QUASI-EPIDEMIOLOGICAL MODELING IN PHONOGRAPHIC MARKETS

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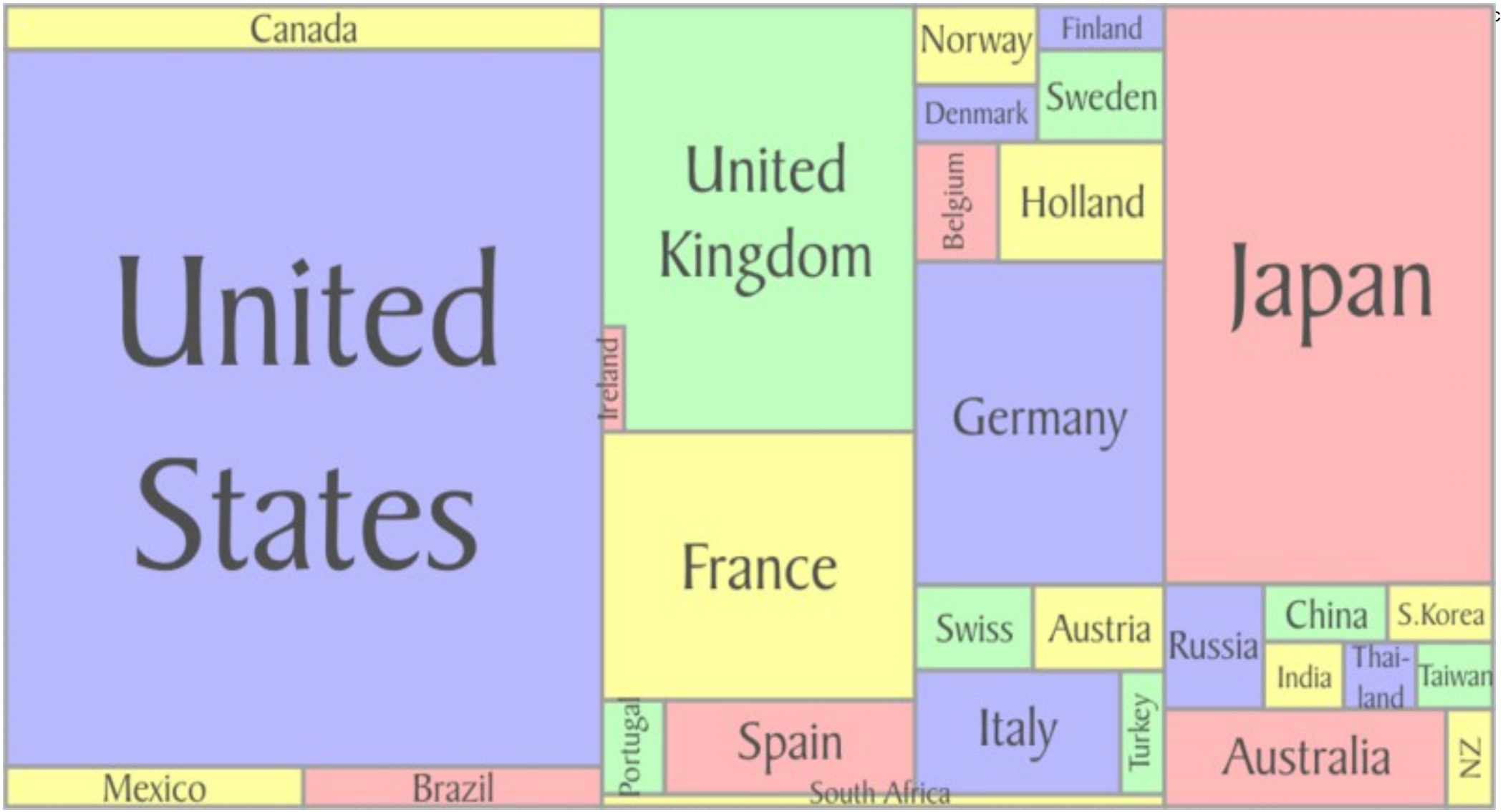
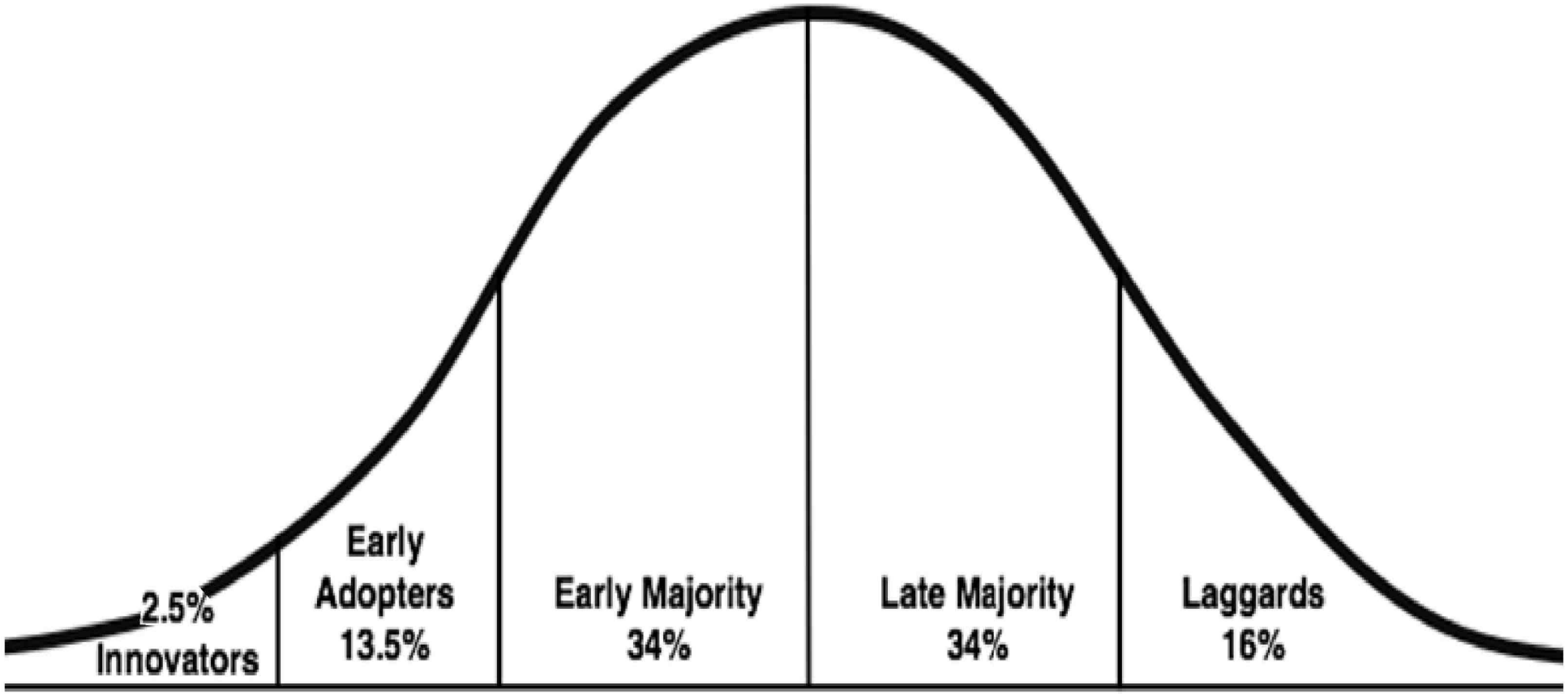
