In [1]:
```
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
import rbo
import warnings
from sklearn.metrics import jaccard_similarity_score
warnings.filterwarnings("ignore")

# pd.set_option('display.max_columns',100)
# pd.set_option('display.max_rows',100)
sns.set(rc={'figure.figsize':(10,8)})
```

In [2]:
```
df = pd.read_csv("Data.csv",index_col=0)
```

In [3]:
```
df.columns
```

Out[3]:
```
Index(['Survey Id', 'Keyword Id', 'Keyword Content', 'Country Of Origin Id',
       'Country Of Origin Label', 'Country Id', 'Country Label', 'Province I
d',
       'Province Label', 'Age Group Id', 'Age Group Label', 'Gender Label',
       'Share Device', 'Mobile Type', 'Degree', 'Rank Pandemic',
       'Source Information Id', 'Source Information Label', 'Result Item Ran
k',
       'Result Item Title', 'Result Item Metadesc', 'Result Item Created At',
       'Result Item Full Url', 'Result Item Full Domain',
       'Google Tracked Country', 'Google Tracked Address',
       'Result Item Openrank', 'Keyword Openrank Average',
       'Survey Openrank Average', 'Html File'],
      dtype='object')
```

In [4]:
```
dff = df.copy()
```

• For each of the 10 queries, how similar or different are the results across the 50 participants?

In [5]:
```
query_dict = {}
query_dict_1 = {}
for i in dff.groupby("Keyword Id"):
    dumy = i[1]
    print("Query ID : {}   Content : {}".format(i[0],dumy["Keyword Content"].v
alues[0]))
    qd = {}
    qd_1 = {}
    for survey in dumy.groupby("Survey Id"):
        s_df = survey[1]
        qd[survey[0]] = s_df["Result Item Full Url"].to_list()
        qd_1[survey[0]] = s_df["Result Item Full Domain"].to_list()

    query_dict[i[0]] = qd
    query_dict_1[i[0]] = qd_1
```

```
Query ID : 1   Content : should i get tested for covid
Query ID : 2   Content : should i not get tested for covid
Query ID : 3   Content : should i get flu shot
Query ID : 4   Content : should i not get flu shot
Query ID : 5   Content : should i get vaccinated
Query ID : 6   Content : should i avoid get vaccinated
Query ID : 7   Content : should i wear facemask
Query ID : 8   Content : should i not wear facemask
Query ID : 9   Content : is hydroxychloroquine effective for covid
Query ID : 10   Content : is hydroxychloroquine ineffective for covid
```

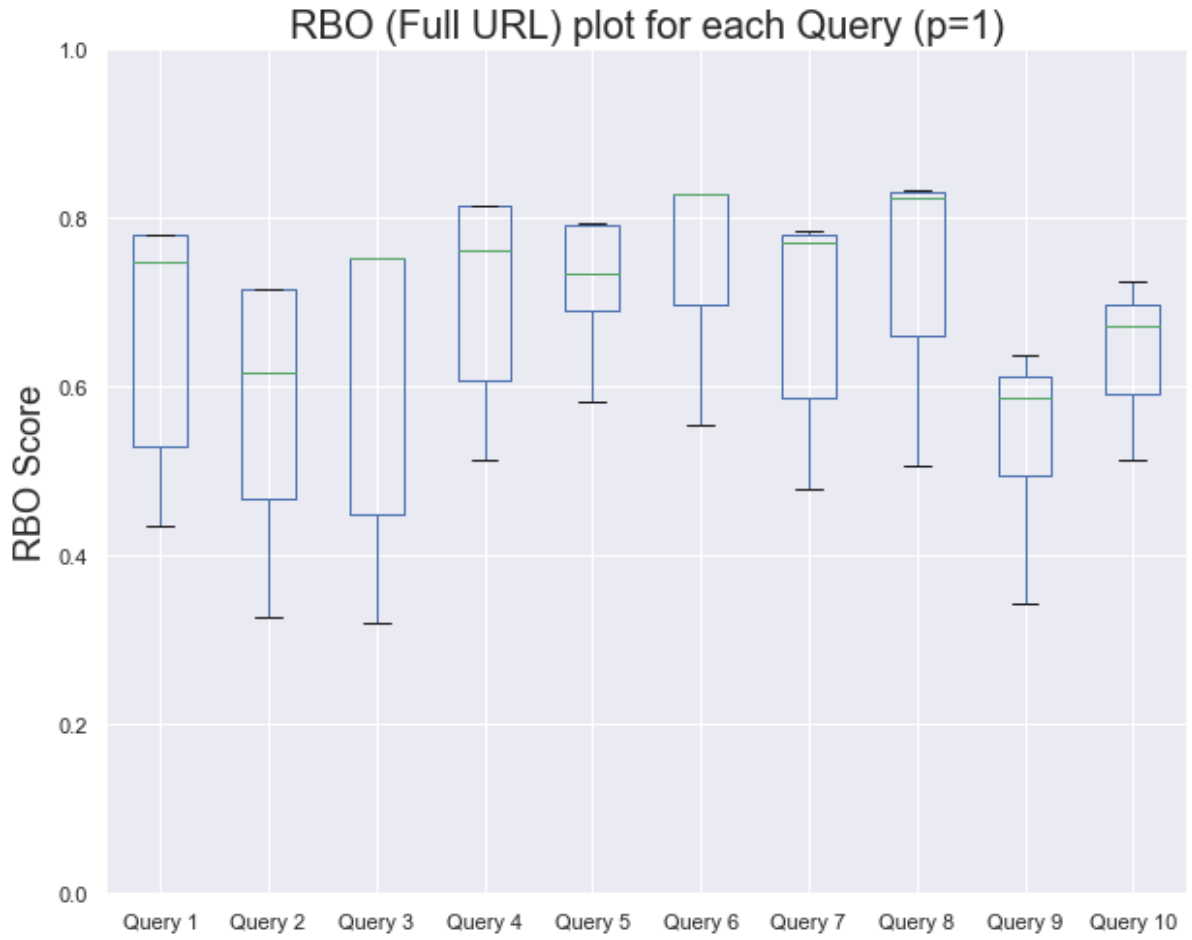
In [6]:
```
d1 = pd.DataFrame()
d2 = pd.DataFrame()
d3 = pd.DataFrame()

dd1 = pd.DataFrame()
dd2 = pd.DataFrame()
dd3 = pd.DataFrame()

for num in range(1,11):
#     print(num)
    ls = query_dict[num]
    ls_1 = query_dict_1[num]

#     print(ls)
    averages = {}
    averages_2 = {}
    averages_3 = {}
#     print(len(ls))
    daverages = {}
    daverages_2 = {}
    daverages_3 = {}

    for idx1, i in enumerate(ls.items()):
#         print(i[0])
#         print(i[1])
        scores = []
        scores_2 = []
        scores_3 = []

        for idx2, j in enumerate(ls.items()):
            if idx1 != idx2:
#                 print(len(i[1]),len(j[1]))
                score = rbo.RankingSimilarity(i[1],j[1]).rbo(p=1)
                scores.append(score)

                score_2 = rbo.RankingSimilarity(i[1],j[1]).rbo(p=0.67)
                scores_2.append(score_2)

                v = min(len(i[1]),len(j[1]))
                score_3 = jaccard_similarity_score(i[1][:v],j[1][:v])
                scores_3.append(score_3)

#         # Average of 49 RBO values for a single survey for a particular que
ry
#         # to know how similar or different this particular query of survey
 was comapred with 49 other surveys search results
#         print(scores)
        avg = sum(scores)/len(scores)
        averages[i[0]] = avg

        avg_2 = sum(scores_2)/len(scores_2)
        averages_2[i[0]] = avg_2

        avg_3 = sum(scores_3)/len(scores_3)
        averages_3[i[0]] = avg_3
```

```
    for idx1, i in enumerate(ls_1.items()):

        dscores = []
        dscores_2 = []
        dscores_3 = []

        for idx2, j in enumerate(ls_1.items()):
            if idx1 != idx2:
                o1 = []
                o2 = []

                for q in i[1]:
                    if q not in o1:
                        o1.append(q)

                for q in j[1]:
                    if q not in o2:
                        o2.append(q)

                dscore = rbo.RankingSimilarity(o1,o2).rbo(p=1)
                dscores.append(dscore)

                dscore_2 = rbo.RankingSimilarity(o1,o2).rbo(p=0.67)
                dscores_2.append(dscore_2)

                v = min(len(o1),len(o2))
                dscore_3 = jaccard_similarity_score(o1[:v],o2[:v])
                dscores_3.append(dscore_3)


        davg = sum(dscores)/len(dscores)
        daverages[i[0]] = davg

        davg_2 = sum(dscores_2)/len(dscores_2)
        daverages_2[i[0]] = davg_2

        davg_3 = sum(dscores_3)/len(dscores_3)
        daverages_3[i[0]] = davg_3


# #     print(len(averages))
    d = pd.DataFrame({'Query {}'.format(num):averages})
    d1 = pd.concat([d,d1], ignore_index=True, axis=1)

    d_2 = pd.DataFrame({'Query {}'.format(num):averages_2})
    d2 = pd.concat([d_2,d2], ignore_index=True, axis=1)

    d_3 = pd.DataFrame({'Query {}'.format(num):averages_3})
    d3 = pd.concat([d_3,d3], ignore_index=True, axis=1)

    # #     print(len(averages))
    dd = pd.DataFrame({'Query {}'.format(num):daverages})
    dd1 = pd.concat([dd,dd1], ignore_index=True, axis=1)

    dd_2 = pd.DataFrame({'Query {}'.format(num):daverages_2})
```

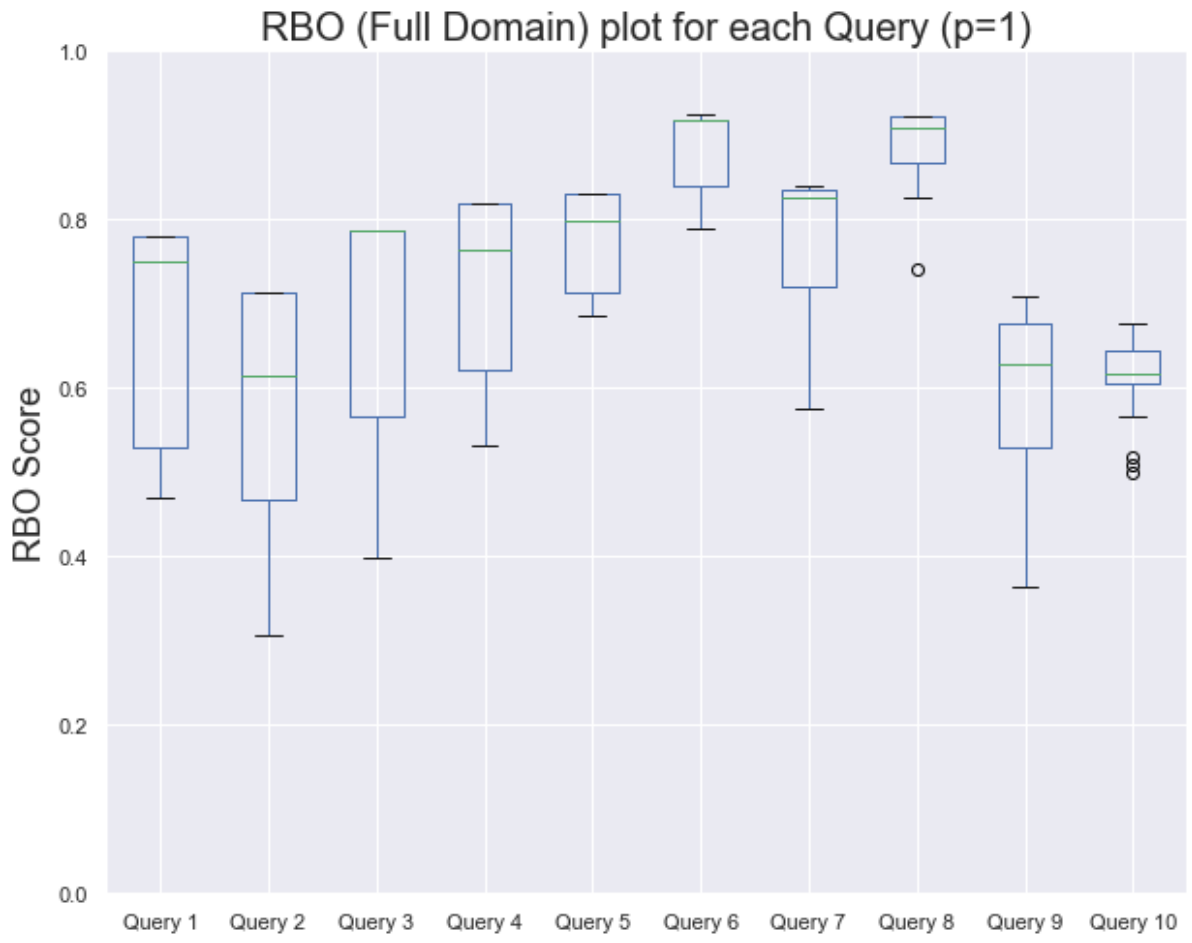
```
    dd2 = pd.concat([dd_2,dd2], ignore_index=True, axis=1)

    dd_3 = pd.DataFrame({'Query {}'.format(num):daverages_3})
    dd3 = pd.concat([dd_3,dd3], ignore_index=True, axis=1)
```

In [7]:
```
d1.columns = ["Query {}".format(i) for i in range(1,11)]
d2.columns = ["Query {}".format(i) for i in range(1,11)]
d3.columns = ["Query {}".format(i) for i in range(1,11)]

dd1.columns = ["Query {}".format(i) for i in range(1,11)]
dd2.columns = ["Query {}".format(i) for i in range(1,11)]
dd3.columns = ["Query {}".format(i) for i in range(1,11)]
```

In [8]:
```
d1.plot(kind='box')
plt.ylim([0,1])
plt.title("RBO (Full URL) plot for each Query (p=1)",fontsize=20)
plt.ylabel("RBO Score",fontsize=18)
plt.show()
```



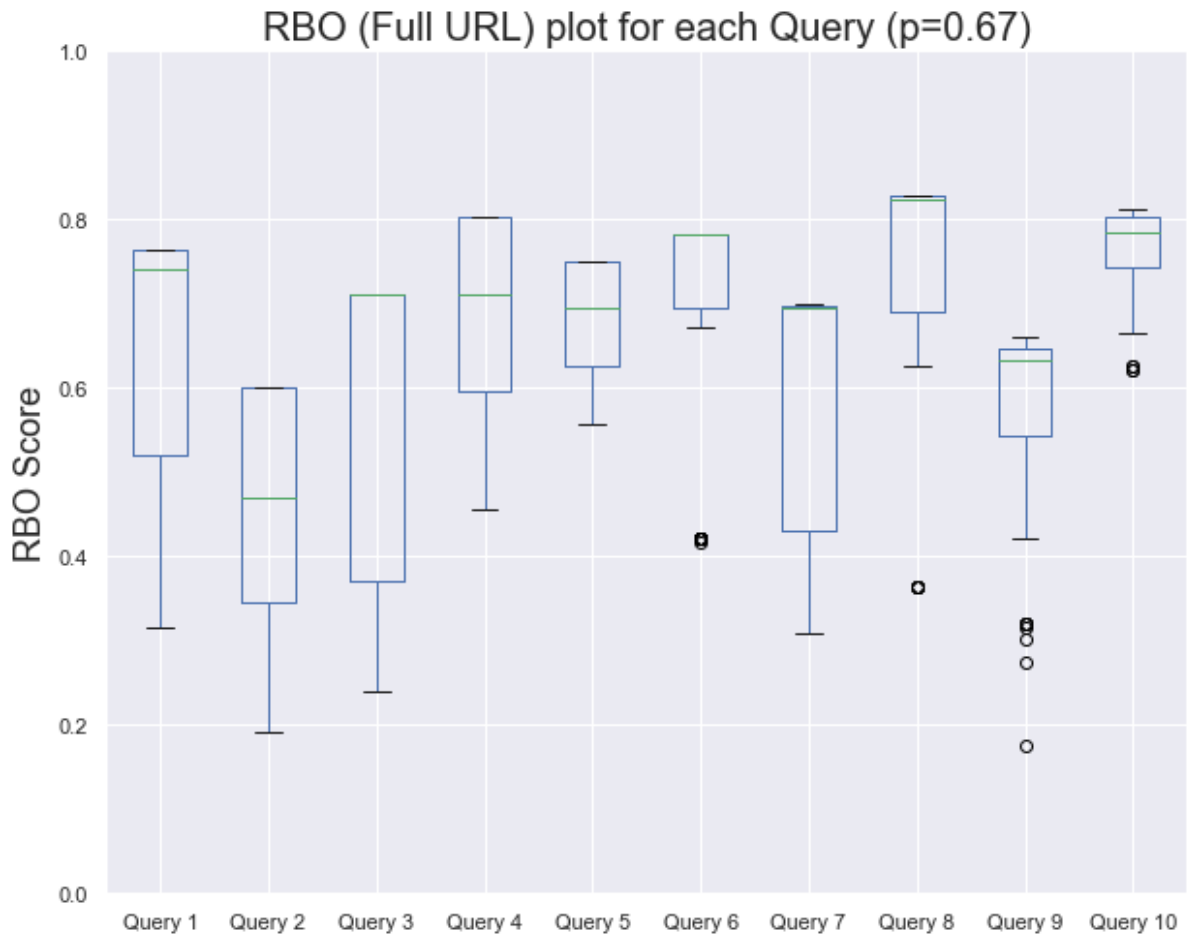
In [9]:
```
dd1.plot(kind='box')
plt.ylim([0,1])
plt.title("RBO (Full Domain) plot for each Query (p=1)",fontsize=20)
plt.ylabel("RBO Score",fontsize=18)
plt.show()
```



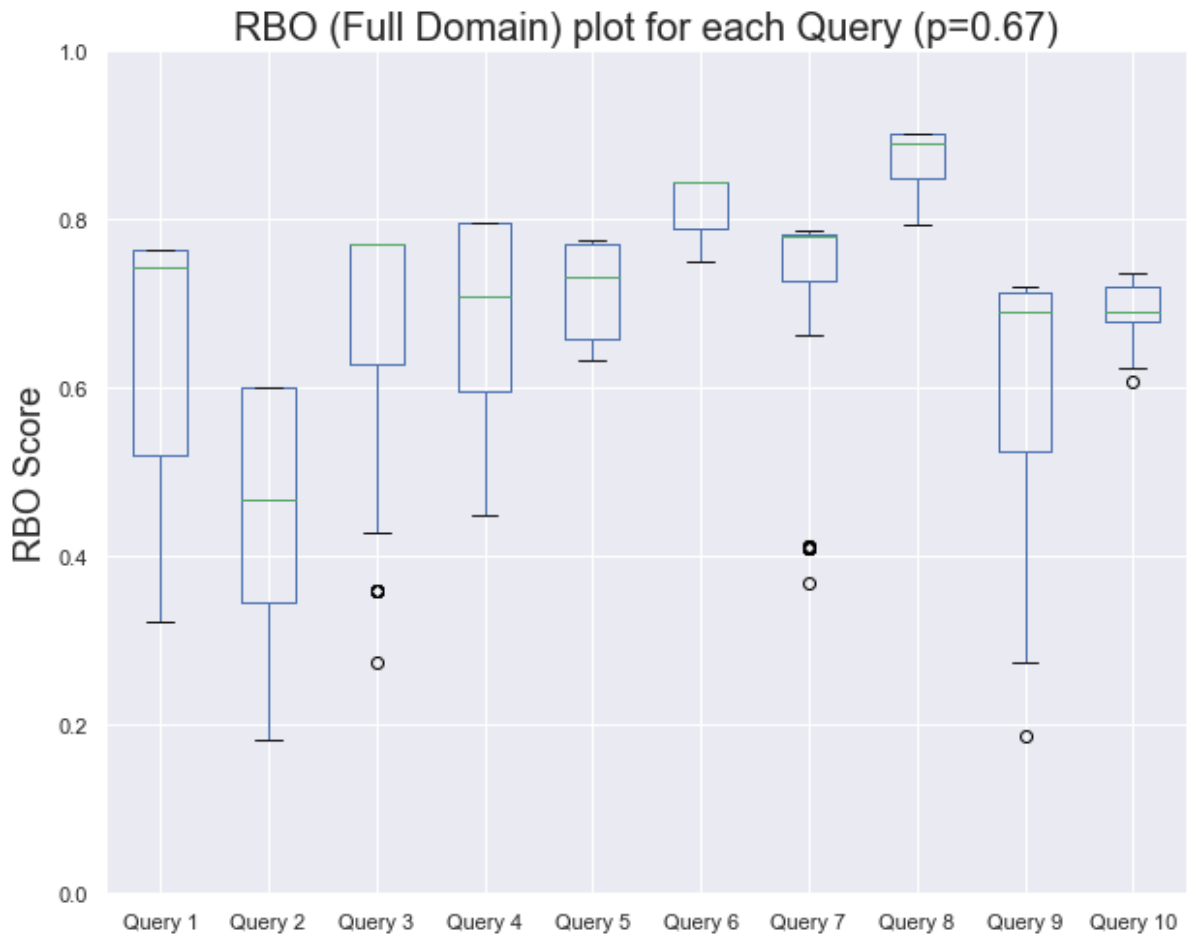
o Where are the differences? (E.g. are the differences near the top or bottom of the list?)

Rank-biased overlap falls in the range [0, 1], where 0 means disjoint, and 1 means identical. The parameter p determines how steep the decline in weights is: the smaller p, the more top-weighted the metric is. In the limit, when p = 0, only the top-ranked item is considered, and the RBO score is either zero or one. On the other hand, as p approaches arbitrarily close to 1, the weights become arbitrarily flat, and the evaluation becomes arbitrarily deep.

