###### **Group 1. The ‘undecided’ challenge**

###### What if there was an ‘undecided’ group in the population? Think of elections. You may only be able to vote option A or option B (like in the Brexit referendum) but equally you may decide not to go voting at all, therefore becoming an ‘undecided’. You can imagine that, for example, once the attractiveness of a given option falls below a certain threshold some of the believers do not want to follow it anymore but equally they may not want to sign up to the other option straight away. Or perhaps, initially everyone is ‘undecided’ and each option needs to attract followers. Try implementing this type of social dynamics into the code and see what happens.

###### **Group 2. The constantly shifting population challenge**

###### What if the population size was not static? Think of football fans. Once the national team makes it to the quarter finals everyone seem to become interested in football. At each time step the total number of people may grow or shrink depending on a newly defined function. Perhaps, at every time step the population grows by the same amount or the increase depends on the difference in attractiveness between the cultural options, or one of the options crosses a certain attractiveness threshold? What would happen if one of the options was less attractive but was able to ‘produce’ more believers? Try implementing this type of social dynamics into the code and see what happens.

###### **Group 3. The resilience challenge**

###### Occasionally even the most unexpected things happen. Think of a political party. They may be thinking they are sailing smoothly to a victory in the next elections but instead a political earthquake happens and a large proportion of their supporters shifts alliances. Some parties seem to be resilient to such catastrophic events, while other succumb to them easily. Some characteristics increase and some decrease the resilience of each option. Often, it matters if the option is particularly strong or weak at the time of the event Similarly, different types of events (a sudden shift of believers, a sudden drop in attractiveness, etc) may have different effect? Try implementing this type of social dynamics into the code and see what happens.

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