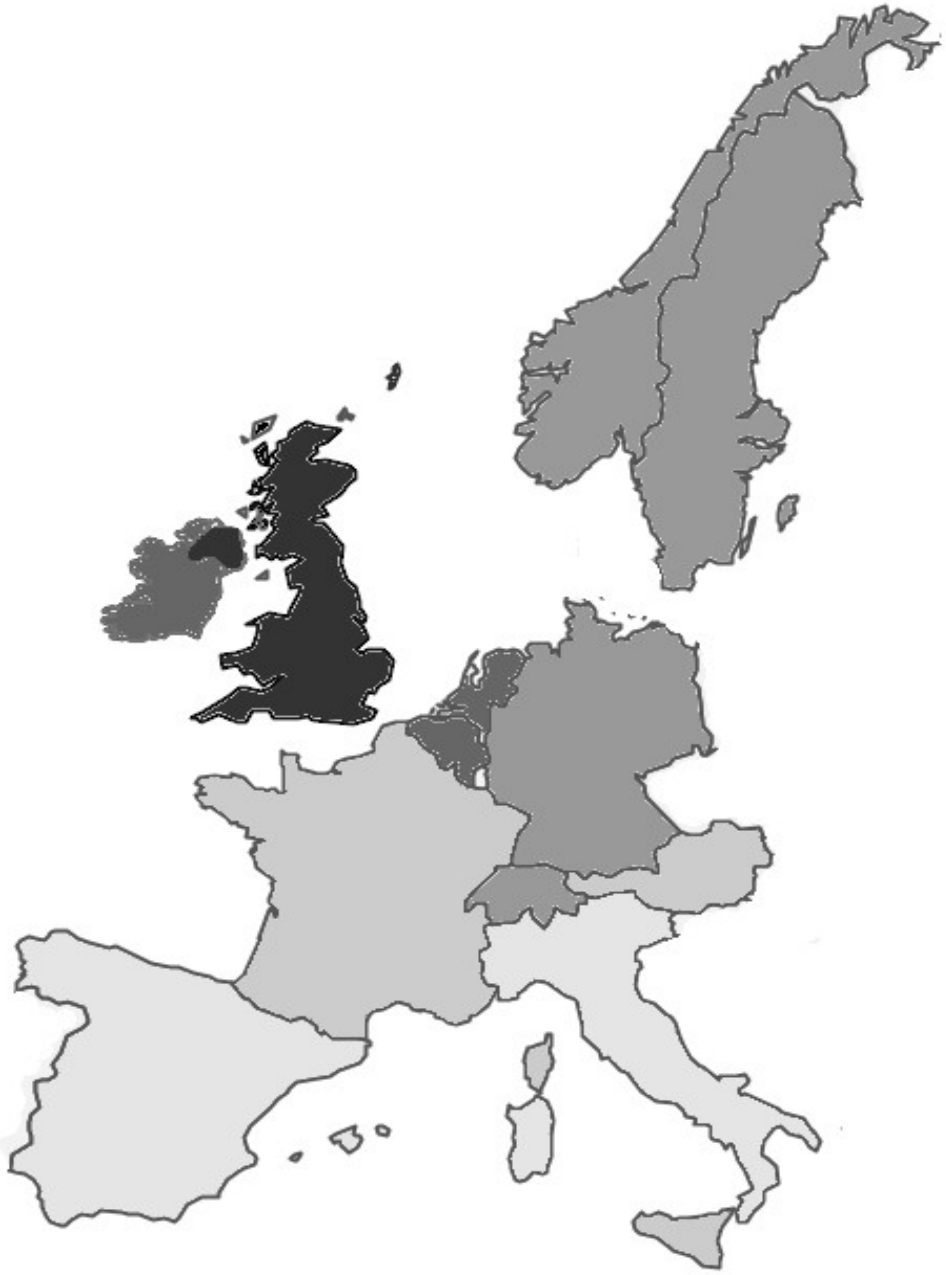
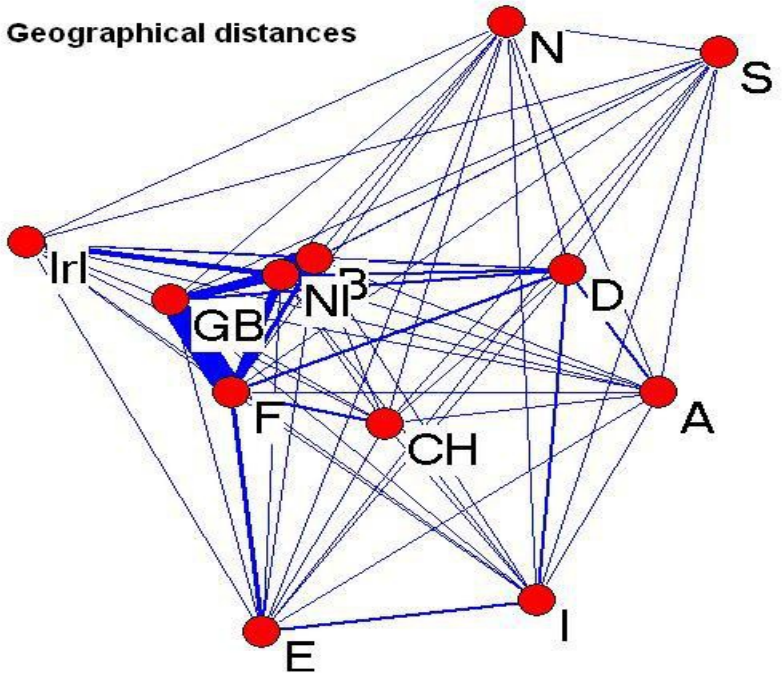