In [10]:
```
d2.plot(kind='box')
plt.ylim([0,1])
plt.title("RBO (Full URL) plot for each Query (p=0.67)",fontsize=20)
plt.ylabel("RBO Score",fontsize=18)
plt.show()
```



In [11]:
```
dd2.plot(kind='box')
plt.ylim([0,1])
plt.title("RBO (Full Domain) plot for each Query (p=0.67)",fontsize=20)
plt.ylabel("RBO Score",fontsize=18)
plt.show()
```

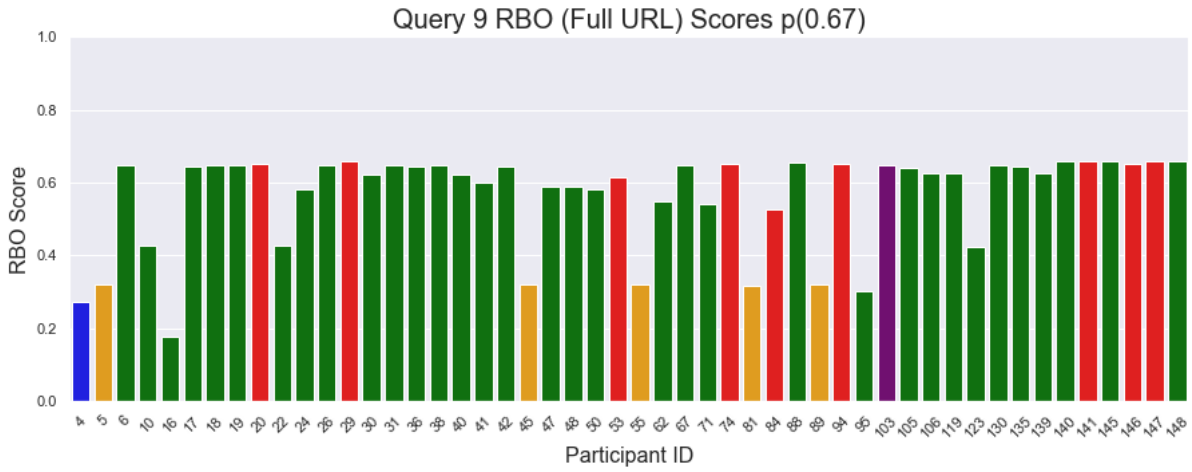


In [12]:
```
vals = dff.set_index("Survey Id").groupby(level=0)["Country Label"].agg("max")
.to_dict().values()
country_series = dff.set_index("Survey Id").groupby(level=0)["Country Label"].
agg("max")
set(vals)
country_colorss = {'Brazil':"orange", 'Germany':"blue", 'India':"red", 'Spain'
:"purple", 'United States':"green"}
```

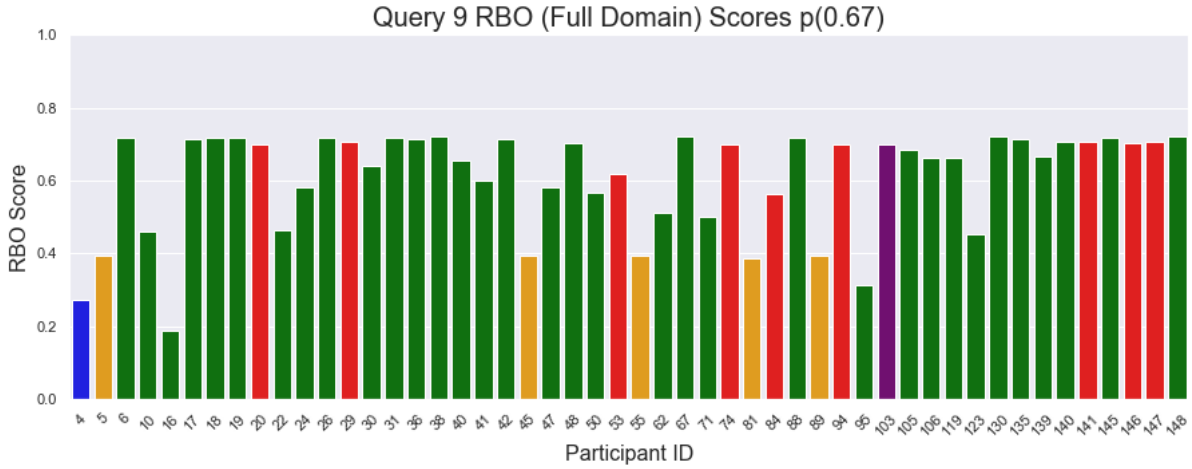
In [13]:
```
d2_dumy = d2.copy()
d2_dumy["country"] = country_series
d2_dumy["color"] = d2_dumy["country"].map(country_colorss)
country_colors = d2_dumy["color"]
```

Plotting Outliers for Queries

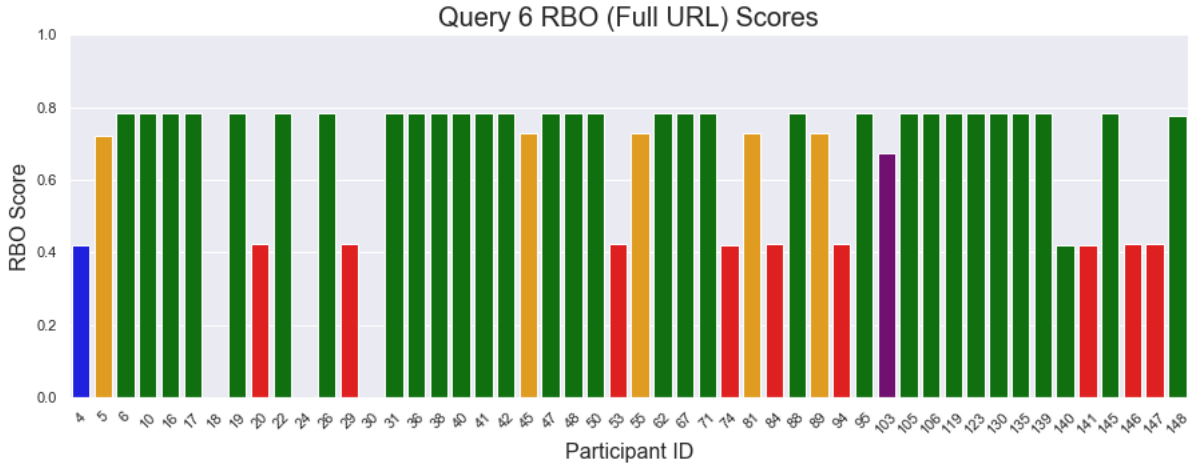
In [14]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=d2.index,y=d2['Query 9'],palette=country_colors)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("Query 9 RBO (Full URL) Scores p(0.67)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



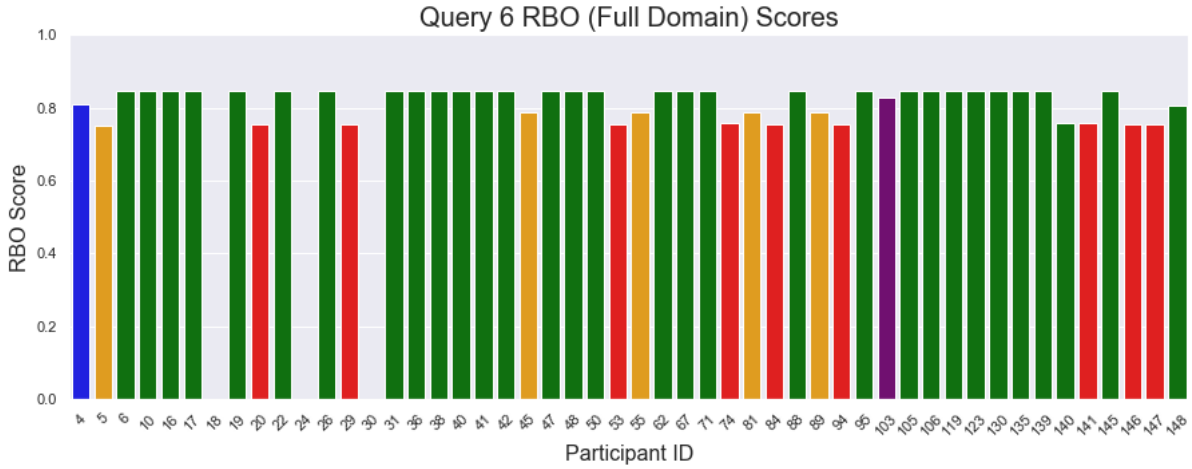
In [15]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=dd2.index,y=dd2['Query 9'],palette=country_colors)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("Query 9 RBO (Full Domain) Scores p(0.67)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



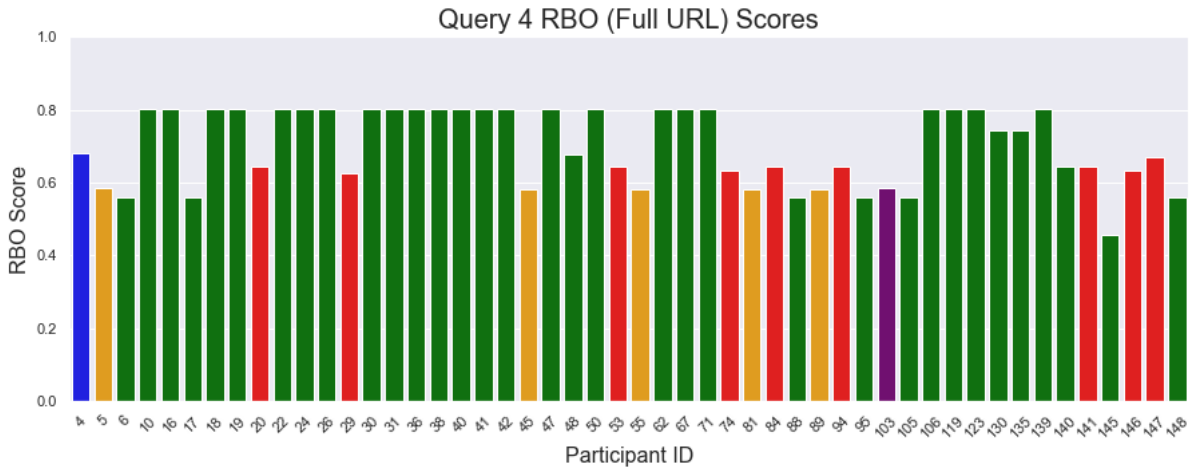
In [16]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=d2.index,y=d2['Query 6'],palette=country_colors)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("Query 6 RBO (Full URL) Scores",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



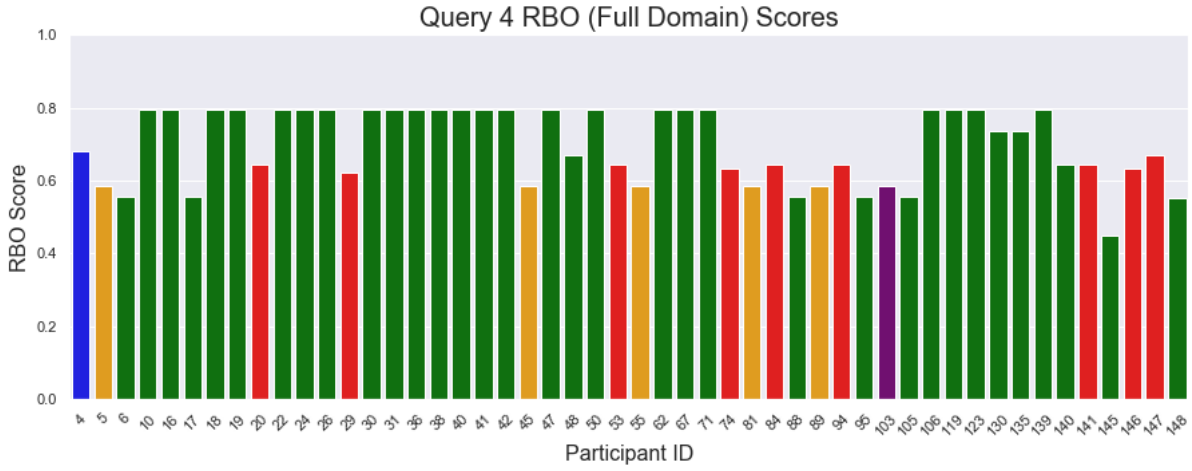
In [17]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=dd2.index,y=dd2['Query 6'],palette=country_colors)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("Query 6 RBO (Full Domain) Scores",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



In [18]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=d2.index,y=d2['Query 4'],palette=country_colors)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("Query 4 RBO (Full URL) Scores",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



In [19]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=dd2.index,y=dd2['Query 4'],palette=country_colors)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("Query 4 RBO (Full Domain) Scores",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



In [20]:
```
country_dict = df.set_index("Survey Id")[["Country Label"]].groupby(level=0).agg('max').to_dict()["Country Label"]
```

In [21]:
```
d1country = pd.melt(d1.T)
d1country["country"] = d1country["variable"].map(country_dict)
d1country.head()
```

Out[21]:

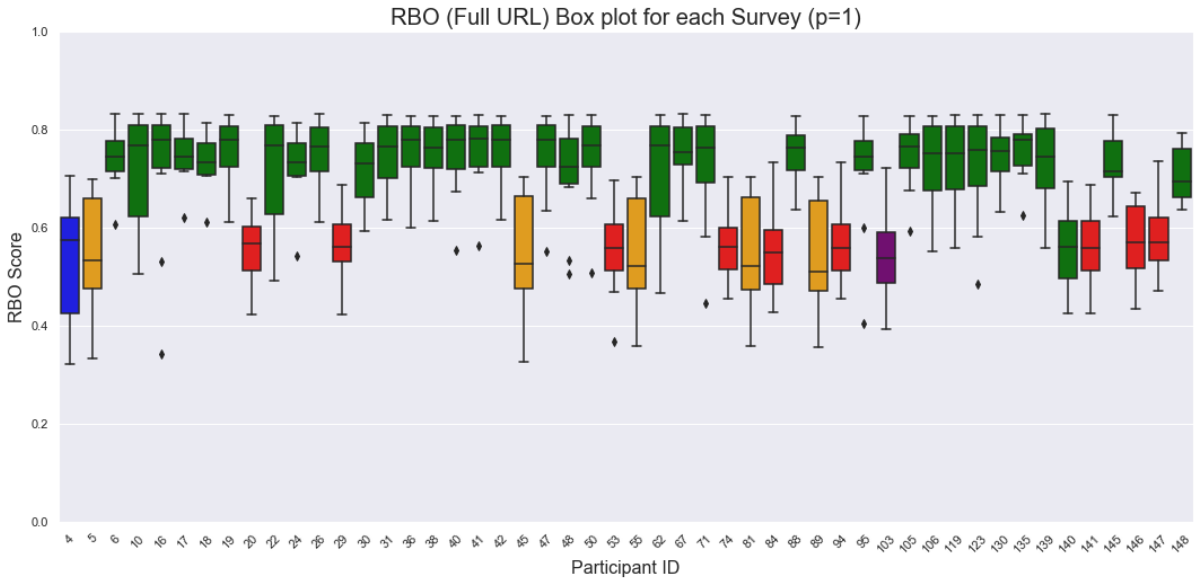
	variable	value	country
0	4	0.435739	Germany
1	4	0.421045	Germany
2	4	0.321406	Germany
3	4	0.637333	Germany
4	4	0.582339	Germany

In [22]:
```
dd1country = pd.melt(dd1.T)
dd1country["country"] = dd1country["variable"].map(country_dict)
dd1country.head()
```

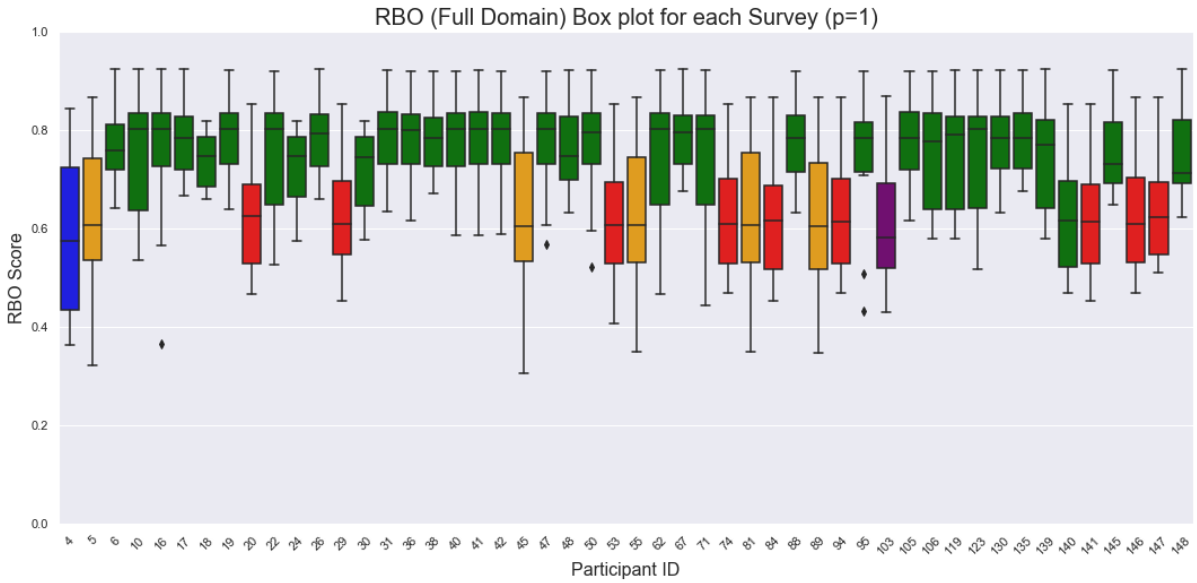
Out[22]:

	variable	value	country
0	4	0.469739	Germany
1	4	0.422645	Germany
2	4	0.398234	Germany
3	4	0.647575	Germany
4	4	0.734730	Germany

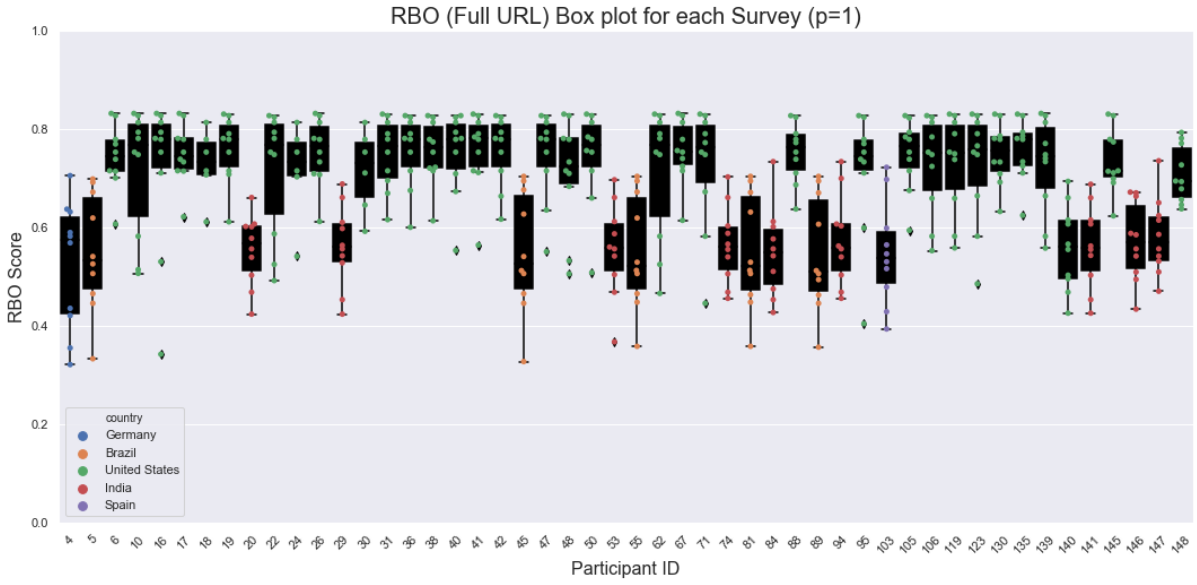
In [23]:
```
sns.set(rc={'figure.figsize':(18,8)})
sns.boxplot(x="variable", y="value", data=d1country,palette=country_colors)
plt.xticks(rotation=45)
plt.title("RBO (Full URL) Box plot for each Survey (p=1)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.ylim([0,1])
plt.show()
```



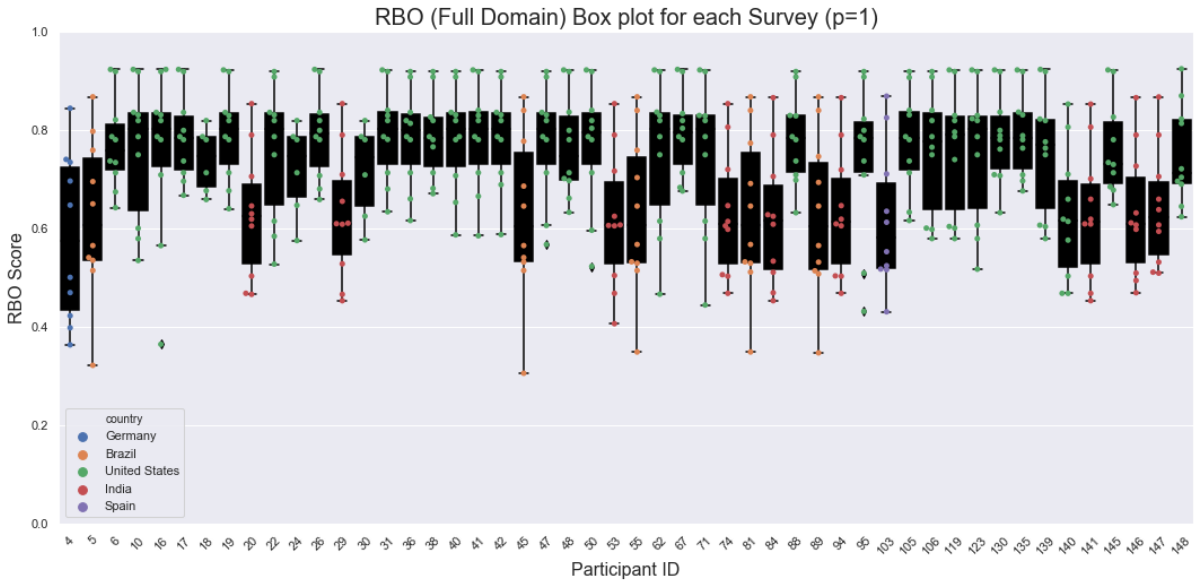
In [24]:
```
sns.set(rc={'figure.figsize':(18,8)})
sns.boxplot(x="variable", y="value", data=dd1country,palette=country_colors)
plt.xticks(rotation=45)
plt.title("RBO (Full Domain) Box plot for each Survey (p=1)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.ylim([0,1])
plt.show()
```



