.influence_plot(reg12, ax = ax, criterion="cooks")
fige.tight_layout(pad=1.0)
```

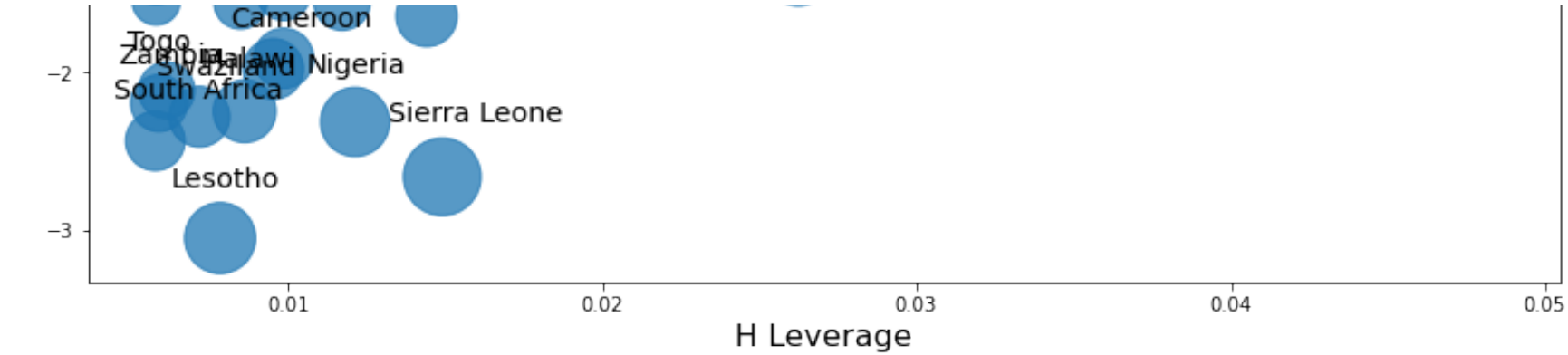


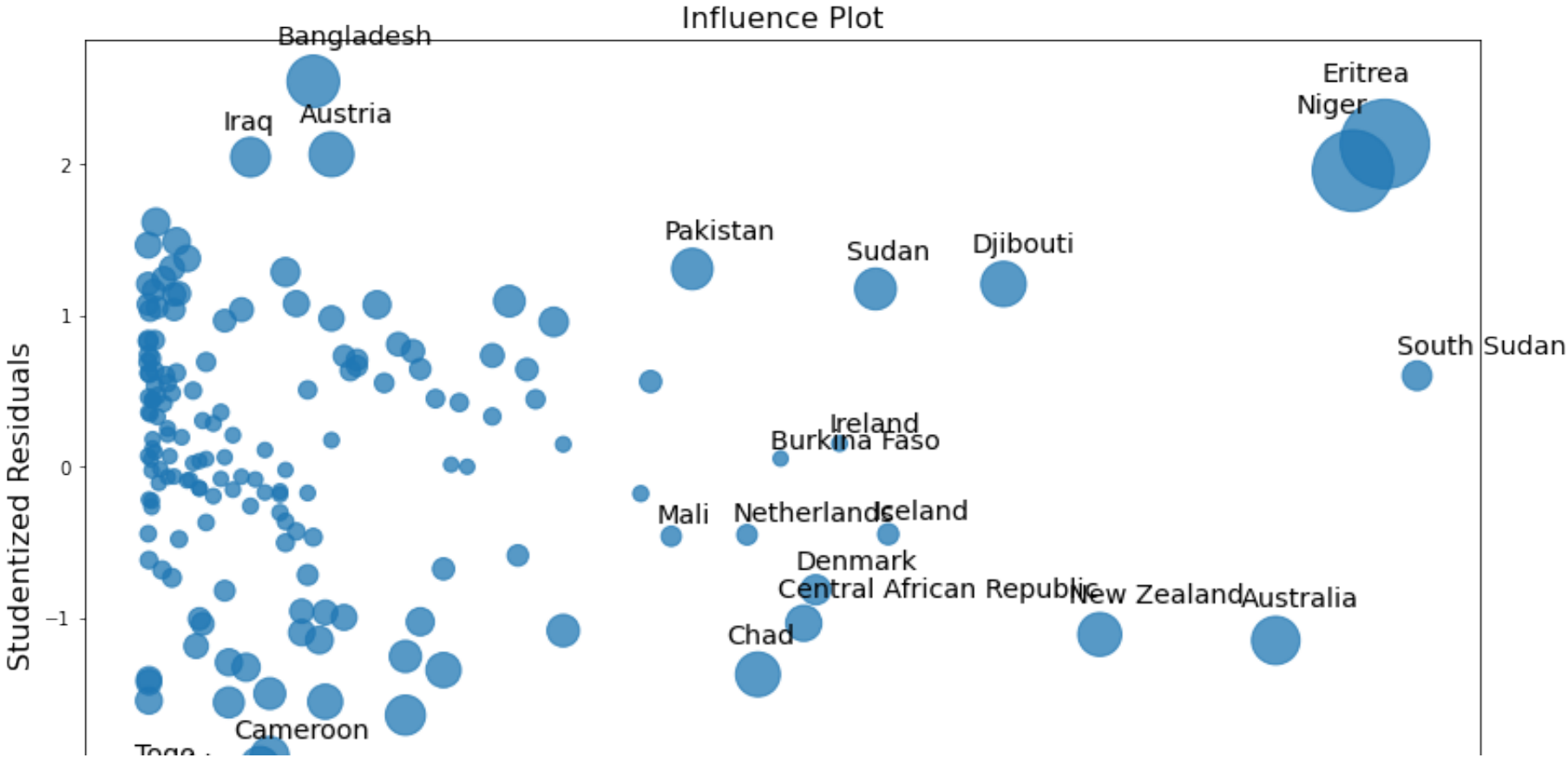

Sierra Leone
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
H Leverage
Influence Plot
Germany
Austria
Ireland
Finland
Iceland
Netherlands
Singapore
Canada
Sweden
Brunei Darussalam
United Arab Emirates
Australia
Kuwait
Switzerland
Qatar
Central African Republic
Equatorial Guinea
Sierra Leone
Studentized Residuals
2
1
0
−1
−2



In [124]:
```
figd, ax = plt.subplots(figsize=(12,8))
figd = sm.graphics.influence_plot(reg13, ax = ax, criterion="DFFITS")
figd.tight_layout(pad=1.0)

fige, ax = plt.subplots(figsize=(12,8))
fige = sm.graphics.influence_plot(reg13, ax = ax, criterion="cooks")
fige.tight_layout(pad=1.0)
```




Cameroon
Togo
Zambia
Malawi
Swaziland
Nigeria
South Africa
Sierra Leone
Lesotho
−2
−3
0.01
0.02
0.03
0.04
0.05
H Leverage


Influence Plot
Bangladesh
Iraq
Austria
Eritrea
Niger
Pakistan
Sudan
Djibouti
South Sudan
Ireland
Burkina Faso
Mali
Netherlands
Iceland
Denmark
Central African Republic
New Zealand
Australia
Chad
Cameroon
Togo
2
1
0
−1
Studentized Residuals


−2
−3
Swaziland
Nigeria
South Africa
Sierra Leone
Lesotho
0.01
0.02
0.03
0.04
0.05
H Leverage