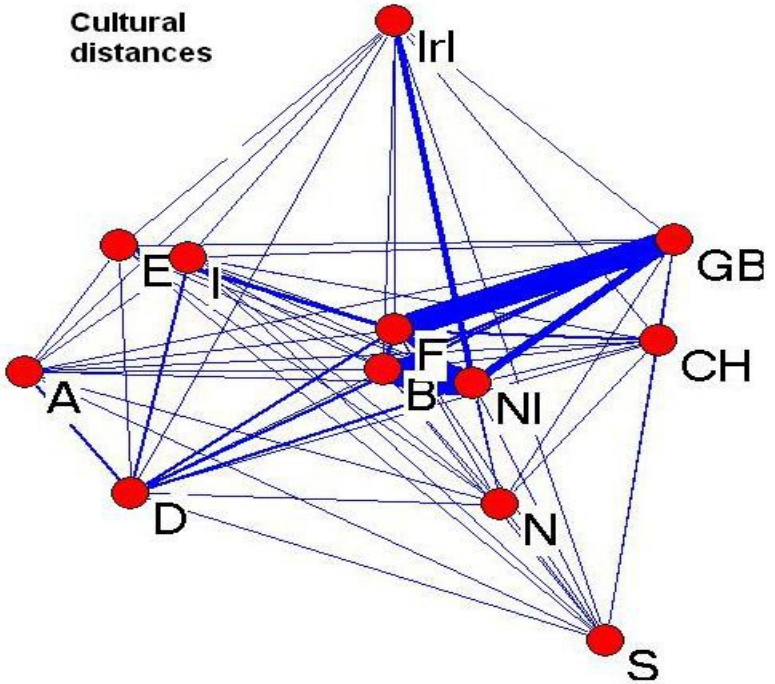
According to the IFPI more than 95% of the global revenue of music in 2003 was derived from the biggest 30 major countries in the proportion shown above, organized by geographic location