In [25]:
```
sns.set(rc={'figure.figsize':(18,8)})
sns.boxplot(x="variable", y="value", data=d1country,color='black')
sns.swarmplot(x="variable", y="value", data=d1country,hue='country')
plt.xticks(rotation=45)
plt.title("RBO (Full URL) Box plot for each Survey (p=1)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.ylim([0,1])
plt.show()
```



In [26]:
```
sns.set(rc={'figure.figsize':(18,8)})
sns.boxplot(x="variable", y="value", data=dd1country,color='black')
sns.swarmplot(x="variable", y="value", data=dd1country,hue='country')
plt.xticks(rotation=45)
plt.title("RBO (Full Domain) Box plot for each Survey (p=1)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.ylim([0,1])
plt.show()
```



In [27]:
```
d2country = pd.melt(d2.T)
d2country["country"] = d2country["variable"].map(country_dict)
d2country.head()
```

Out[27]:

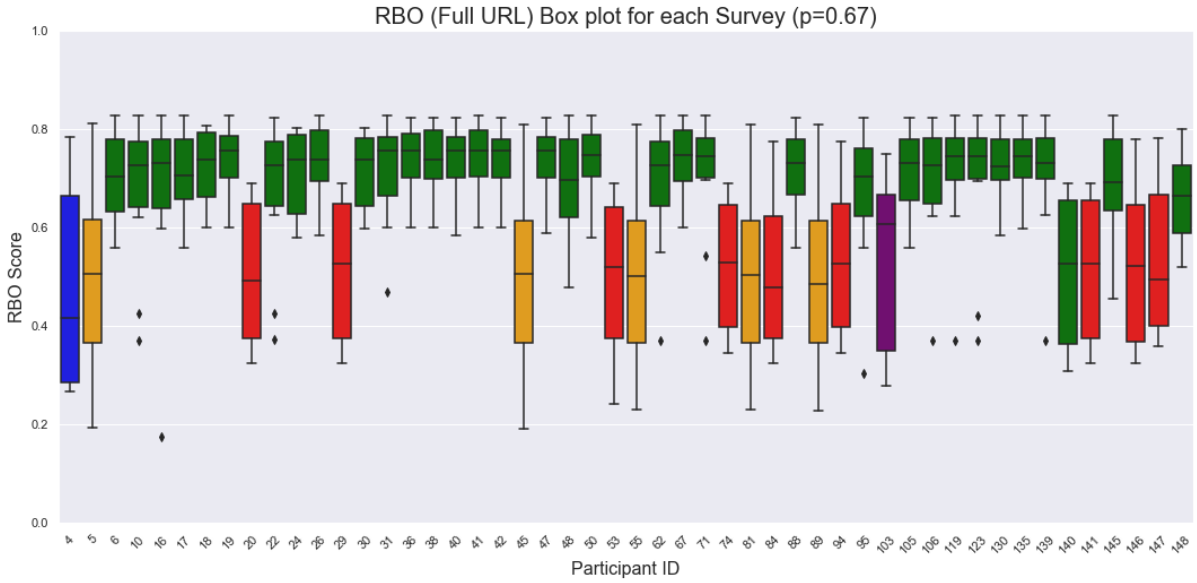
	variable	value	country
0	4	0.316545	Germany
1	4	0.266576	Germany
2	4	0.273596	Germany
3	4	0.682320	Germany
4	4	0.612938	Germany

In [28]:
```
dd2country = pd.melt(dd2.T)
dd2country["country"] = dd2country["variable"].map(country_dict)
dd2country.head()
```

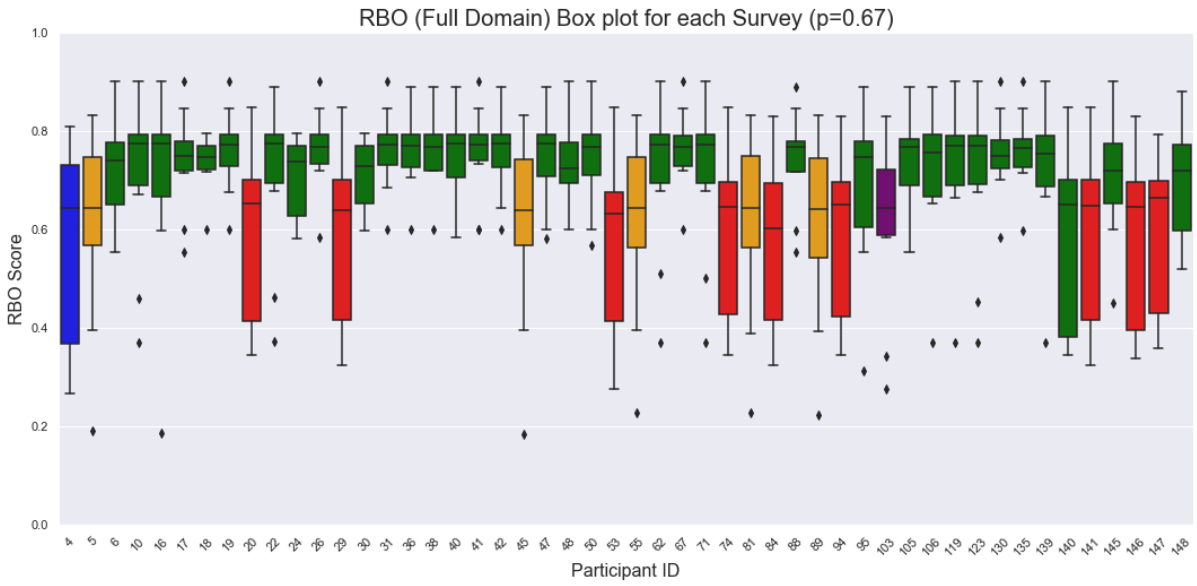
Out[28]:

	variable	value	country
0	4	0.323734	Germany
1	4	0.265923	Germany
2	4	0.498953	Germany
3	4	0.680615	Germany
4	4	0.739663	Germany

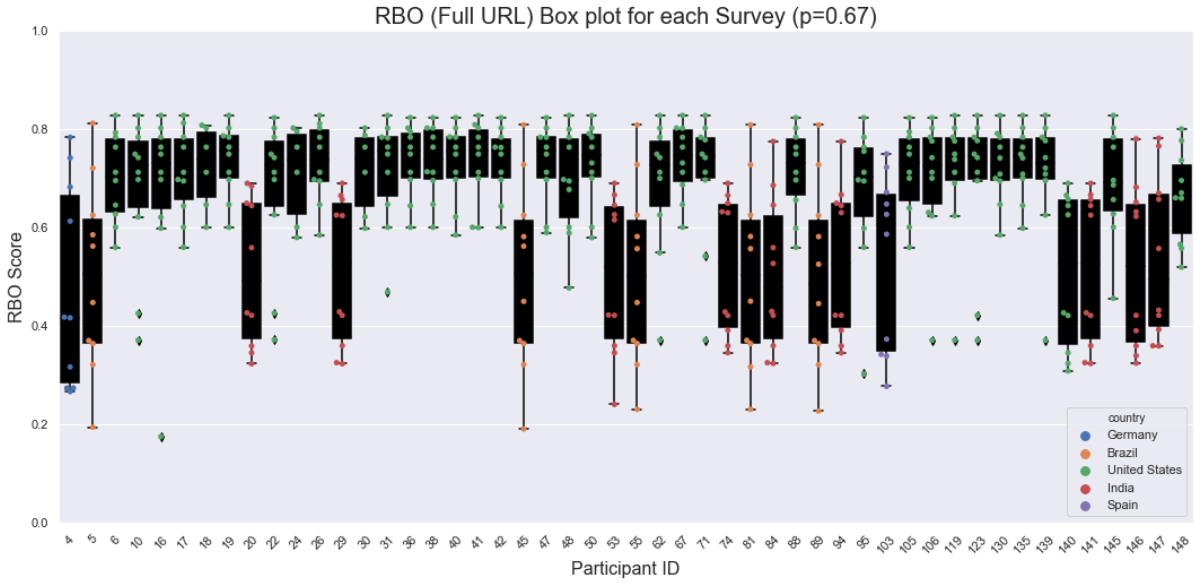
In [29]:
```
sns.set(rc={'figure.figsize':(18,8)})
sns.boxplot(x="variable", y="value", data=pd.melt(d2.T),palette=country_colors
)
plt.xticks(rotation=45)
plt.title("RBO (Full URL) Box plot for each Survey (p=0.67)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.ylim([0,1])
plt.show()
```



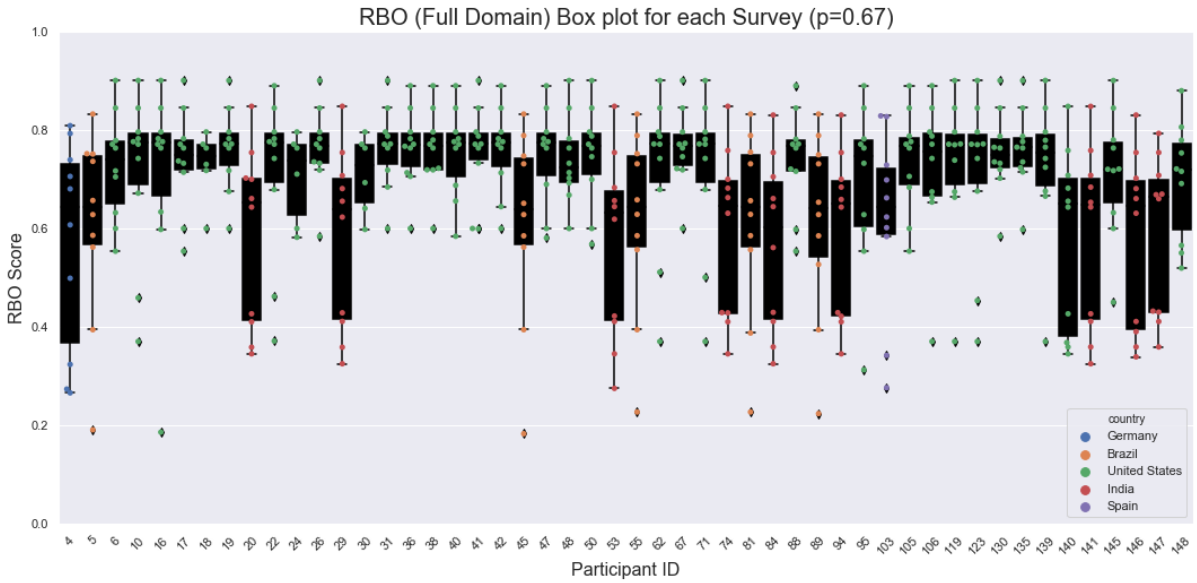
In [30]:
```
sns.set(rc={'figure.figsize':(18,8)})
sns.boxplot(x="variable", y="value", data=pd.melt(dd2.T),palette=country_colors)
plt.xticks(rotation=45)
plt.title("RBO (Full Domain) Box plot for each Survey (p=0.67)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.ylim([0,1])
plt.show()
```



In [31]:
```
sns.set(rc={'figure.figsize':(18,8)})
sns.boxplot(x="variable", y="value", data=pd.melt(d2.T),color='black')
sns.swarmplot(x="variable", y="value", data=d2country,hue='country')
plt.xticks(rotation=45)
plt.title("RBO (Full URL) Box plot for each Survey (p=0.67)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.ylim([0,1])
plt.show()
```



In [32]:
```
sns.set(rc={'figure.figsize':(18,8)})
sns.boxplot(x="variable", y="value", data=pd.melt(dd2.T),color='black')
sns.swarmplot(x="variable", y="value", data=dd2country,hue='country')
plt.xticks(rotation=45)
plt.title("RBO (Full Domain) Box plot for each Survey (p=0.67)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.ylim([0,1])
plt.show()
```



In [33]:
```
d3country = pd.melt(d3.T)
d3country["country"] = d3country["variable"].map(country_dict)
d3country.head()
```

Out[33]:

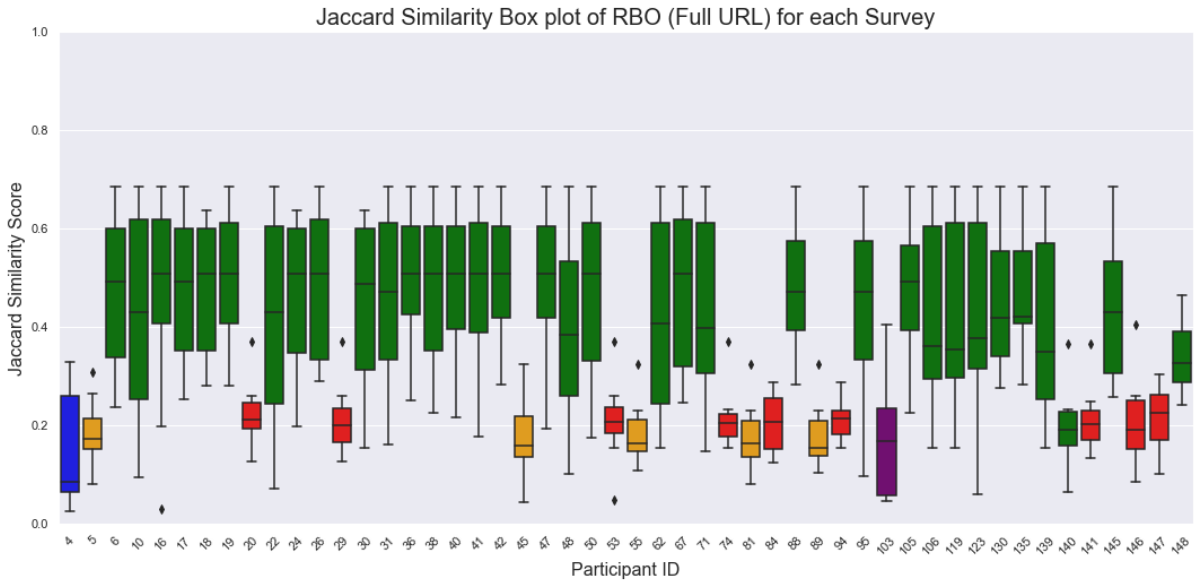
	variable	value	country
0	4	0.034694	Germany
1	4	0.087755	Germany
2	4	0.024490	Germany
3	4	0.277098	Germany
4	4	0.078261	Germany

In [34]:
```
dd3country = pd.melt(dd3.T)
dd3country["country"] = dd3country["variable"].map(country_dict)
dd3country.head()
```

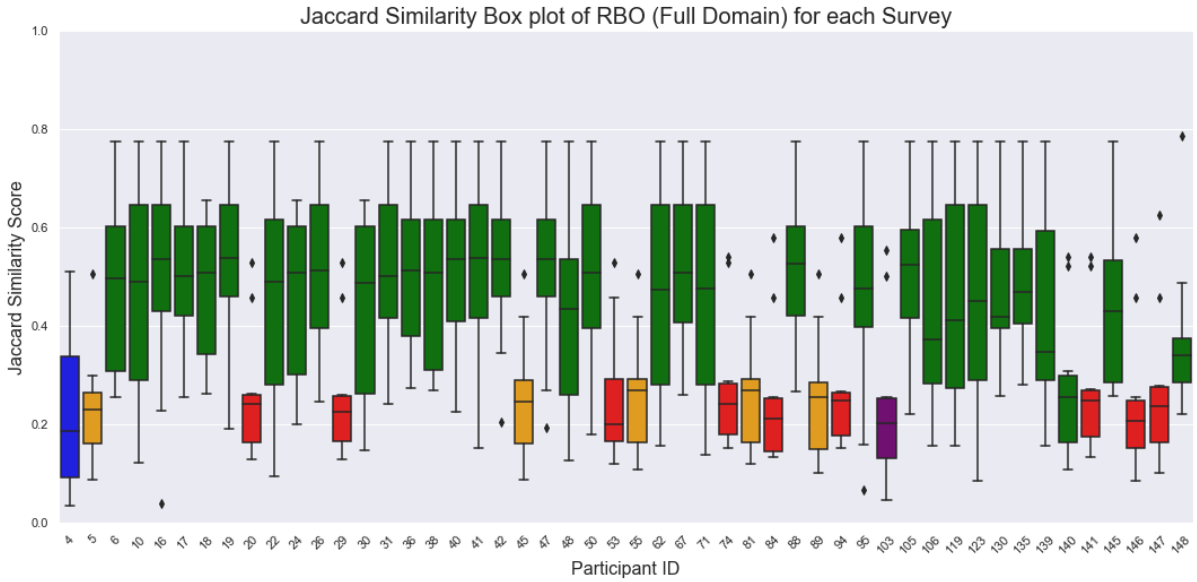
Out[34]:

	variable	value	country
0	4	0.034694	Germany
1	4	0.089626	Germany
2	4	0.097506	Germany
3	4	0.371032	Germany
4	4	0.309222	Germany

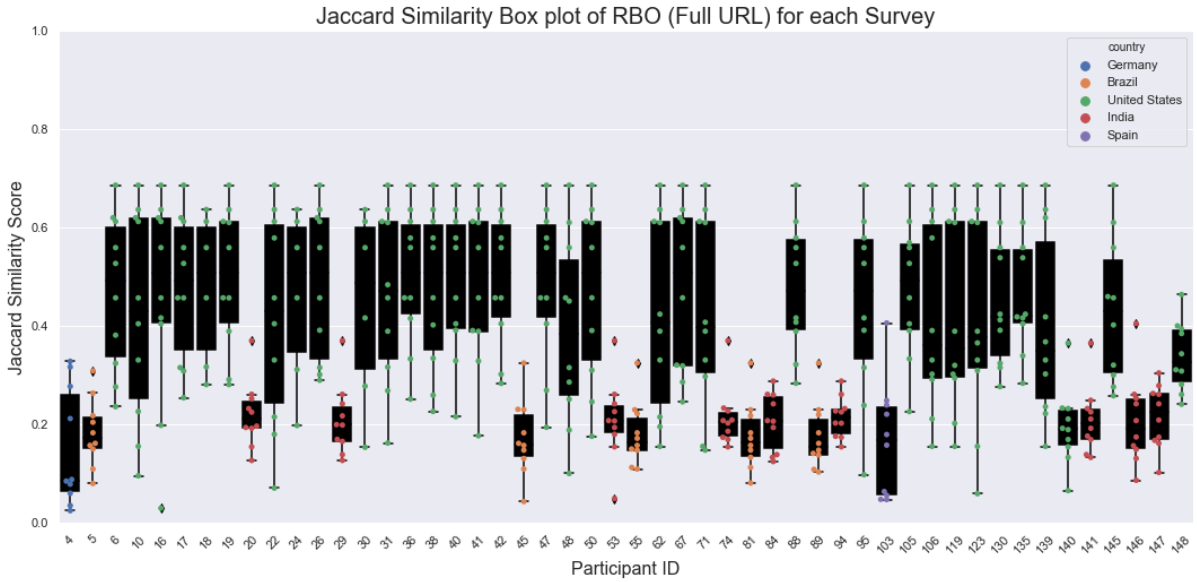
In [35]:
```
sns.set(rc={'figure.figsize':(18,8)})
sns.boxplot(x="variable", y="value", data=pd.melt(d3.T),palette=country_colors
)
plt.xticks(rotation=45)
plt.title("Jaccard Similarity Box plot of RBO (Full URL) for each Survey",font
size=20)
plt.ylabel("Jaccard Similarity Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.ylim([0,1])
plt.show()
```



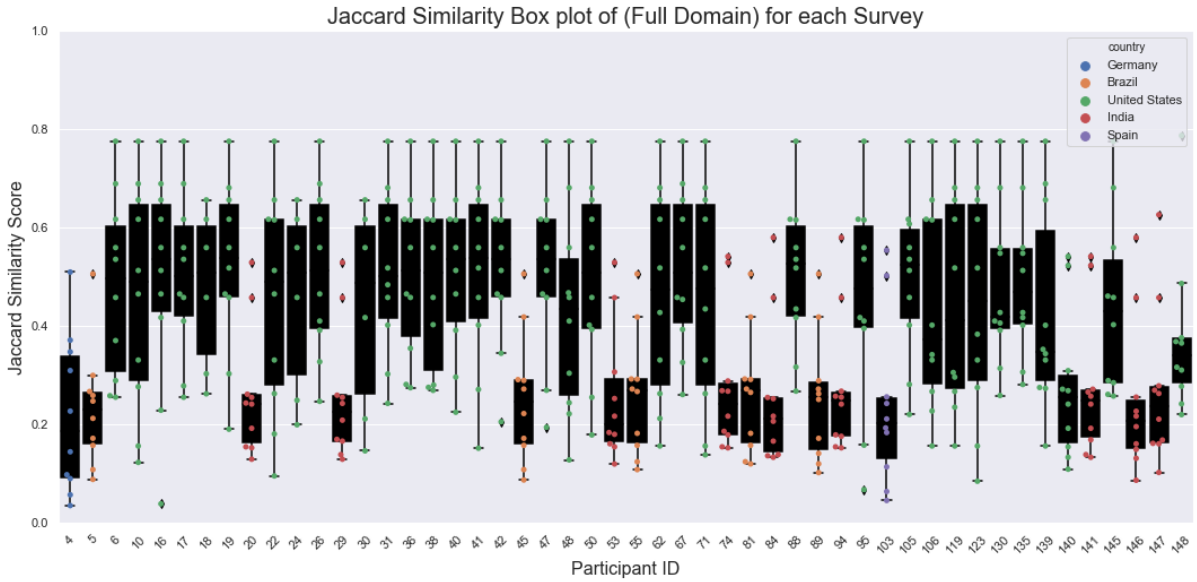
In [36]:
```
sns.set(rc={'figure.figsize':(18,8)})
sns.boxplot(x="variable", y="value", data=pd.melt(dd3.T),palette=country_color
s)
plt.xticks(rotation=45)
plt.title("Jaccard Similarity Box plot of RBO (Full Domain) for each Survey",f
ontsize=20)
plt.ylabel("Jaccard Similarity Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.ylim([0,1])
plt.show()
```



In [37]:
```
sns.set(rc={'figure.figsize':(18,8)})
sns.boxplot(x="variable", y="value", data=pd.melt(d3.T),color='black')
sns.swarmplot(x="variable", y="value", data=d3country,hue='country')
plt.xticks(rotation=45)
plt.title("Jaccard Similarity Box plot of RBO (Full URL) for each Survey",font
size=20)
plt.ylabel("Jaccard Similarity Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.ylim([0,1])
plt.show()
```



In [38]:
```
sns.set(rc={'figure.figsize':(18,8)})
sns.boxplot(x="variable", y="value", data=pd.melt(dd3.T),color='black')
sns.swarmplot(x="variable", y="value", data=dd3country,hue='country')
plt.xticks(rotation=45)
plt.title("Jaccard Similarity Box plot of (Full Domain) for each Survey",fonts
ize=20)
plt.ylabel("Jaccard Similarity Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.ylim([0,1])
plt.show()
```



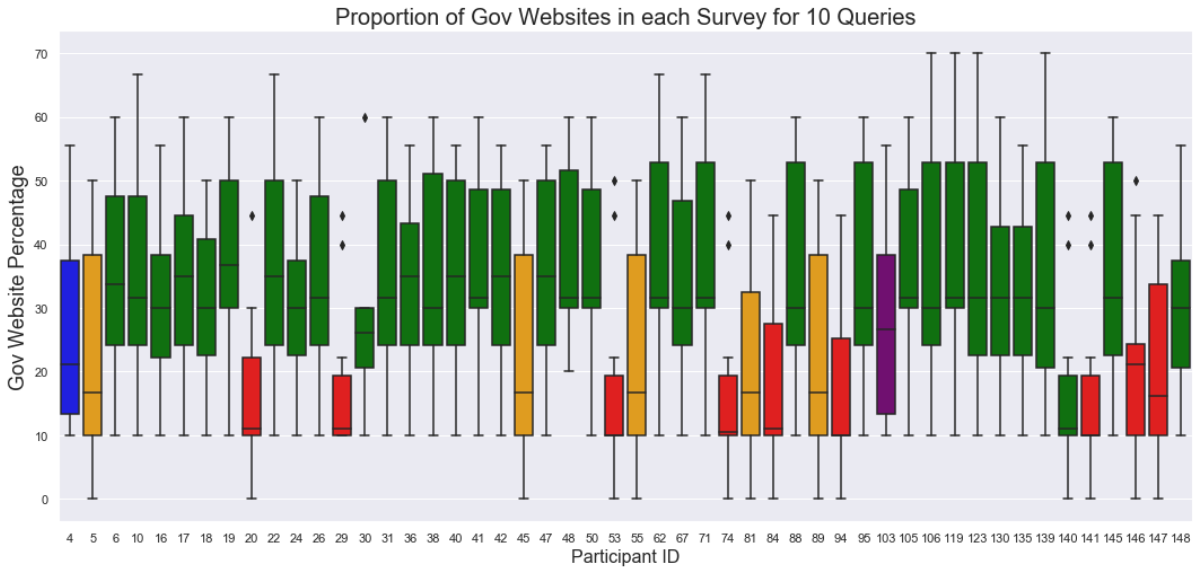
- **What is the difference in the *quality* of what they are getting?**

Proportion of .gov sites?

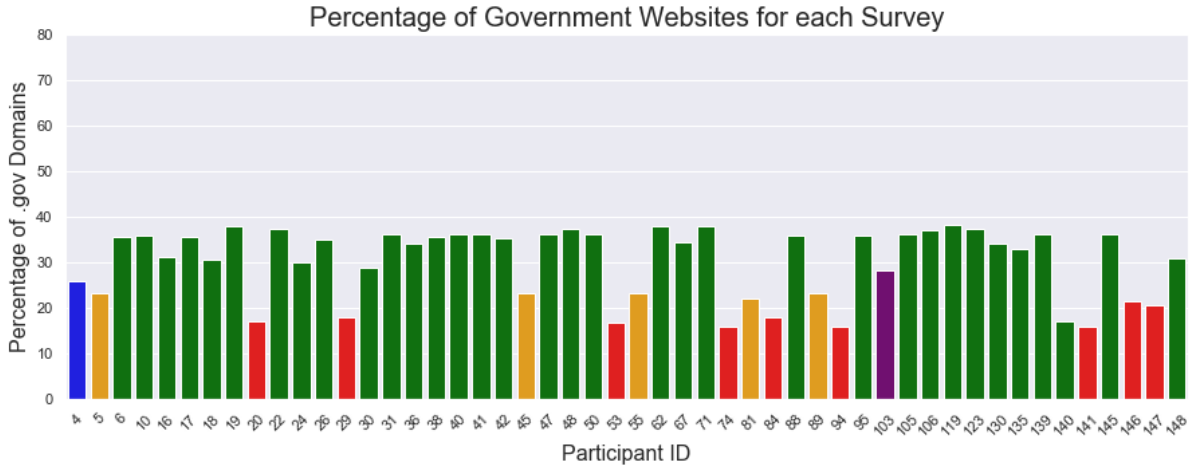
In [39]:
```
dff["gov domain"] = dff["Result Item Full Domain"].apply(lambda x: 1 if ".gov"
in x else 0)
df2 = dff.groupby(["Survey Id","Keyword Id"])[["gov domain"]].agg(['count','su
m'])["gov domain"]
df2["pct"] = (df2['sum'] / df2["count"])*100
# df2
```

In [40]:
```
df3 = df2.reset_index()
```

In [41]:
```
sns.set(rc={'figure.figsize':(18,8)})
sns.boxplot(x="Survey Id",y="pct",data=df3,palette=country_colors)
plt.title("Proportion of Gov Websites in each Survey for 10 Queries",fontsize=
20)
plt.ylabel("Gov Website Percentage",fontsize=18)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



In [42]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=df2.reset_index("Keyword Id").index,y=df2['pct'],ci=None,palette
=country_colors)
plt.xticks(rotation=45)
plt.ylim([0,80])
plt.title("Percentage of Government Websites for each Survey",fontsize=20)
plt.ylabel("Percentage of .gov Domains",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```

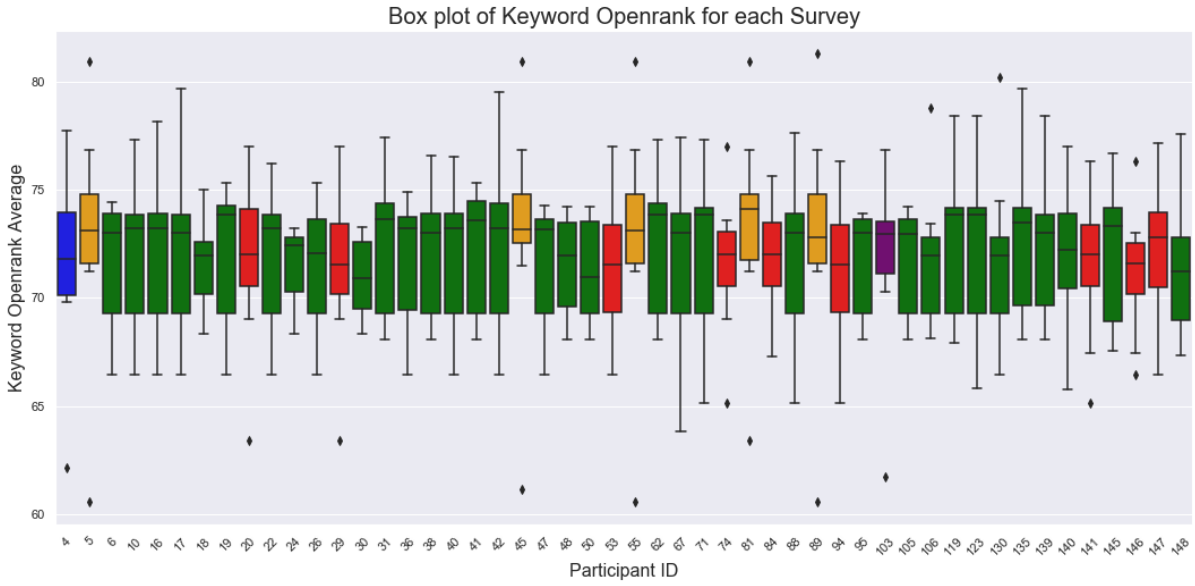


Openrank scores?

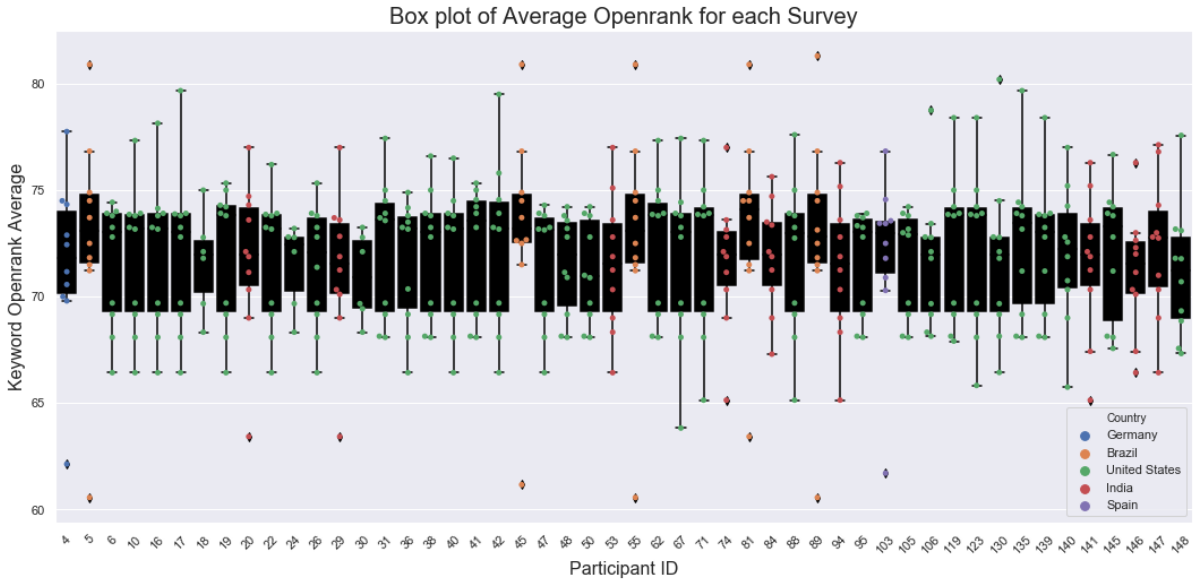
In [43]:
```
df3 = dff.groupby(["Survey Id",'Keyword Id'],as_index=False)[["Keyword Openrank Average"]].agg("max")
df3 = df3[["Survey Id","Keyword Openrank Average"]]
```

In [44]:
```
df3["Country"] = df3["Survey Id"].map(country_dict)
```

In [45]:
```
sns.set(rc={'figure.figsize':(18,8)})
sns.boxplot(x="Survey Id", y="Keyword Openrank Average", data=df3,palette=country_colors)
plt.xticks(rotation=45)
plt.title("Box plot of Keyword Openrank for each Survey",fontsize=20)
plt.ylabel("Keyword Openrank Average",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



In [46]:
```
sns.set(rc={'figure.figsize':(18,8)})
sns.boxplot(x="Survey Id", y="Keyword Openrank Average", data=df3,color='blac
k')
sns.swarmplot(x="Survey Id", y="Keyword Openrank Average", data=df3,hue='Count
ry')
plt.xticks(rotation=45)
plt.title("Box plot of Average Openrank for each Survey",fontsize=20)
plt.ylabel("Keyword Openrank Average",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



Do results vary between positive and negative query formulations?

• For each pair of queries, how similar or different are the results?

In [47]:
```
pos = ["should i get tested for covid",
       "should i get flu shot",
       "should i get vaccinated",
       "should i wear facemask",
       "is hydroxychloroquine effective for covid"]

neg = ["should i not get tested for covid",
       "should i not get flu shot",
       "should i avoid get vaccinated",
       "should i not wear facemask",
       "is hydroxychloroquine ineffective for covid"]

dff["Pos Keyword"] = dff["Keyword Content"].apply(lambda x: "Yes" if (x in pos
) else 'No')
```

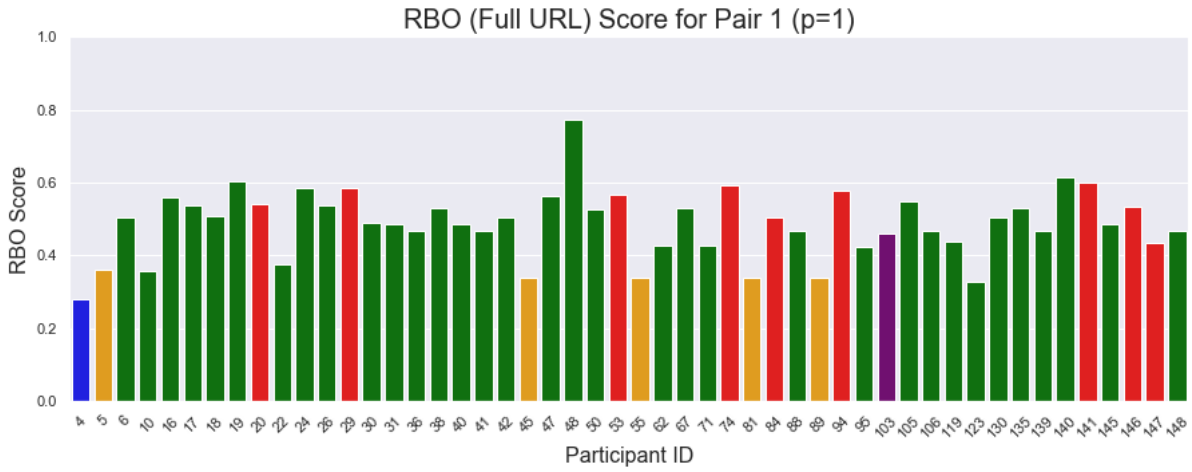
In [48]:
```
p1 = ["should i get tested for covid","should i not get tested for covid"]
p2 = ["should i get flu shot","should i not get flu shot"]
p3 = ["should i get vaccinated","should i avoid get vaccinated"]
p4 = ["should i wear facemask","should i not wear facemask"]
p5 = ["is hydroxychloroquine effective for covid","is hydroxychloroquine ineff
ective for covid"]

dff['rbo'] = None
```

In [49]:
```
d1 = dff[dff["Keyword Content"].apply(lambda x: True if x in p1 else False)]
d2 = dff[dff["Keyword Content"].apply(lambda x: True if x in p2 else False)]
d3 = dff[dff["Keyword Content"].apply(lambda x: True if x in p3 else False)]
d4 = dff[dff["Keyword Content"].apply(lambda x: True if x in p4 else False)]
d5 = dff[dff["Keyword Content"].apply(lambda x: True if x in p5 else False)]
```

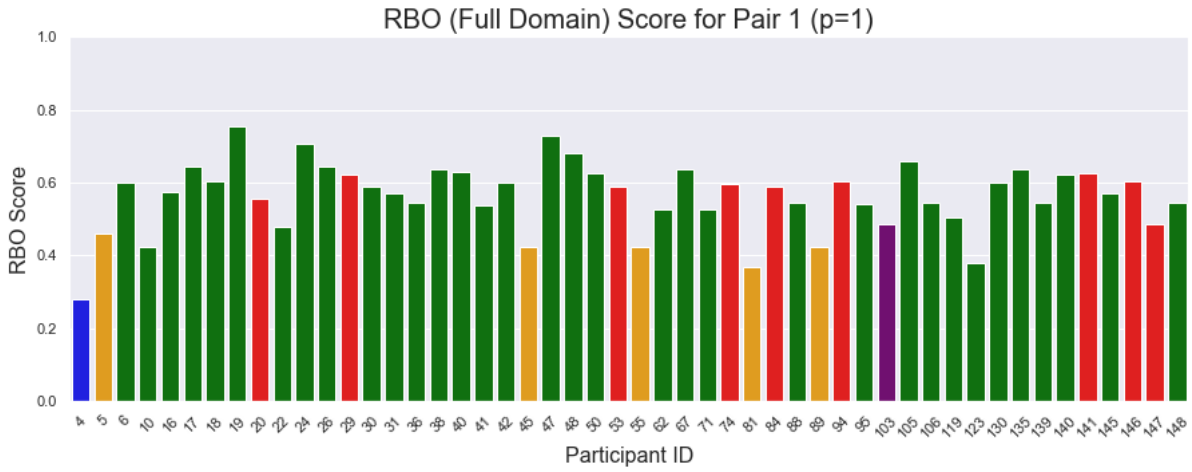
In [50]:
```
pairs_dictionary = {}
pairs_dictionary_2 = {}
pairs_dictionary_3 = {}

dpairs_dictionary = {}
dpairs_dictionary_2 = {}
dpairs_dictionary_3 = {}

for idx,dd in enumerate([d1,d2,d3,d4,d5]):
    sd = {}
    sd_2 = {}
    sd_3 = {}

    dsd = {}
    dsd_2 = {}
    dsd_3 = {}

    for i in dd.groupby("Survey Id"):
        sid = i[0]
        sdf = i[1]
        kids = sdf["Keyword Id"].unique()
        a1 = sdf[sdf["Keyword Id"] == kids[0]]
        a2 = sdf[sdf["Keyword Id"] == kids[1]]

        c1 = a1["Result Item Full Url"].to_list()
        c2 = a2["Result Item Full Url"].to_list()

        cc1 = a1["Result Item Full Domain"].to_list()
        cc2 = a2["Result Item Full Domain"].to_list()

        dc1 = []
        dc2 = []

        for q in cc1:
            if q not in dc1:
                dc1.append(q)

        for q in cc2:
            if q not in dc2:
                dc2.append(q)


        score = rbo.RankingSimilarity(c1, c2).rbo(p=1)

        score_2 = rbo.RankingSimilarity(c1,c2).rbo(p=0.67)

        v = min(len(c1),len(c2))
        score_3 = jaccard_similarity_score(c1[:v],c2[:v])

        dscore = rbo.RankingSimilarity(dc1, dc2).rbo(p=1)

        dscore_2 = rbo.RankingSimilarity(dc1,dc2).rbo(p=0.67)

        v = min(len(dc1),len(dc2))
        dscore_3 = jaccard_similarity_score(dc1[:v],dc2[:v])
```