Popularity spread as a classic trajectory of product life-cycle



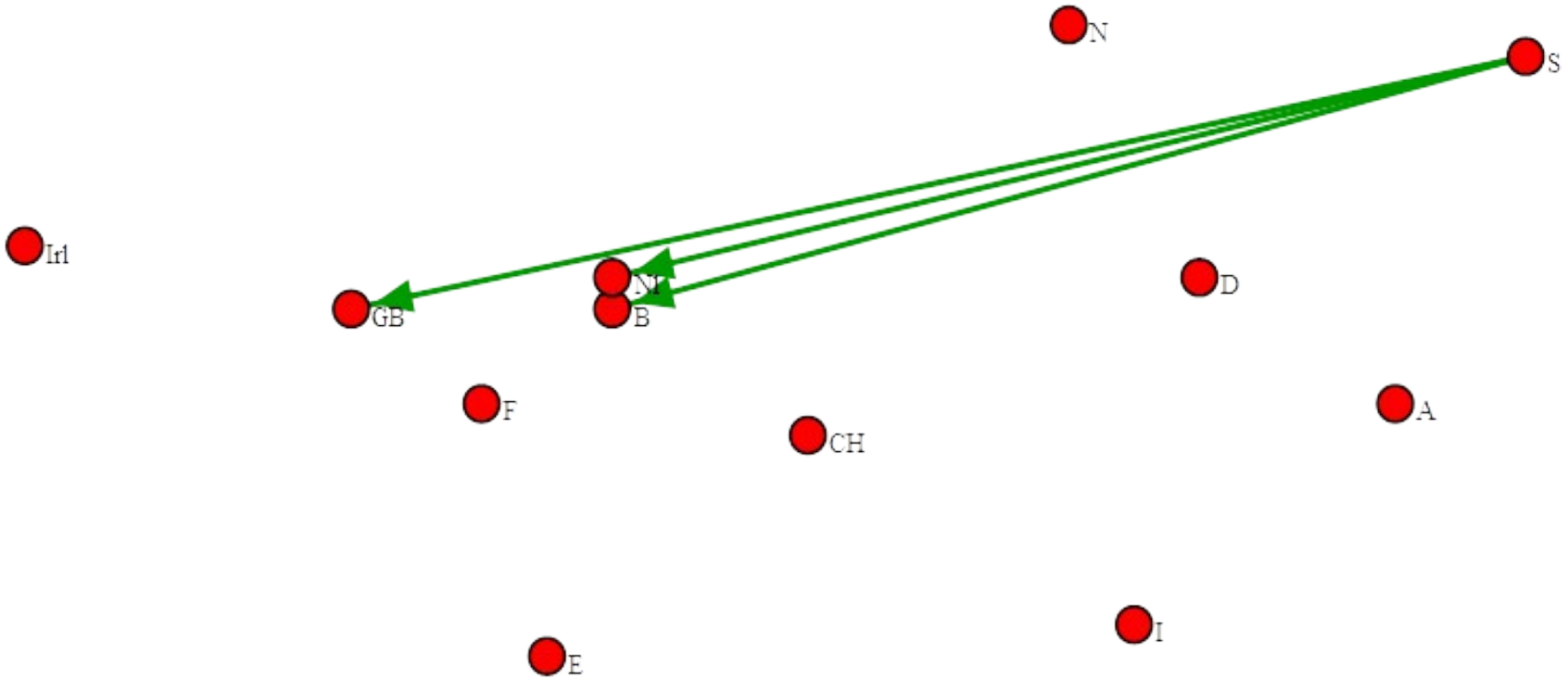

Geographical distances
N
S
Irl
B
Nl
GB
D
A
F
CH
I
E


Cultural distances
Irl
E
I
GB
F
CH
A
B
Nl
D
N
S

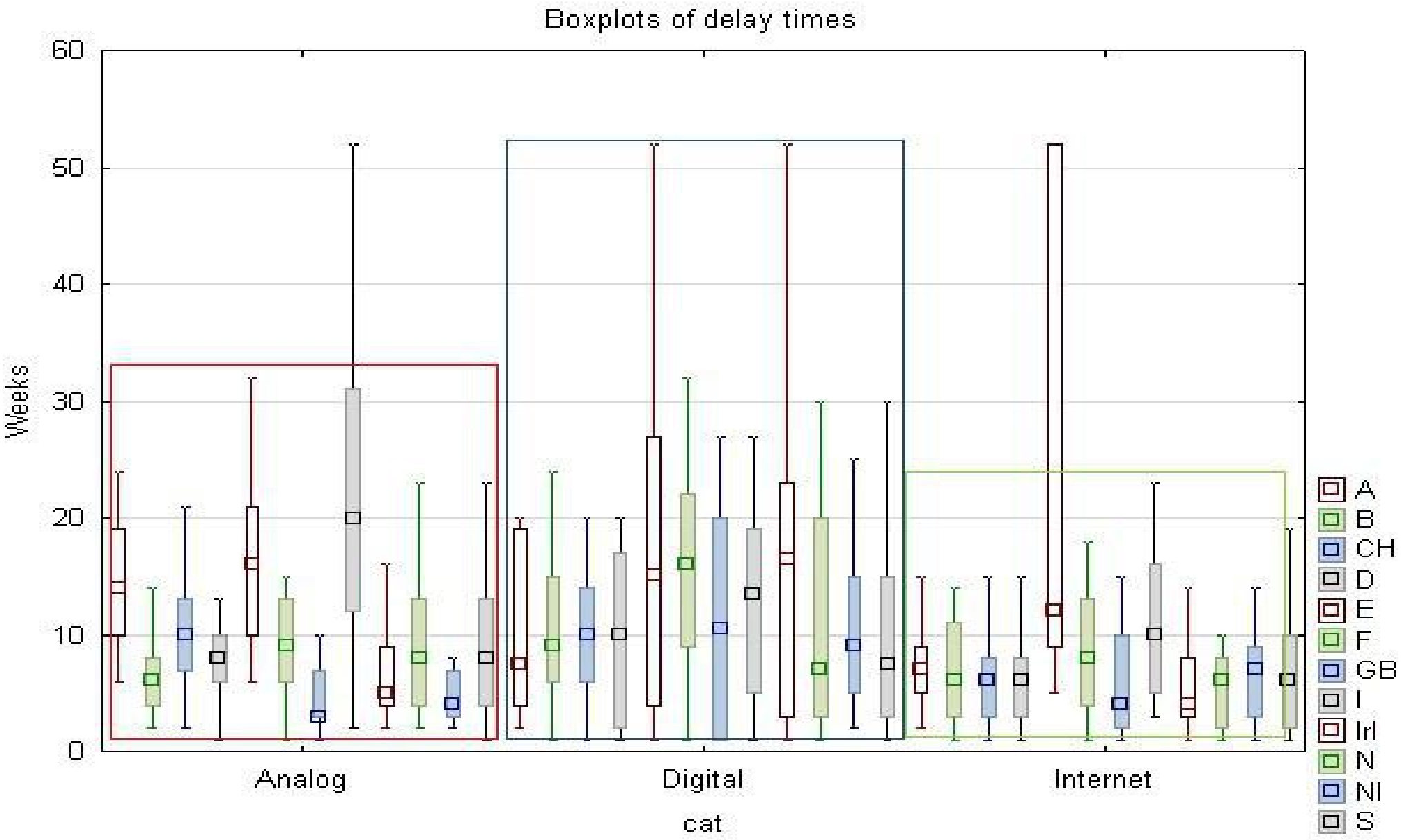
Tab. 1 Higher and higher chart positions in the national charts by Rihanna's 'We Found Love' within 8 weeks. After reaching the top position, cells are matched in grey because a country is infected.