```
    #     print(score)
        sd[sid] = score
        sd_2[sid] = score_2
        sd_3[sid] = score_3

        dsd[sid] = dscore
        dsd_2[sid] = dscore_2
        dsd_3[sid] = dscore_3

    pairs_dictionary["Pair {}".format(idx+1)] = sd
    pairs_dictionary_2["Pair {}".format(idx+1)] = sd_2
    pairs_dictionary_3["Pair {}".format(idx+1)] = sd_3

    dpairs_dictionary["Pair {}".format(idx+1)] = dsd
    dpairs_dictionary_2["Pair {}".format(idx+1)] = dsd_2
    dpairs_dictionary_3["Pair {}".format(idx+1)] = dsd_3
```

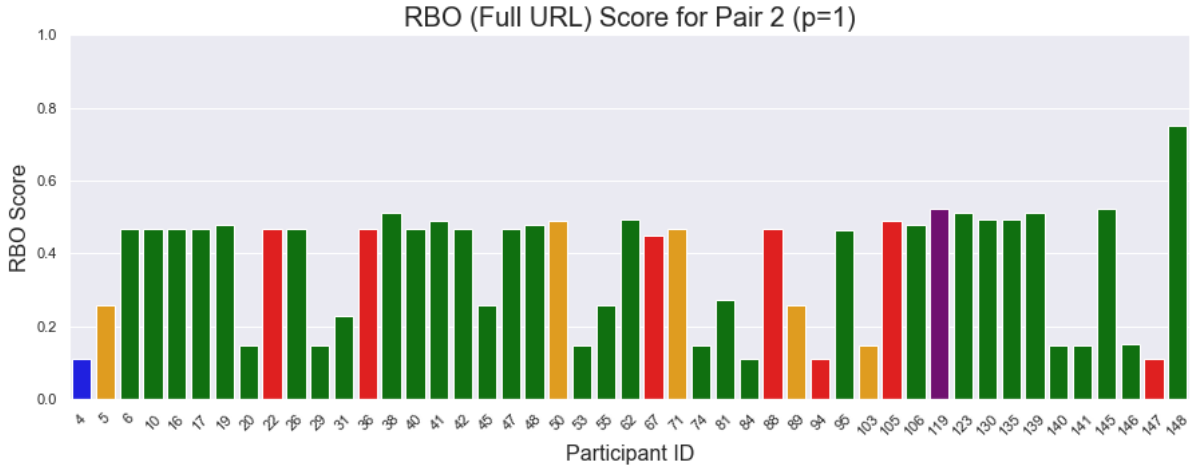
In [51]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=list(pairs_dictionary["Pair 1"].keys()),
            y=list(pairs_dictionary["Pair 1"].values()),palette=country_colors
)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("RBO (Full URL) Score for Pair 1 (p=1)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



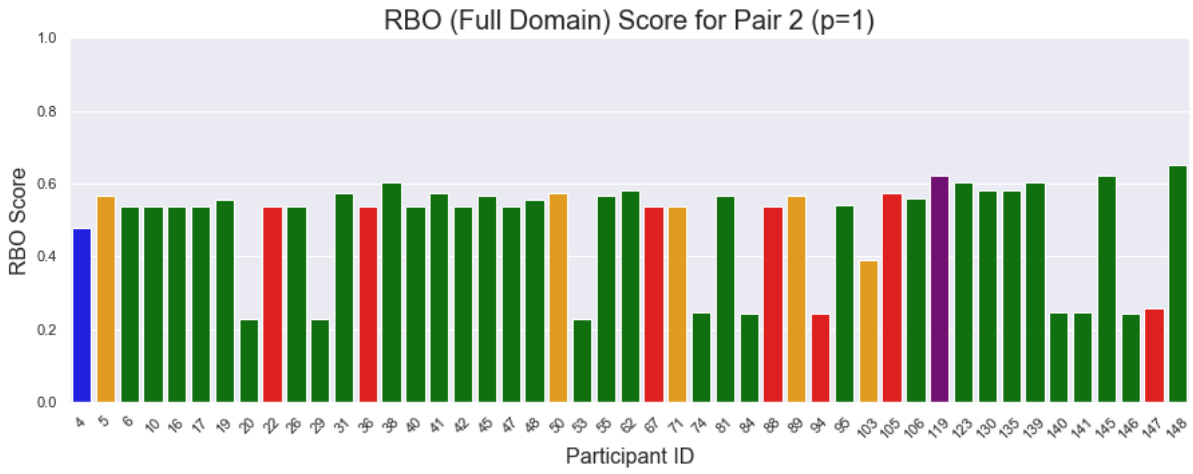
In [52]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=list(dpairs_dictionary["Pair 1"].keys()),
            y=list(dpairs_dictionary["Pair 1"].values()),palette=country_color
s)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("RBO (Full Domain) Score for Pair 1 (p=1)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



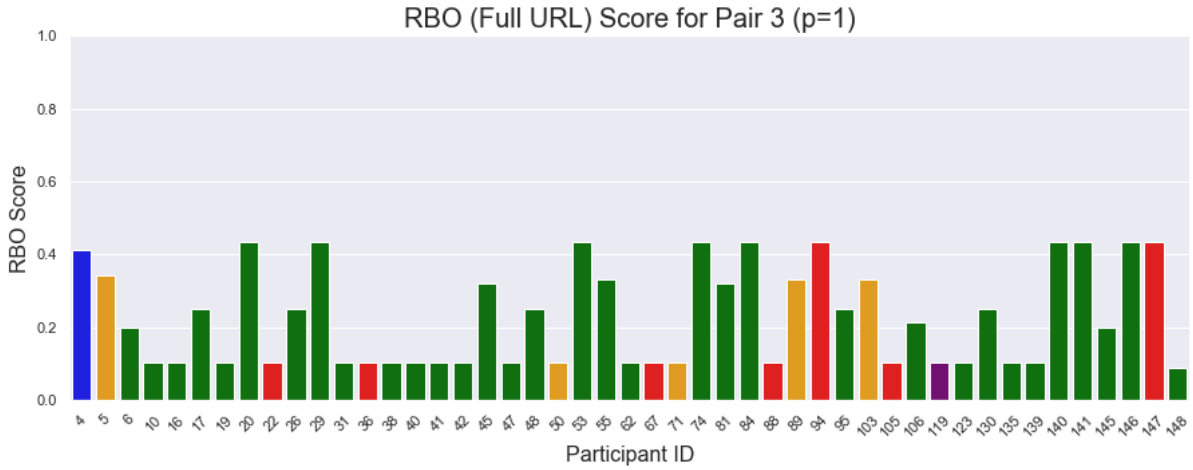
In [53]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=list(pairs_dictionary["Pair 2"].keys()),
            y=list(pairs_dictionary["Pair 2"].values()),palette=country_colors
)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("RBO (Full URL) Score for Pair 2 (p=1)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



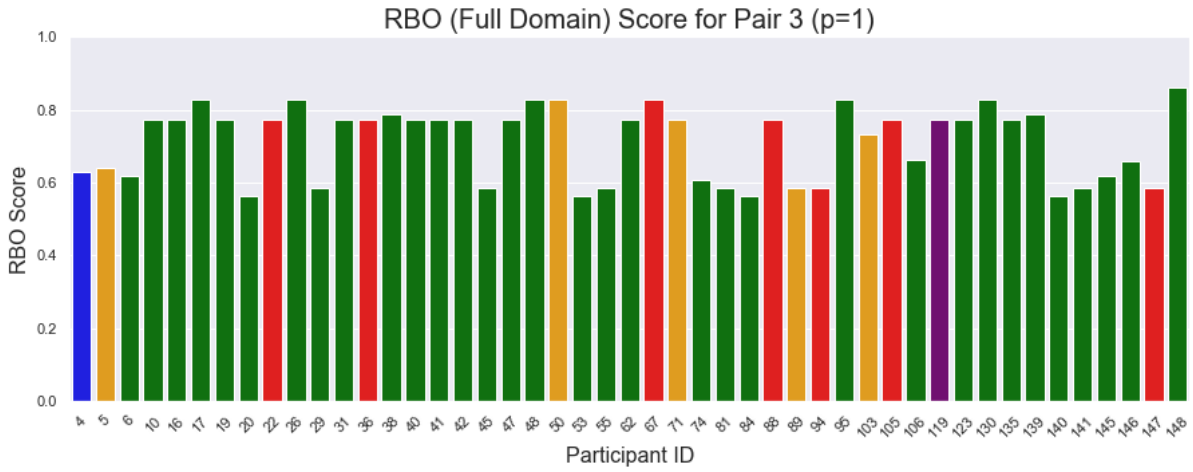
In [54]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=list(dpairs_dictionary["Pair 2"].keys()),
            y=list(dpairs_dictionary["Pair 2"].values()),palette=country_color
s)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("RBO (Full Domain) Score for Pair 2 (p=1)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



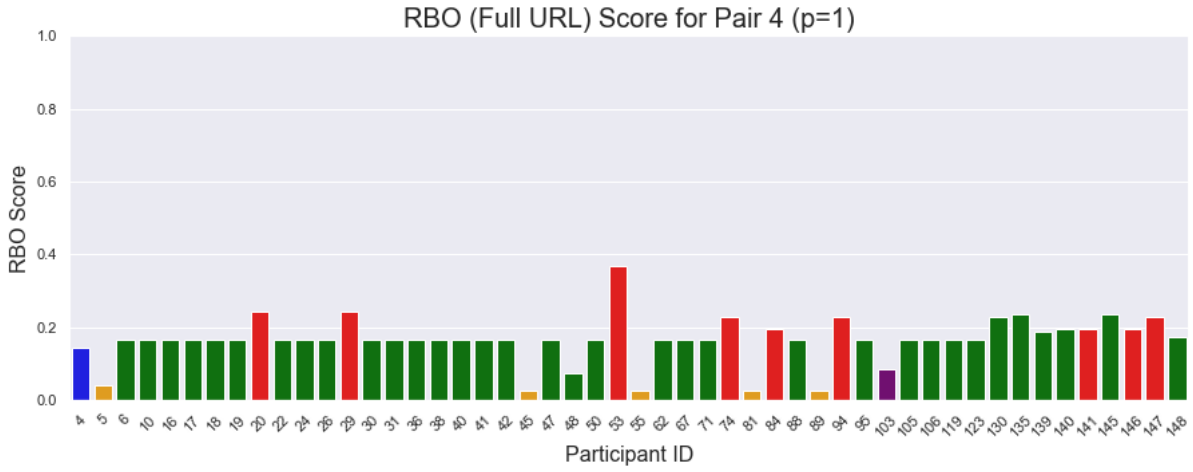
In [55]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=list(pairs_dictionary["Pair 3"].keys()),
            y=list(pairs_dictionary["Pair 3"].values()),palette=country_colors
)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("RBO (Full URL) Score for Pair 3 (p=1)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



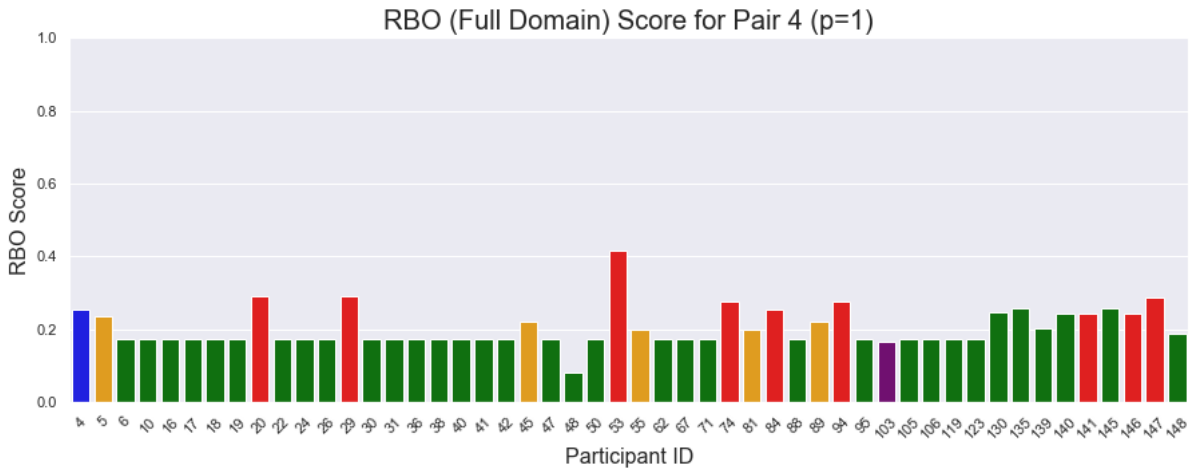
In [56]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=list(dpairs_dictionary["Pair 3"].keys()),
            y=list(dpairs_dictionary["Pair 3"].values()),palette=country_color
s)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("RBO (Full Domain) Score for Pair 3 (p=1)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



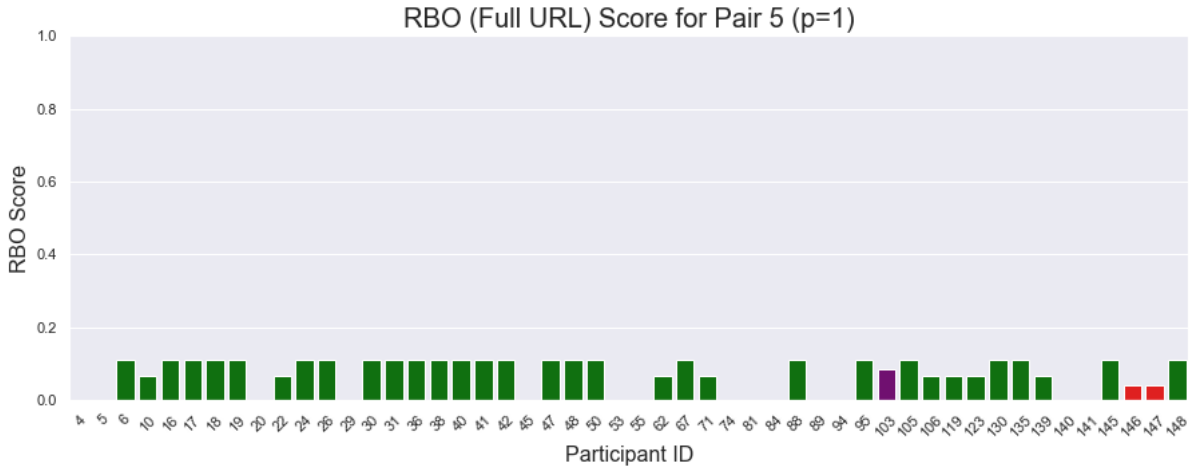
In [57]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=list(pairs_dictionary["Pair 4"].keys()),
            y=list(pairs_dictionary["Pair 4"].values()),palette=country_colors
)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("RBO (Full URL) Score for Pair 4 (p=1)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



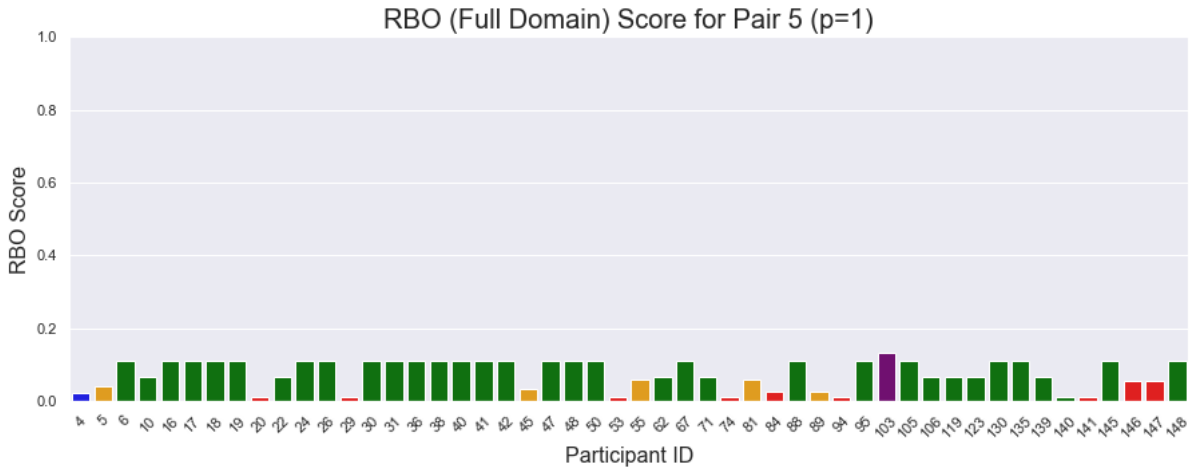
In [58]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=list(dpairs_dictionary["Pair 4"].keys()),
            y=list(dpairs_dictionary["Pair 4"].values()),palette=country_color
s)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("RBO (Full Domain) Score for Pair 4 (p=1)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



In [59]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=list(pairs_dictionary["Pair 5"].keys()),
            y=list(pairs_dictionary["Pair 5"].values()),palette=country_colors
)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("RBO (Full URL) Score for Pair 5 (p=1)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```

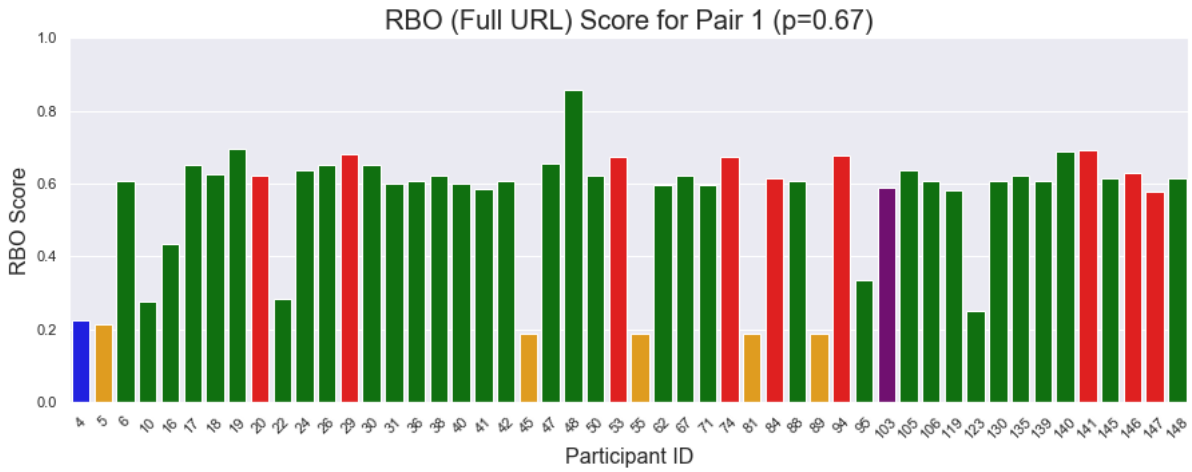


In [60]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=list(dpairs_dictionary["Pair 5"].keys()),
            y=list(dpairs_dictionary["Pair 5"].values()),palette=country_color
s)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("RBO (Full Domain) Score for Pair 5 (p=1)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```

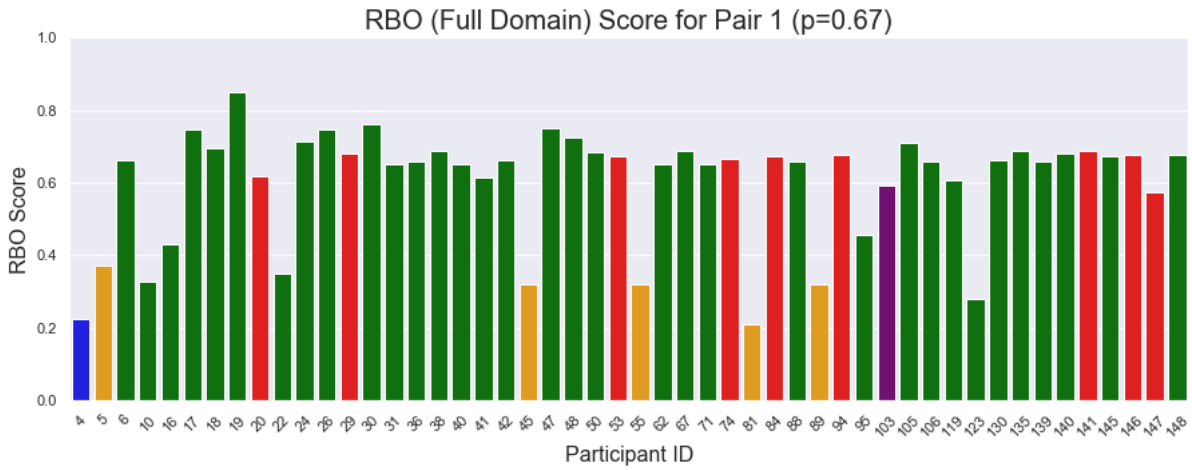


Showing the charts for Top Results RBO Scores

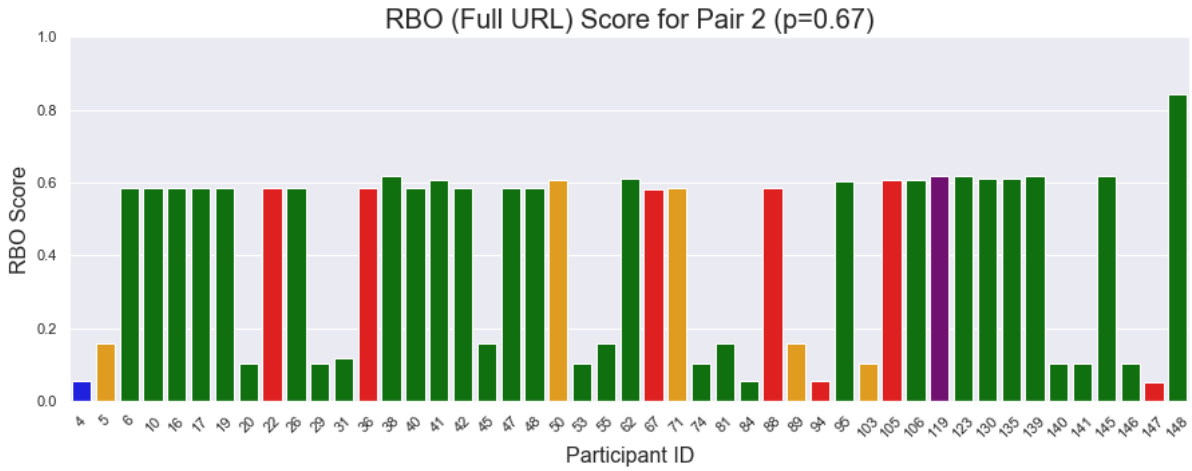
In [61]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=list(pairs_dictionary_2["Pair 1"].keys()),
            y=list(pairs_dictionary_2["Pair 1"].values()),palette=country_colo
rs)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("RBO (Full URL) Score for Pair 1 (p=0.67)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



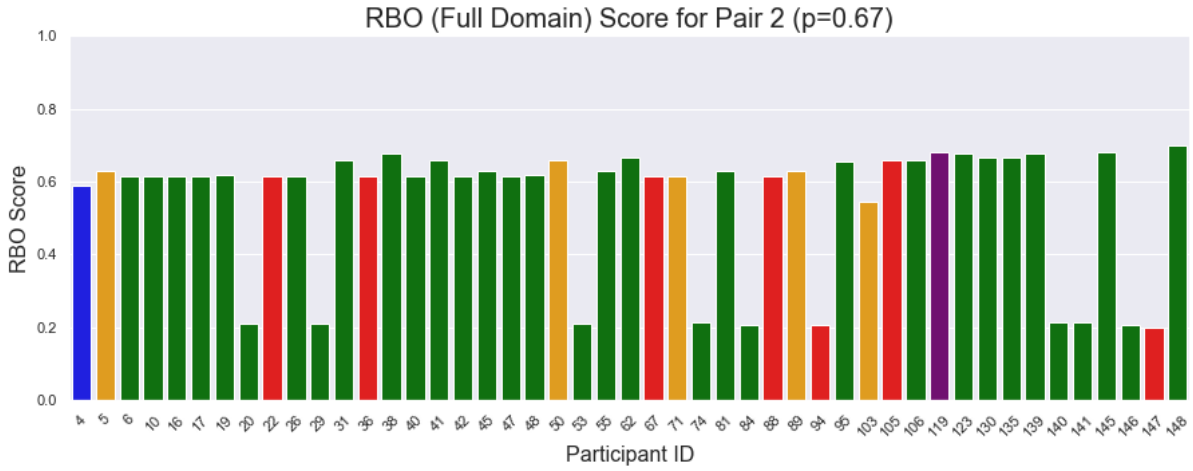
In [62]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=list(dpairs_dictionary_2["Pair 1"].keys()),
            y=list(dpairs_dictionary_2["Pair 1"].values()),palette=country_col
ors)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("RBO (Full Domain) Score for Pair 1 (p=0.67)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



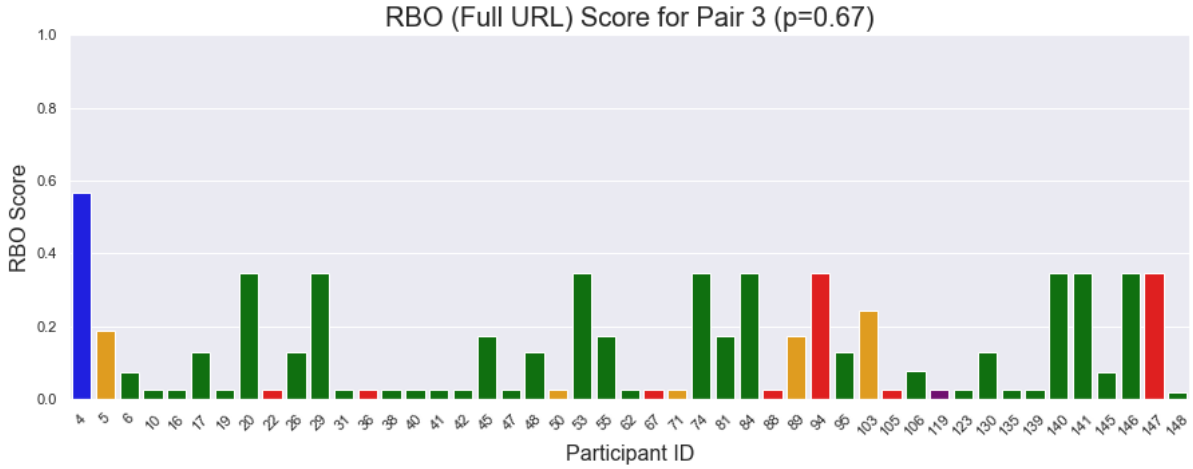
In [63]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=list(pairs_dictionary_2["Pair 2"].keys()),
            y=list(pairs_dictionary_2["Pair 2"].values()),palette=country_colo
rs)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("RBO (Full URL) Score for Pair 2 (p=0.67)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



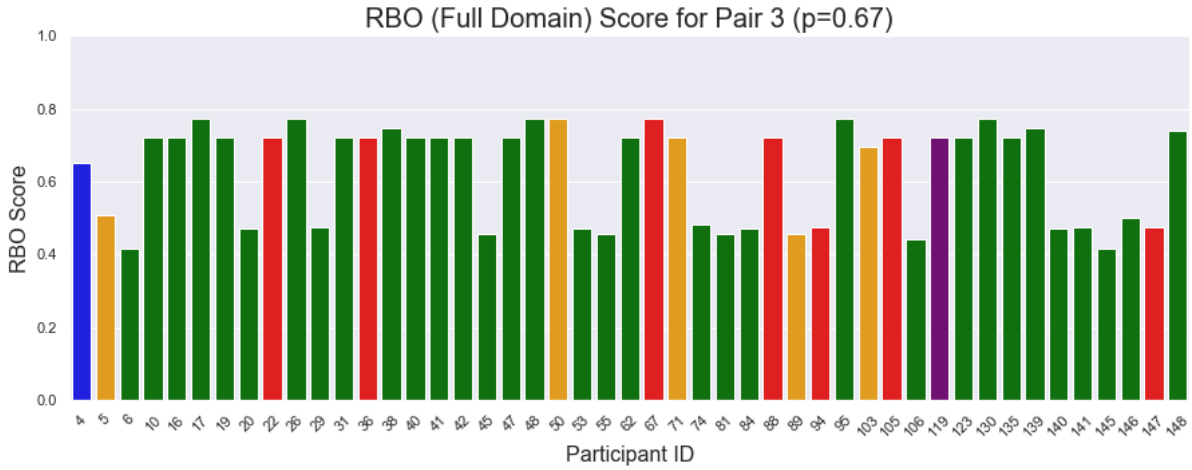
In [64]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=list(dpairs_dictionary_2["Pair 2"].keys()),
            y=list(dpairs_dictionary_2["Pair 2"].values()),palette=country_col
ors)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("RBO (Full Domain) Score for Pair 2 (p=0.67)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



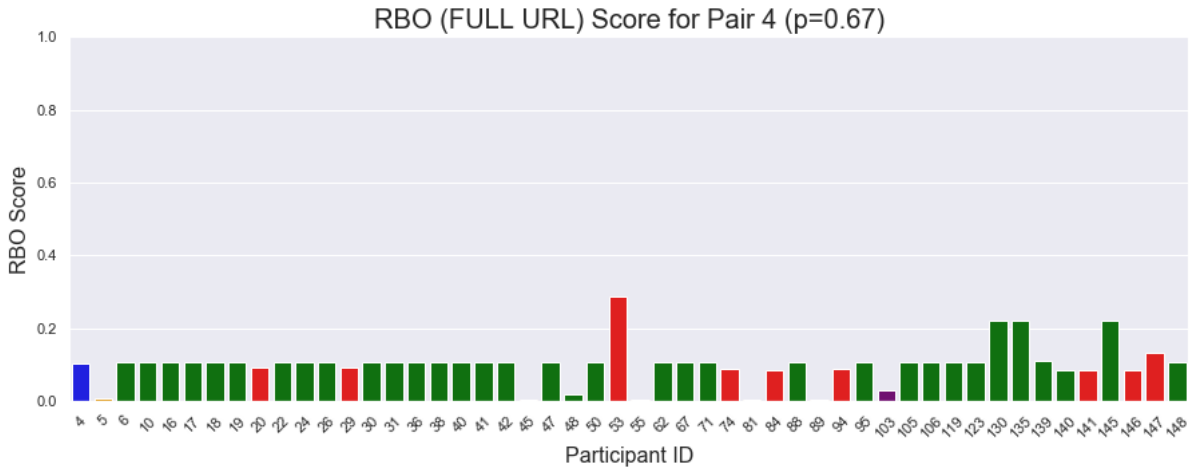
In [65]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=list(pairs_dictionary_2["Pair 3"].keys()),
            y=list(pairs_dictionary_2["Pair 3"].values()),palette=country_colo
rs)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("RBO (Full URL) Score for Pair 3 (p=0.67)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



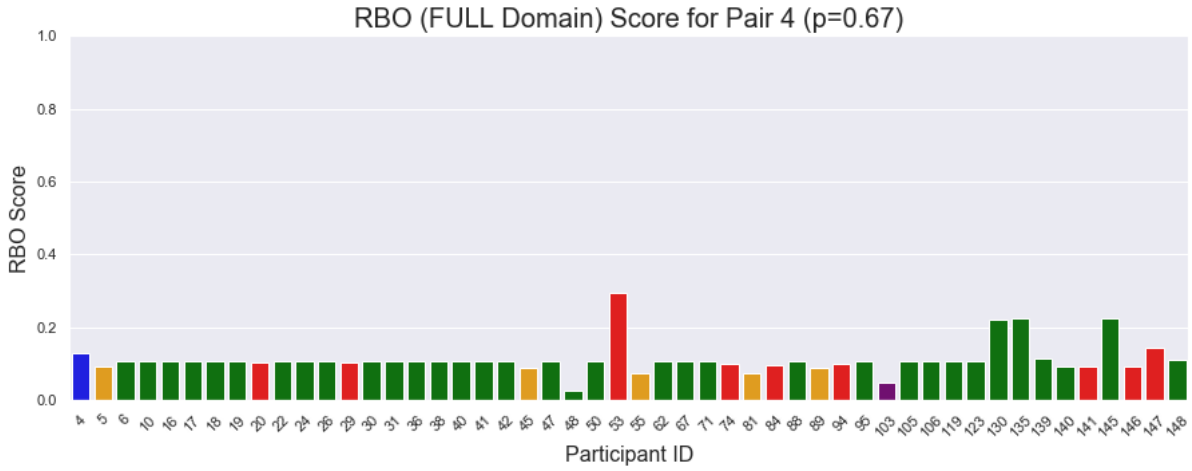
In [66]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=list(dpairs_dictionary_2["Pair 3"].keys()),
            y=list(dpairs_dictionary_2["Pair 3"].values()),palette=country_col
ors)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("RBO (Full Domain) Score for Pair 3 (p=0.67)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



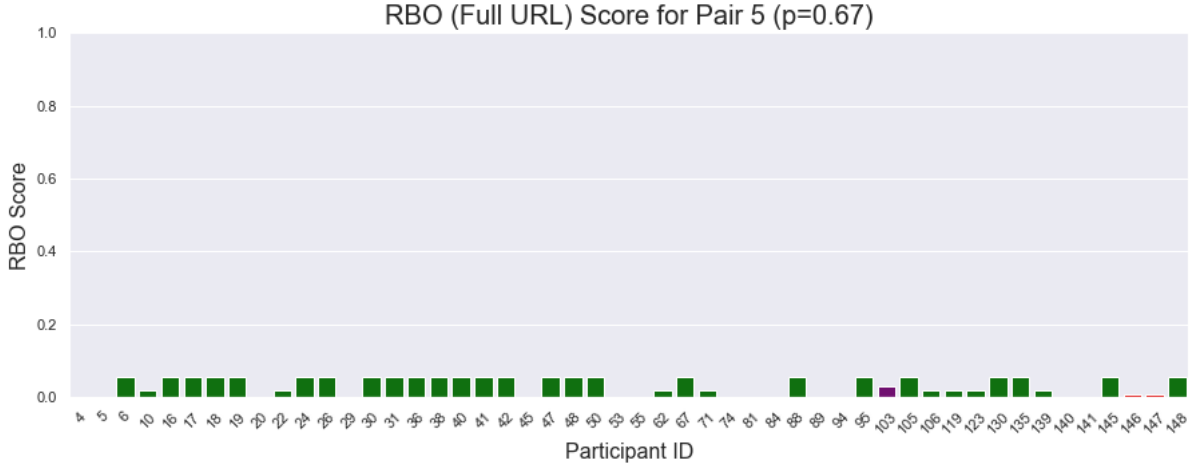
In [67]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=list(pairs_dictionary_2["Pair 4"].keys()),
            y=list(pairs_dictionary_2["Pair 4"].values()),palette=country_colo
rs)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("RBO (FULL URL) Score for Pair 4 (p=0.67)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



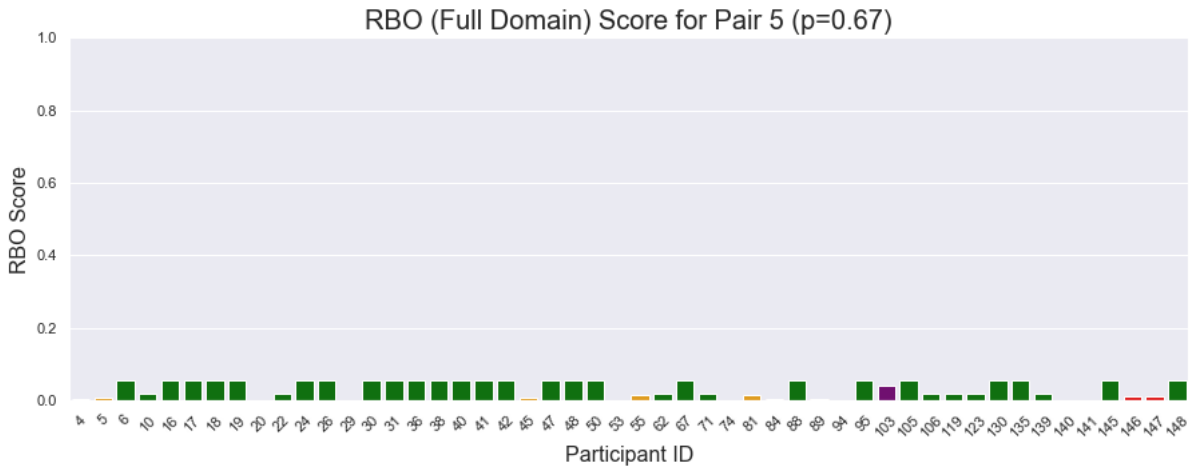
In [68]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=list(dpairs_dictionary_2["Pair 4"].keys()),
            y=list(dpairs_dictionary_2["Pair 4"].values()),palette=country_col
ors)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("RBO (FULL Domain) Score for Pair 4 (p=0.67)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



In [69]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=list(pairs_dictionary_2["Pair 5"].keys()),
            y=list(pairs_dictionary_2["Pair 5"].values()),palette=country_colo
rs)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("RBO (Full URL) Score for Pair 5 (p=0.67)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



In [70]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=list(dpairs_dictionary_2["Pair 5"].keys()),
            y=list(dpairs_dictionary_2["Pair 5"].values()),palette=country_col
ors)
plt.xticks(rotation=45)
plt.ylim([0,1])
plt.title("RBO (Full Domain) Score for Pair 5 (p=0.67)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



In [71]:
```
d3 = pd.DataFrame(pairs_dictionary)
d3.head()
```

Out[71]:

	Pair 1	Pair 2	Pair 3	Pair 4	Pair 5
4	0.278730	0.110626	0.413536	0.142897	0.000000
5	0.362024	0.258289	0.341138	0.042108	0.000000
6	0.504613	0.465520	0.197487	0.164008	0.109563
10	0.355952	0.465520	0.102734	0.164008	0.064563
16	0.559171	0.465520	0.102734	0.164008	0.109563

In [72]:
```
dd3 = pd.DataFrame(dpairs_dictionary)
dd3.head()
```

Out[72]:

	Pair 1	Pair 2	Pair 3	Pair 4	Pair 5
4	0.280379	0.478912	0.627778	0.255357	0.021111
5	0.461508	0.566667	0.641667	0.235582	0.042108
6	0.599320	0.538095	0.619444	0.173898	0.109563
10	0.421280	0.538095	0.772222	0.173898	0.064563
16	0.573512	0.538095	0.772222	0.173898	0.109563

In [73]:
```
d3 = pd.melt(d3.reset_index(),id_vars=["index"])
dd3 = pd.melt(dd3.reset_index(),id_vars=["index"])
```

In [74]:
```
d3["Country"] = d3["index"].map(country_dict)
d3.tail()
```

Out[74]:

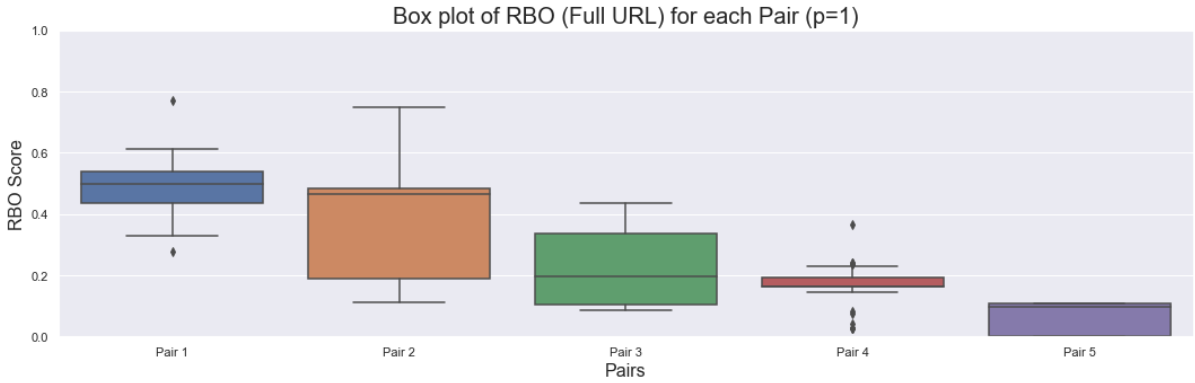
	index	variable	value	Country
245	141	Pair 5	0.000000	India
246	145	Pair 5	0.109563	United States
247	146	Pair 5	0.042108	India
248	147	Pair 5	0.042108	India
249	148	Pair 5	0.109563	United States

In [75]:
```
dd3["Country"] = dd3["index"].map(country_dict)
dd3.tail()
```

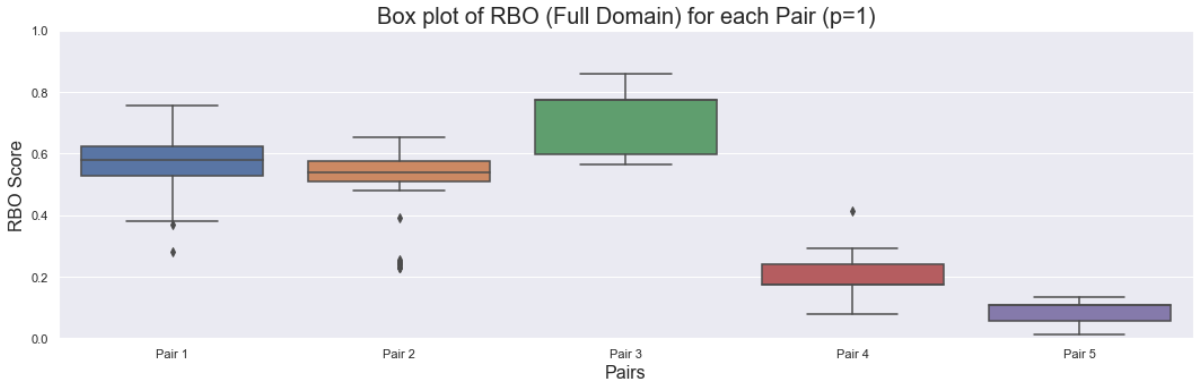
Out[75]:

	index	variable	value	Country