Country	1st week	2nd week	3rd week	4th week	5th week	6th week	7th week	8th week
A	-	-	-	12	12	4		
B	3							
CH	3	3	2	2	2	1		
D	-	-	-	1				
E	15	14	14	9	9	9	5	3
F	1							
GB	-	1						
I	-	-	-	7	4	4		
IRE	-	3	1					
N	1							
NL	14	3						
S	2	2	2	2	1			

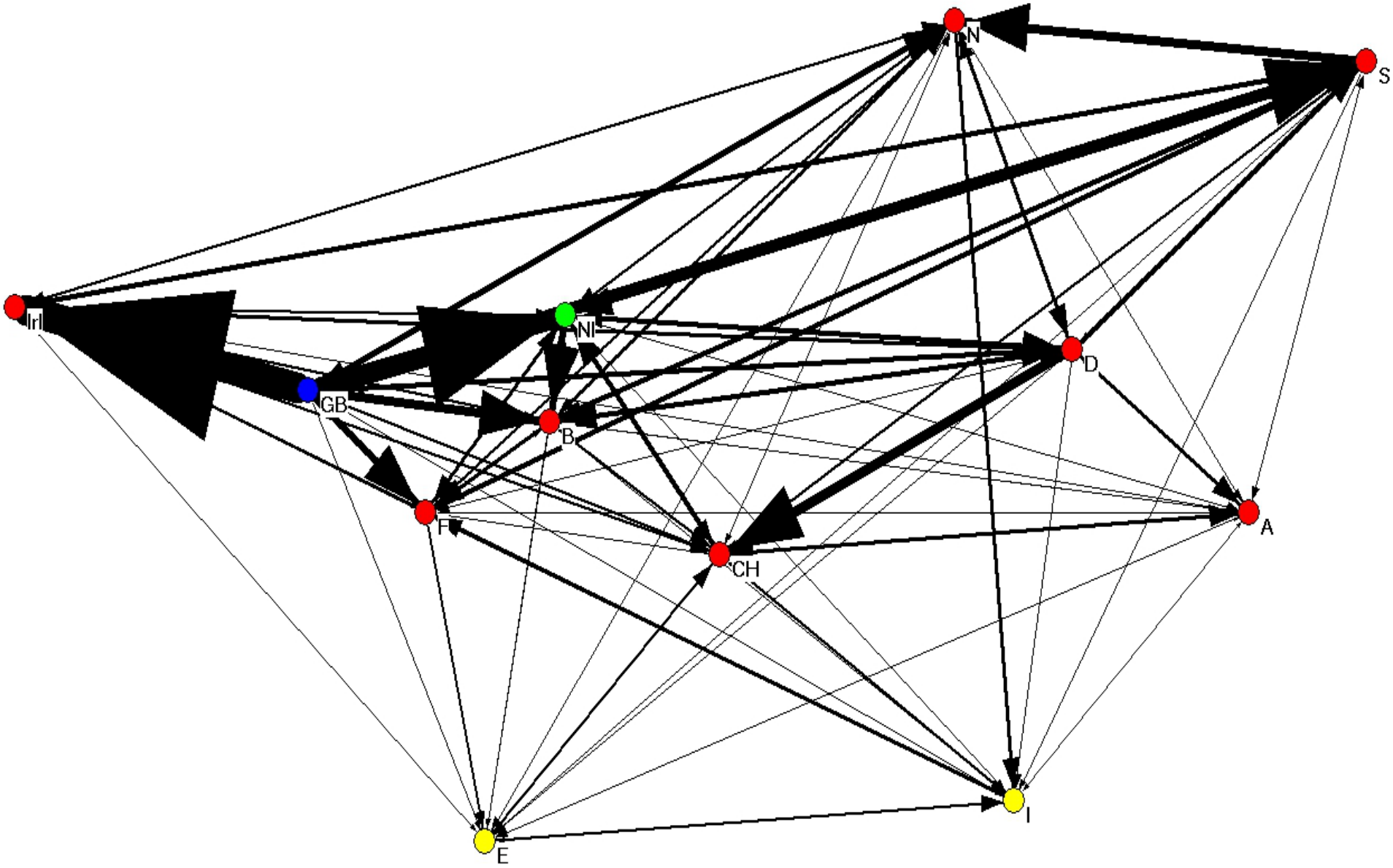
single	year	A	B	CH	D	E	F	GB	I	Irl	N	NI	S
ABBA - DANCING QUEEN	1975	12	2	7	5	26	7	2	52	5	4	2	1