245	141	Pair 5	0.012346	India
246	145	Pair 5	0.109563	United States
247	146	Pair 5	0.054453	India
248	147	Pair 5	0.054453	India
249	148	Pair 5	0.109563	United States

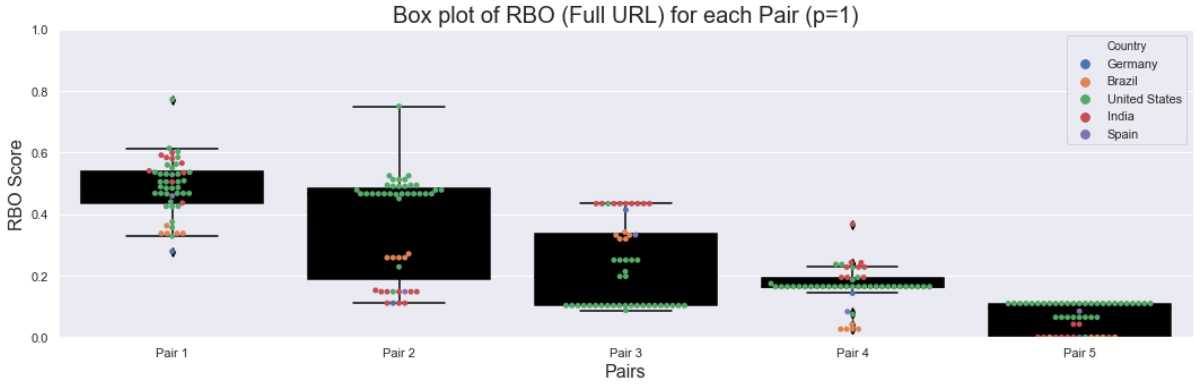
In [76]:
```
sns.set(rc={'figure.figsize':(18,5)})
sns.boxplot(x="variable", y="value", data=d3)
plt.title("Box plot of RBO (Full URL) for each Pair (p=1)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Pairs",fontsize=16)
plt.ylim([0,1])
plt.show()
```



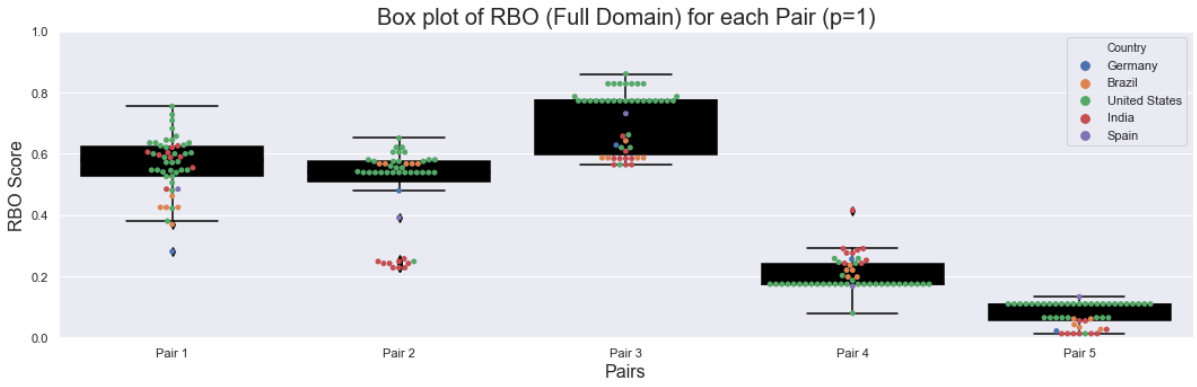
In [77]:
```
sns.set(rc={'figure.figsize':(18,5)})
sns.boxplot(x="variable", y="value", data=dd3)
plt.title("Box plot of RBO (Full Domain) for each Pair (p=1)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Pairs",fontsize=16)
plt.ylim([0,1])
plt.show()
```



In [78]:
```
sns.set(rc={'figure.figsize':(18,5)})
sns.boxplot(x="variable", y="value", data=d3,color="black")
sns.swarmplot(x="variable", y="value", data=d3,hue="Country")
plt.title("Box plot of RBO (Full URL) for each Pair (p=1)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Pairs",fontsize=16)
plt.ylim([0,1])
plt.show()
```



In [79]:
```
sns.set(rc={'figure.figsize':(18,5)})
sns.boxplot(x="variable", y="value", data=dd3,color="black")
sns.swarmplot(x="variable", y="value", data=dd3,hue="Country")
plt.title("Box plot of RBO (Full Domain) for each Pair (p=1)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Pairs",fontsize=16)
plt.ylim([0,1])
plt.show()
```



In [80]:
```
d4 = pd.DataFrame(pairs_dictionary_2)
d4.head()
```

Out[80]:

	Pair 1	Pair 2	Pair 3	Pair 4	Pair 5
4	0.225177	0.053792	0.564878	0.104069	0.000000
5	0.213448	0.156963	0.185941	0.008253	0.000000
6	0.608725	0.584942	0.073460	0.106455	0.054690
10	0.275766	0.584942	0.023933	0.106455	0.016577
16	0.435742	0.584942	0.023933	0.106455	0.054690

In [81]:
```
dd4 = pd.DataFrame(dpairs_dictionary_2)
dd4.head()
```

Out[81]:

	Pair 1	Pair 2	Pair 3	Pair 4	Pair 5
4	0.224677	0.589535	0.651110	0.129797	0.002387
5	0.370683	0.630385	0.505852	0.091024	0.008253
6	0.663904	0.615489	0.416028	0.107160	0.054690
10	0.328104	0.615489	0.721462	0.107160	0.016577
16	0.429786	0.615489	0.721462	0.107160	0.054690

In [82]:
```
d4 = pd.melt(d4.reset_index(),id_vars=["index"])
dd4 = pd.melt(dd4.reset_index(),id_vars=["index"])
```

In [83]:
```
d4["Country"] = d4["index"].map(country_dict)
d4.head()
```

Out[83]:

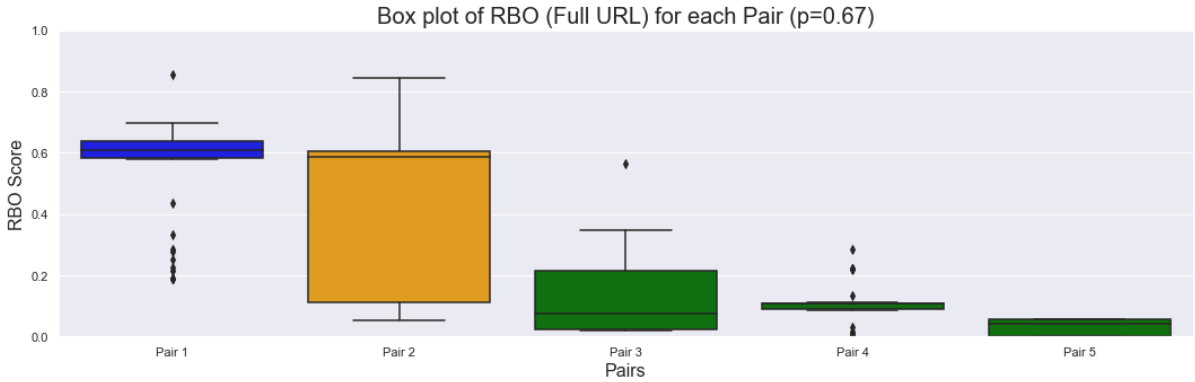
	index	variable	value	Country
0	4	Pair 1	0.225177	Germany
1	5	Pair 1	0.213448	Brazil
2	6	Pair 1	0.608725	United States
3	10	Pair 1	0.275766	United States
4	16	Pair 1	0.435742	United States

In [84]:
```
dd4["Country"] = dd4["index"].map(country_dict)
dd4.head()
```

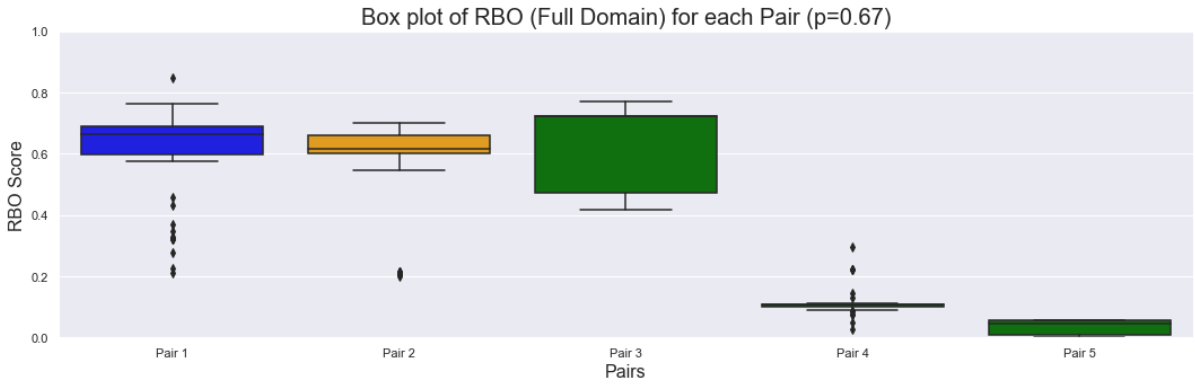
Out[84]:

	index	variable	value	Country
0	4	Pair 1	0.224677	Germany
1	5	Pair 1	0.370683	Brazil
2	6	Pair 1	0.663904	United States
3	10	Pair 1	0.328104	United States
4	16	Pair 1	0.429786	United States

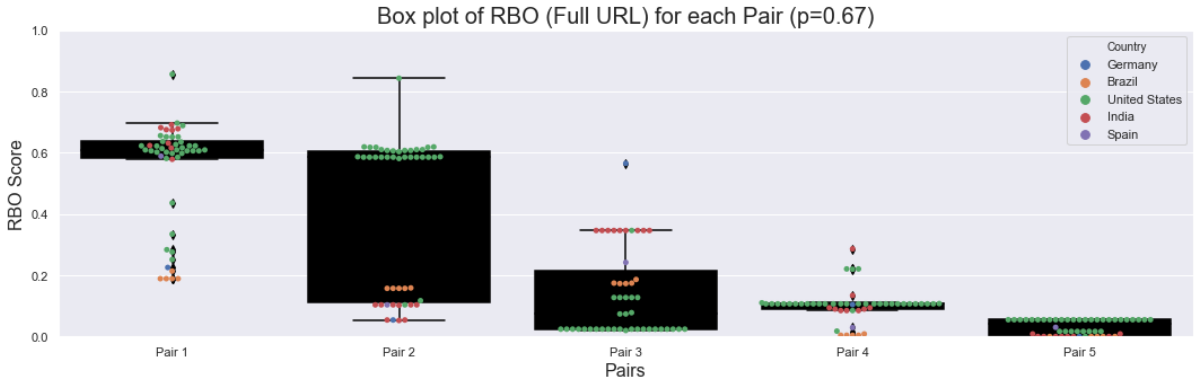
In [85]:
```
sns.set(rc={'figure.figsize':(18,5)})
sns.boxplot(x="variable", y="value", data=d4,palette=country_colors)
plt.title("Box plot of RBO (Full URL) for each Pair (p=0.67)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Pairs",fontsize=16)
plt.ylim([0,1])
plt.show()
```



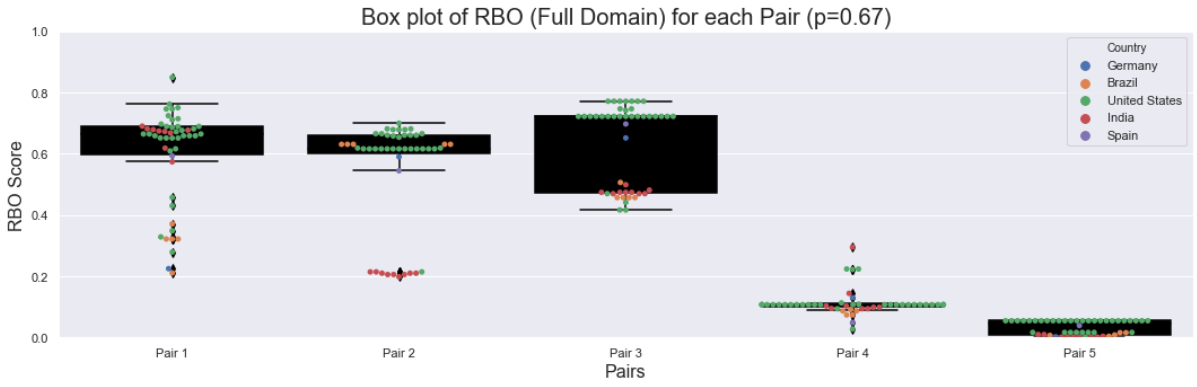
In [86]:
```
sns.set(rc={'figure.figsize':(18,5)})
sns.boxplot(x="variable", y="value", data=dd4,palette=country_colors)
plt.title("Box plot of RBO (Full Domain) for each Pair (p=0.67)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Pairs",fontsize=16)
plt.ylim([0,1])
plt.show()
```



In [87]:
```
sns.set(rc={'figure.figsize':(18,5)})
sns.boxplot(x="variable", y="value", data=d4,color='black')
sns.swarmplot(x="variable", y="value", data=d4,hue='Country')
plt.title("Box plot of RBO (Full URL) for each Pair (p=0.67)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Pairs",fontsize=16)
plt.ylim([0,1])
plt.show()
```



In [88]:
```
sns.set(rc={'figure.figsize':(18,5)})
sns.boxplot(x="variable", y="value", data=dd4,color='black')
sns.swarmplot(x="variable", y="value", data=dd4,hue='Country')
plt.title("Box plot of RBO (Full Domain) for each Pair (p=0.67)",fontsize=20)
plt.ylabel("RBO Score",fontsize=16)
plt.xlabel("Pairs",fontsize=16)
plt.ylim([0,1])
plt.show()
```



In [89]:
```
d5 = pd.DataFrame(pairs_dictionary_3)
d5.head()
```

Out[89]:

	Pair 1	Pair 2	Pair 3	Pair 4	Pair 5
4	0.100000	0.000000	0.111111	0.0	0.0
5	0.000000	0.000000	0.000000	0.0	0.0
6	0.125000	0.111111	0.000000	0.0	0.0
10	0.111111	0.111111	0.000000	0.0	0.0
16	0.000000	0.111111	0.000000	0.0	0.0

In [90]:
```
dd5 = pd.DataFrame(dpairs_dictionary_3)
dd5.head()
```

Out[90]:

	Pair 1	Pair 2	Pair 3	Pair 4	Pair 5
4	0.000000	0.142857	0.166667	0.000000	0.0
5	0.111111	0.166667	0.166667	0.111111	0.0
6	0.142857	0.125000	0.000000	0.000000	0.0
10	0.125000	0.125000	0.166667	0.000000	0.0
16	0.000000	0.125000	0.166667	0.000000	0.0

In [91]:
```
d5 = pd.melt(d5.reset_index(),id_vars=["index"])
d5["Country"] = d5["index"].map(country_dict)
d5.head()
```

Out[91]:

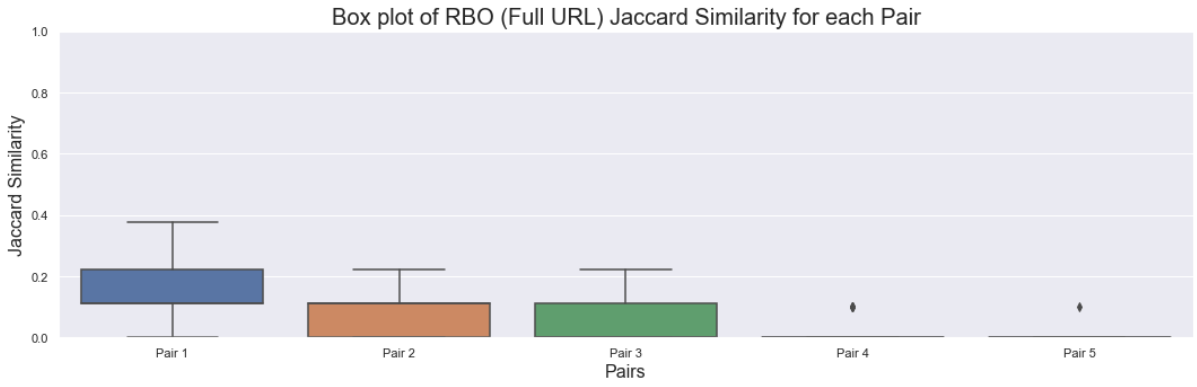
	index	variable	value	Country
0	4	Pair 1	0.100000	Germany
1	5	Pair 1	0.000000	Brazil
2	6	Pair 1	0.125000	United States
3	10	Pair 1	0.111111	United States
4	16	Pair 1	0.000000	United States

In [92]:
```
dd5 = pd.melt(dd5.reset_index(),id_vars=["index"])
dd5["Country"] = dd5["index"].map(country_dict)
dd5.head()
```

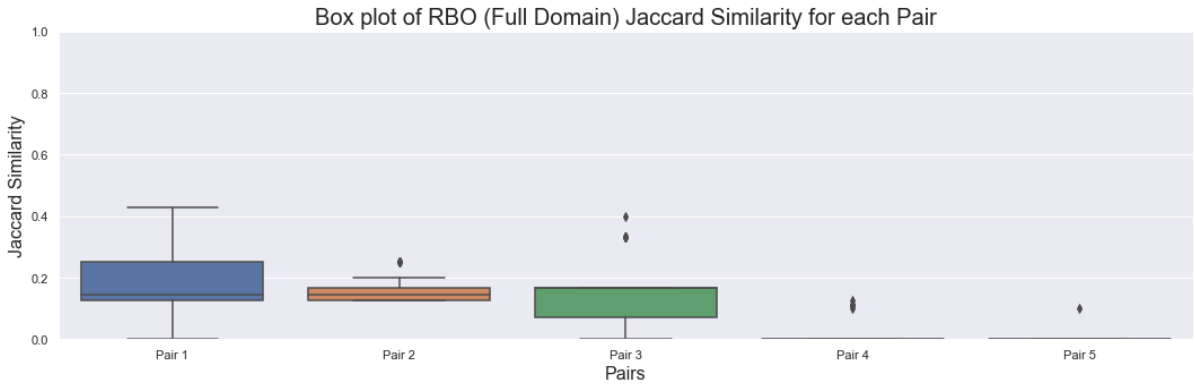
Out[92]:

	index	variable	value	Country
0	4	Pair 1	0.000000	Germany
1	5	Pair 1	0.111111	Brazil
2	6	Pair 1	0.142857	United States
3	10	Pair 1	0.125000	United States
4	16	Pair 1	0.000000	United States

In [93]:
```
sns.set(rc={'figure.figsize':(18,5)})
sns.boxplot(x="variable", y="value", data=d5)
plt.title("Box plot of RBO (Full URL) Jaccard Similarity for each Pair",fontsi
ze=20)
plt.ylabel("Jaccard Similarity",fontsize=16)
plt.xlabel("Pairs",fontsize=16)
plt.ylim([0,1])
plt.show()
```

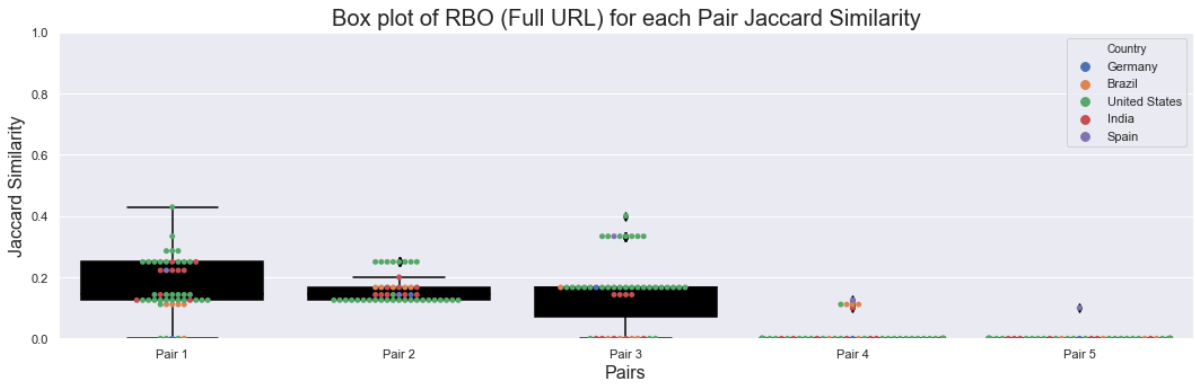


In [94]:
```
sns.set(rc={'figure.figsize':(18,5)})
sns.boxplot(x="variable", y="value", data=dd5)
plt.title("Box plot of RBO (Full Domain) Jaccard Similarity for each Pair",fon
tsize=20)
plt.ylabel("Jaccard Similarity",fontsize=16)
plt.xlabel("Pairs",fontsize=16)
plt.ylim([0,1])
plt.show()
```



In [95]:
```
sns.set(rc={'figure.figsize':(18,5)})
sns.boxplot(x="variable", y="value", data=d5,color='black')
sns.swarmplot(x="variable", y="value", data=d5,hue='Country')
plt.title("Box plot of RBO (Full URL) for each Pair Jaccard Similarity",fontsi
ze=20)
plt.ylabel("Jaccard Similarity",fontsize=16)
plt.xlabel("Pairs",fontsize=16)
plt.ylim([0,1])
plt.show()
```

In [96]:
```
sns.set(rc={'figure.figsize':(18,5)})
sns.boxplot(x="variable", y="value", data=dd5,color='black')
sns.swarmplot(x="variable", y="value", data=dd5,hue='Country')
plt.title("Box plot of RBO (Full URL) for each Pair Jaccard Similarity",fontsi
ze=20)
plt.ylabel("Jaccard Similarity",fontsize=16)
plt.xlabel("Pairs",fontsize=16)
plt.ylim([0,1])
plt.show()
```



What is the difference in the *quality* of what they are getting?

o Proportion of .gov sites?

In [97]:
```
def get_pairs(x):
    if x in p1:
        return "p1"
    elif x in p2:
        return "p2"
    elif x in p3:
        return "p3"
    elif x in p4:
        return "p4"
    elif x in p5:
        return "p5"
```

In [98]:
```
dff["gov domain"] = dff["Result Item Full Domain"].apply(lambda x: 1 if ".gov"
in x else 0)
```

In [99]:
```
govdf = dff[["Survey Id","Keyword Content","gov domain"]]
```

In [100]:
```
govdf["Pair Number"] = govdf["Keyword Content"].apply(get_pairs)
```

In [101]:
```
govdf["Keyword Type"] = govdf["Keyword Content"].apply(lambda x: "pos" if (x i
n pos) else 'neg')
```

In [102]:
```
govdf = govdf.groupby(["Survey Id","Keyword Content","Pair Number","Keyword Type"],as_index=False)[["gov domain"]].agg(['count','sum'])
```

In [103]:
```
govdf.reset_index(inplace=True)
```

In [104]:
```
govdf["Proportion"] = govdf["gov domain"]["sum"] / govdf["gov domain"]['count']
```

In [105]:
```
govdf = govdf.drop("gov domain",axis=1)
```

In [106]:
```
govdf
```

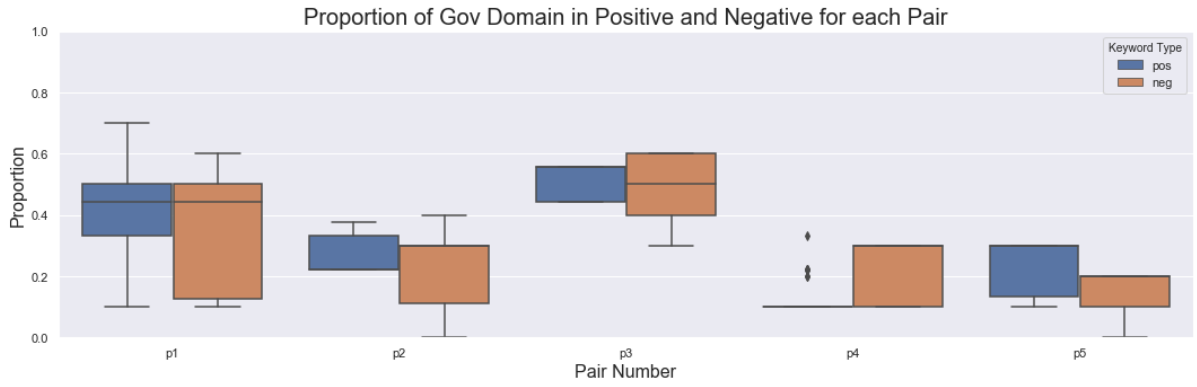
Out[106]:

	Survey Id	Keyword Content	Pair Number	Keyword Type	Proportion
0	4	is hydroxychloroquine effective for covid	p5	pos	0.200000
1	4	is hydroxychloroquine ineffective for covid	p5	neg	0.100000
2	4	should i avoid get vaccinated	p3	neg	0.400000
3	4	should i get flu shot	p2	pos	0.222222
4	4	should i get tested for covid	p1	pos	0.400000
...	...	...	...	...	...
483	148	should i get vaccinated	p3	pos	0.555556
484	148	should i not get flu shot	p2	neg	0.300000
485	148	should i not get tested for covid	p1	neg	0.400000
486	148	should i not wear facemask	p4	neg	0.300000
487	148	should i wear facemask	p4	pos	0.100000

488 rows × 5 columns

In [107]:
```
govdf_2 = govdf[["Pair Number","Keyword Type","Proportion"]].set_index("Pair Number").sort_index().reset_index()
```

In [108]:
```
sns.set(rc={'figure.figsize':(18,5)})
sns.boxplot(x="Pair Number",y="Proportion",hue="Keyword Type",data=govdf_2)
plt.title("Proportion of Gov Domain in Positive and Negative for each Pair",fo
ntsize=20)
plt.ylabel("Proportion",fontsize=16)
plt.xlabel("Pair Number",fontsize=16)
plt.ylim([0,1])
plt.show()
```



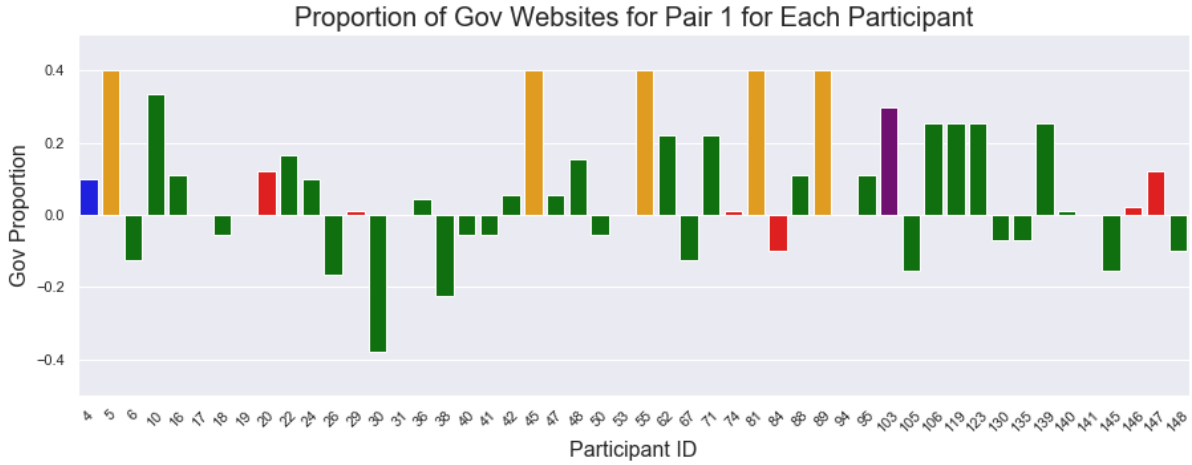
In [109]:
```
pro = {}
pairs = [p1,p2,p3,p4,p5]