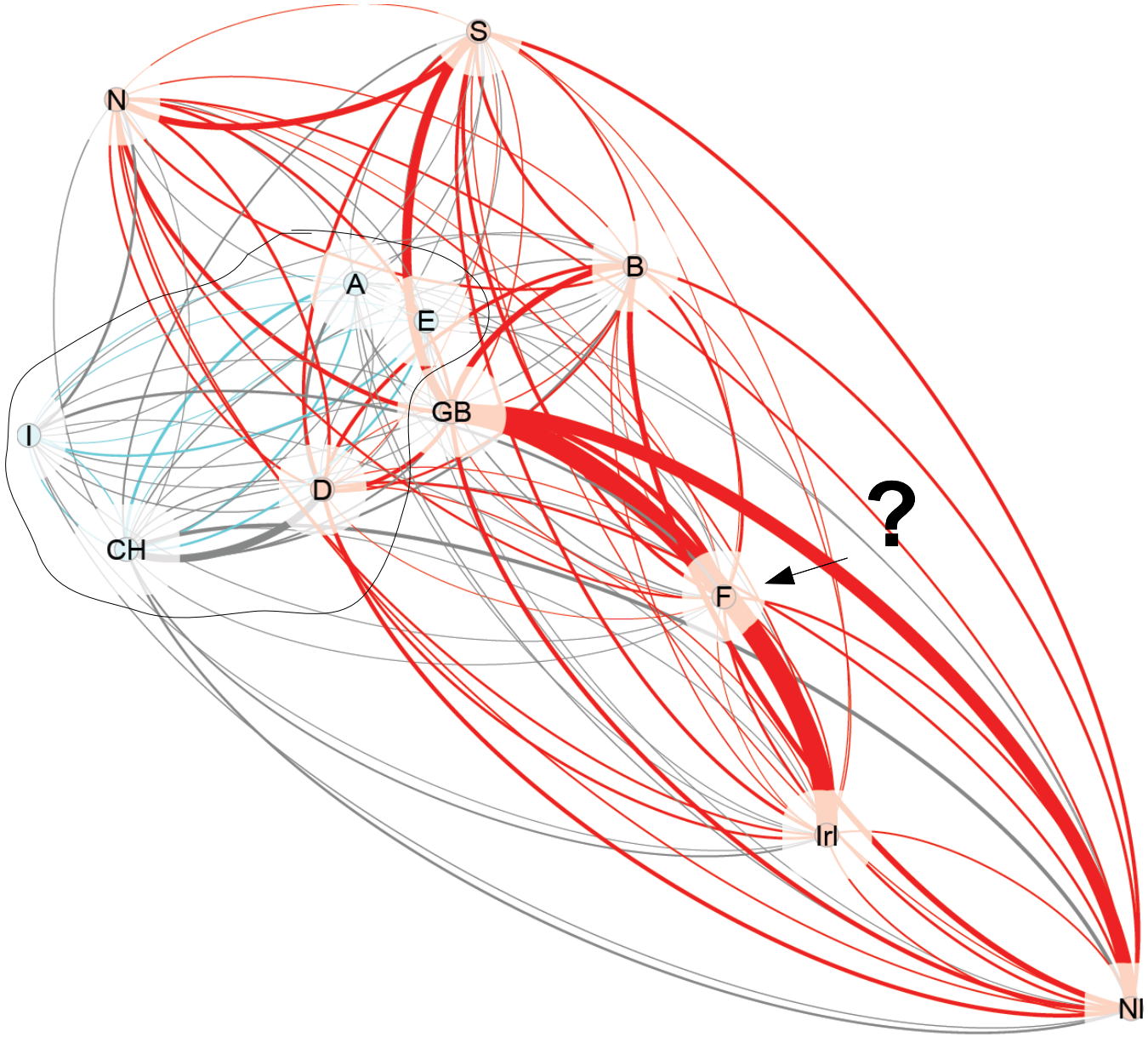
Start Animation Current Slide: 1



Boxplot of time delays in various ages (1966-2016)



We obtain network of popularity spread with: a **hub – the UK**, a **bridge – the Netherlands** and **outliers – Italy and Spain**.