for i in govdf.groupby("Survey Id"):
    d = i[1]
    scores = {}
    for idx,p in enumerate(pairs):
        try:
            pv = d.loc[d["Keyword Content"] == p[0],"Proportion"].values[0]
            nv = d.loc[d["Keyword Content"] == p[1],"Proportion"].values[0]
            diff = pv - nv
            scores["Pair {}".format(idx+1)] = diff
        except Exception as e:
#             print(e)
            pass
    pro[i[0]] = scores
```

In [110]:
```
prodf = pd.DataFrame(data=pro).T
prodf.head()
```

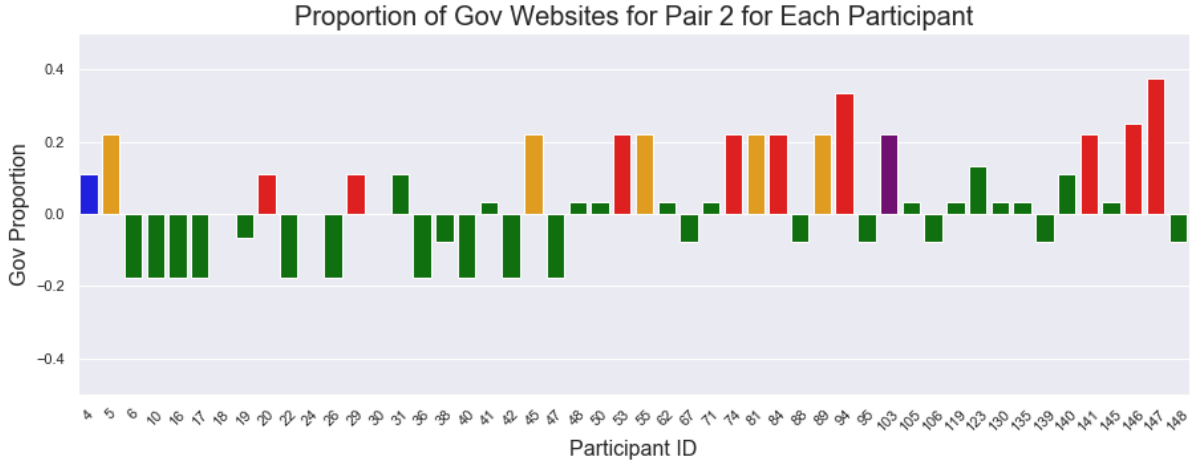
Out[110]:

	Pair 1	Pair 2	Pair 3	Pair 4	Pair 5
4	0.100000	0.111111	0.155556	0.100000	0.1
5	0.400000	0.222222	0.044444	0.122222	0.1
6	-0.125000	-0.177778	-0.044444	-0.200000	0.1
10	0.333333	-0.177778	0.055556	-0.200000	0.1
16	0.111111	-0.177778	0.055556	-0.200000	0.1

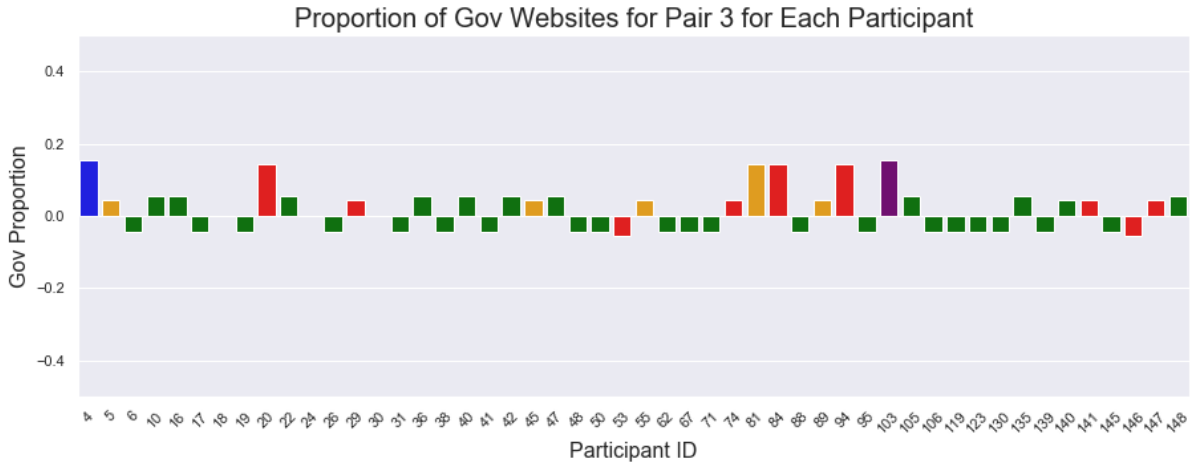
In [111]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=prodf.index,y=prodf["Pair 1"],palette=country_colors)
plt.xticks(rotation=45)
plt.ylim([-0.5,0.5])
plt.title("Proportion of Gov Websites for Pair 1 for Each Participant",fontsiz
e=20)
plt.ylabel("Gov Proportion",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



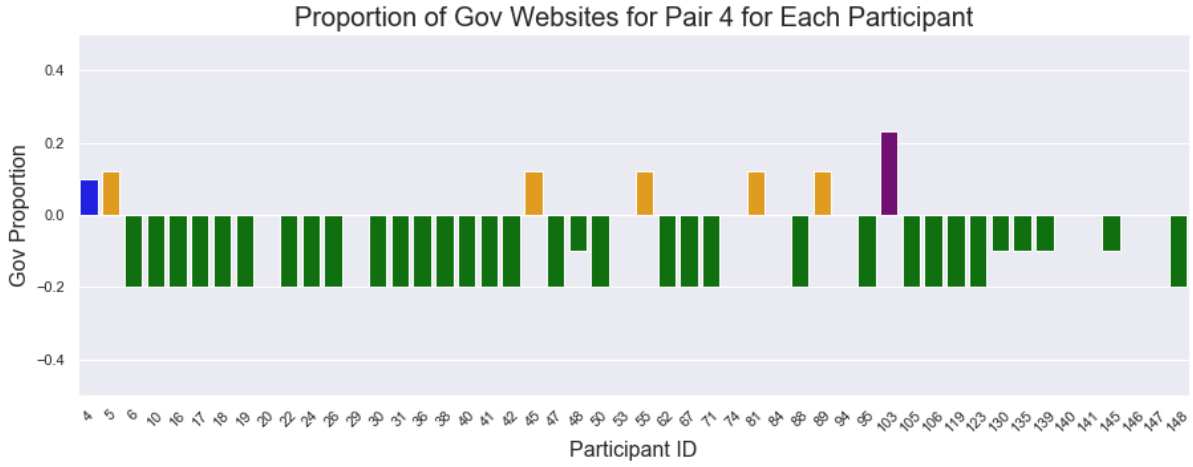
In [112]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=prodf.index,y=prodf["Pair 2"],palette=country_colors)
plt.xticks(rotation=45)
plt.ylim([-0.5,0.5])
plt.title("Proportion of Gov Websites for Pair 2 for Each Participant",fontsiz
e=20)
plt.ylabel("Gov Proportion",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



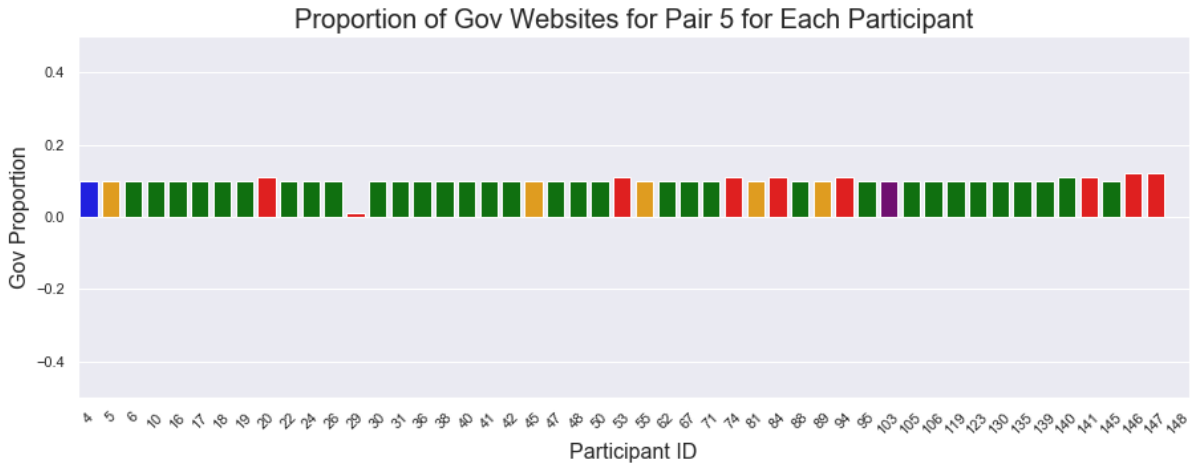
In [113]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=prodf.index,y=prodf["Pair 3"],palette=country_colors)
plt.xticks(rotation=45)
plt.ylim([-0.5,0.5])
plt.title("Proportion of Gov Websites for Pair 3 for Each Participant",fontsiz
e=20)
plt.ylabel("Gov Proportion",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



In [114]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=prodf.index,y=prodf["Pair 4"],palette=country_colors)
plt.xticks(rotation=45)
plt.ylim([-0.5,0.5])
plt.title("Proportion of Gov Websites for Pair 4 for Each Participant",fontsiz
e=20)
plt.ylabel("Gov Proportion",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```

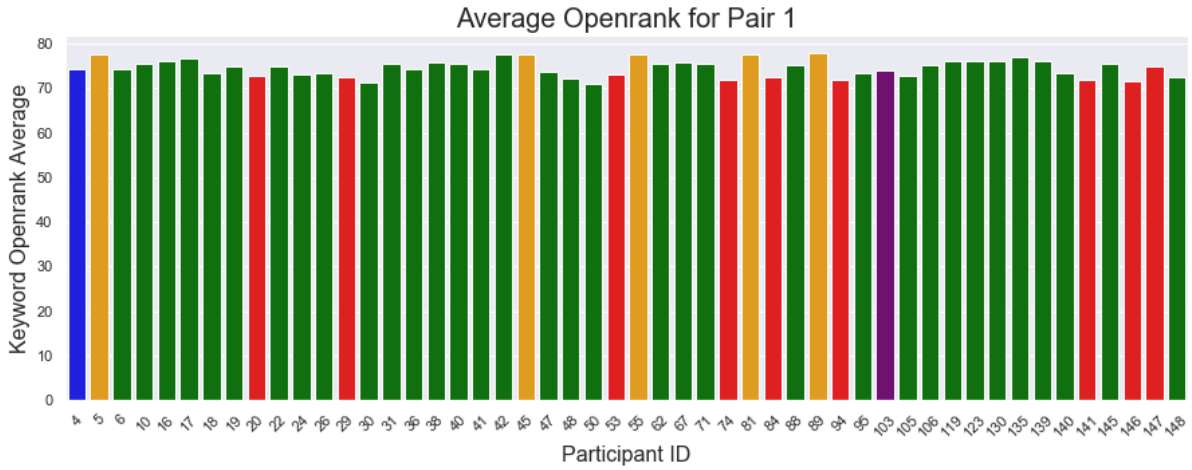


In [115]:
```
sns.set(rc={'figure.figsize':(15,5)})
sns.barplot(x=prodf.index,y=prodf["Pair 5"],palette=country_colors)
plt.xticks(rotation=45)
plt.ylim([-0.5,0.5])
plt.title("Proportion of Gov Websites for Pair 5 for Each Participant",fontsiz
e=20)
plt.ylabel("Gov Proportion",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```

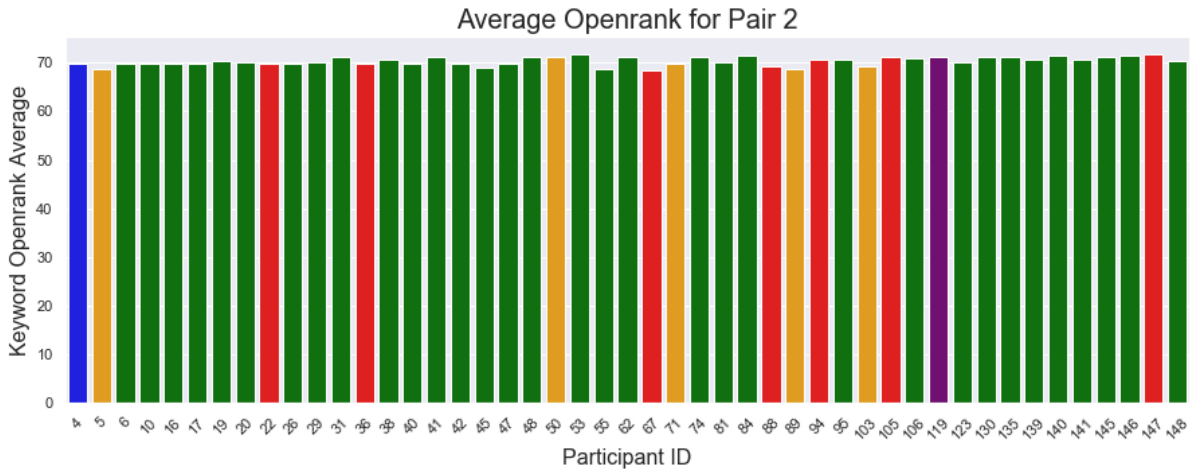


In [116]:
```
rankdf = dff.groupby(["Survey Id","Keyword Content"],as_index=False)[["Keyword
Openrank Average"]].agg("mean")

def get_pair_number(x):
    for idx,p in enumerate(pairs):
        if x in p:
            return idx + 1


rankdf["Pair Number"] = rankdf["Keyword Content"].apply(get_pair_number)
rankdf = rankdf.groupby(["Survey Id","Pair Number"],as_index=False)[["Keyword
 Openrank Average"]].agg("mean")
rankdf = rankdf.set_index("Survey Id")
# rankdf
```

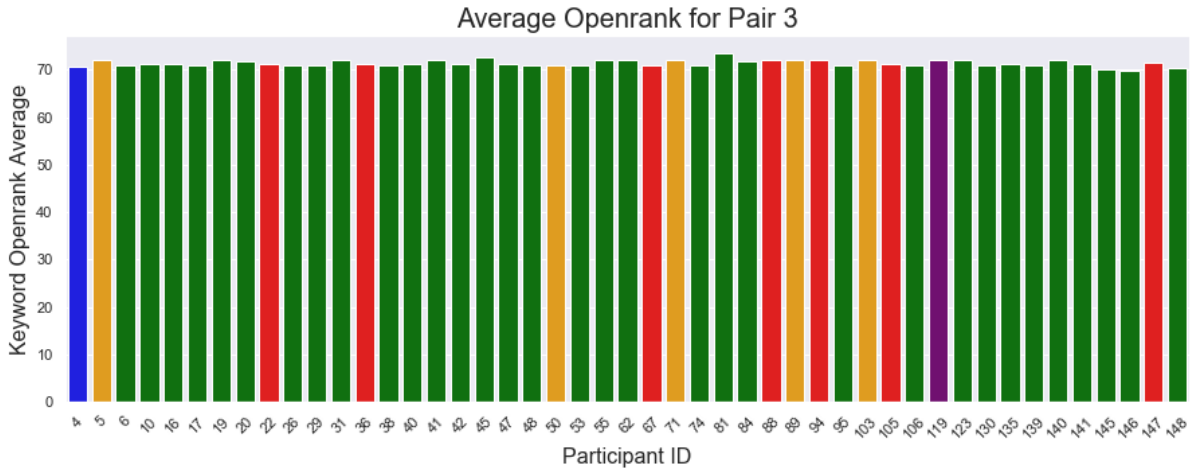
In [117]:
```
sns.set(rc={'figure.figsize':(15,5)})
d = rankdf[rankdf["Pair Number"] == 1][["Keyword Openrank Average"]]
sns.barplot(x=d.index,y=d["Keyword Openrank Average"],palette=country_colors)
plt.xticks(rotation=45)
plt.title("Average Openrank for Pair 1",fontsize=20)
plt.ylabel("Keyword Openrank Average",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



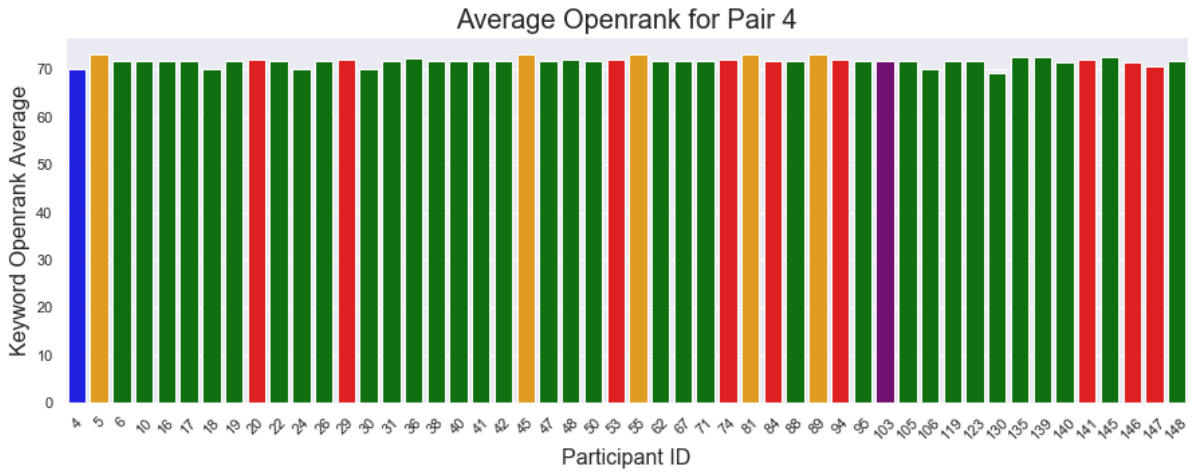
In [118]:
```
sns.set(rc={'figure.figsize':(15,5)})
d = rankdf[rankdf["Pair Number"] == 2][["Keyword Openrank Average"]]
sns.barplot(x=d.index,y=d["Keyword Openrank Average"],palette=country_colors)
plt.xticks(rotation=45)
plt.title("Average Openrank for Pair 2",fontsize=20)
plt.ylabel("Keyword Openrank Average",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



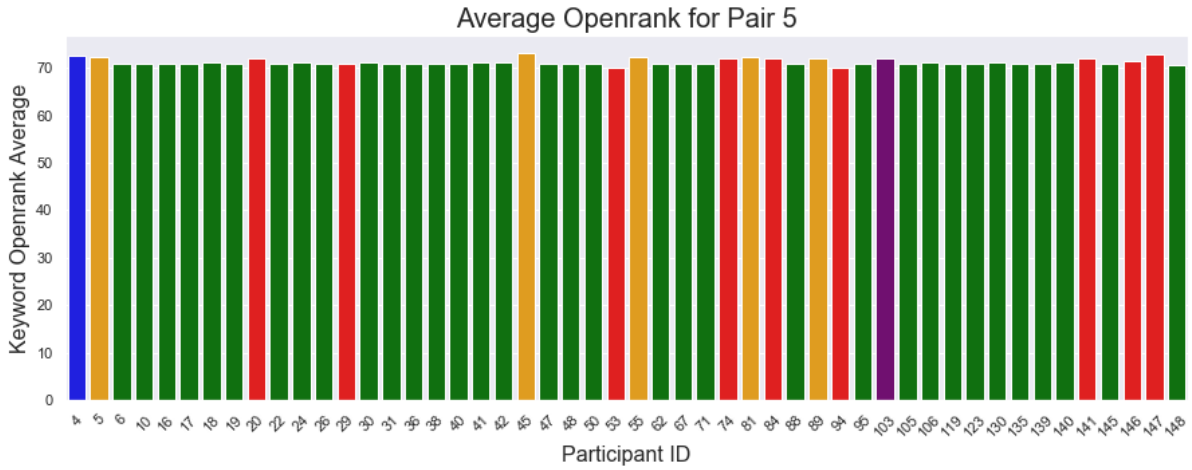
In [119]:
```
sns.set(rc={'figure.figsize':(15,5)})
d = rankdf[rankdf["Pair Number"] == 3][["Keyword Openrank Average"]]
sns.barplot(x=d.index,y=d["Keyword Openrank Average"],palette=country_colors)
plt.xticks(rotation=45)
plt.title("Average Openrank for Pair 3",fontsize=20)
plt.ylabel("Keyword Openrank Average",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



In [120]:
```
sns.set(rc={'figure.figsize':(15,5)})
d = rankdf[rankdf["Pair Number"] == 4][["Keyword Openrank Average"]]
sns.barplot(x=d.index,y=d["Keyword Openrank Average"],palette=country_colors)
plt.xticks(rotation=45)
plt.title("Average Openrank for Pair 4",fontsize=20)
plt.ylabel("Keyword Openrank Average",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



In [121]:
```
sns.set(rc={'figure.figsize':(15,5)})
d = rankdf[rankdf["Pair Number"] == 5][["Keyword Openrank Average"]]
sns.barplot(x=d.index,y=d["Keyword Openrank Average"],palette=country_colors)
plt.xticks(rotation=45)
plt.title("Average Openrank for Pair 5",fontsize=20)
plt.ylabel("Keyword Openrank Average",fontsize=16)
plt.xlabel("Participant ID",fontsize=16)
plt.show()
```



In [ ]:

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