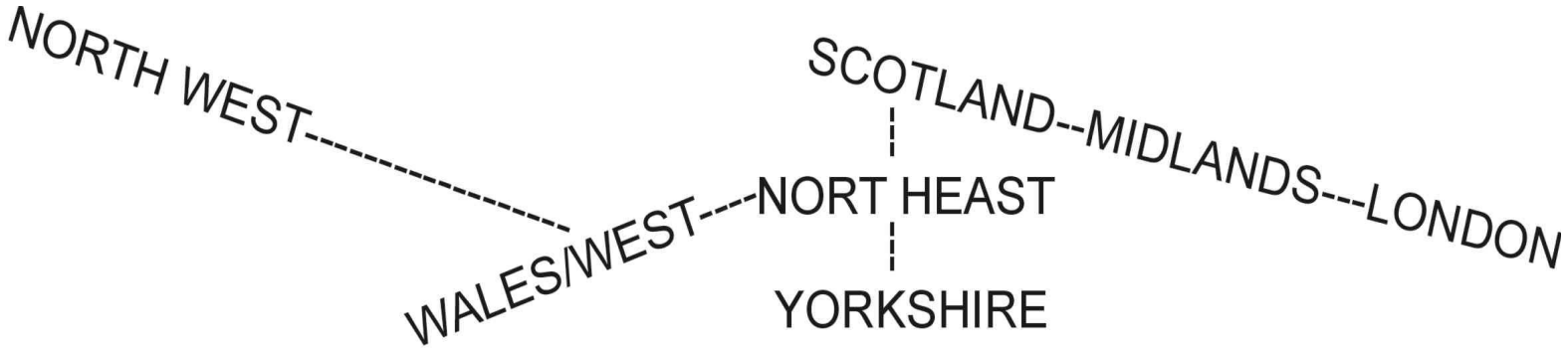


degree	out	in
A	23	36
B	60	65
CH	45	63
D	75	53
E	16	27
F	43	50
GB	192	36
I	17	36
Irl	43	89
N	49	65
Nl	74	94
S	55	78

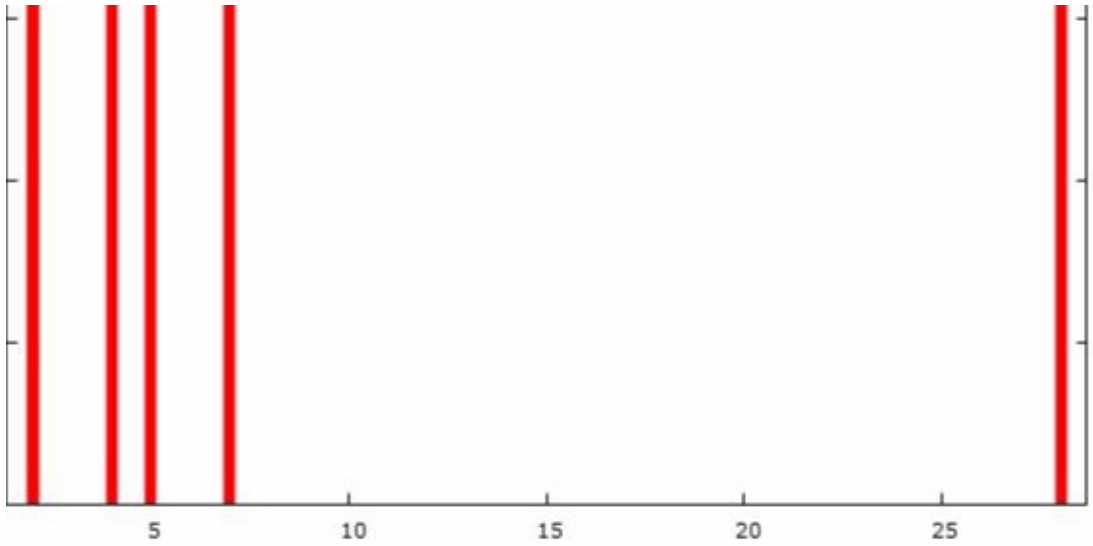
The most likely paths of infections has been already explained by stochastic model where network of European countries becomes a directed graph that contains two subnetworks (clusters):

- Scandinavia, Benelux, UK, Ireland and Germany
- Spain, Italy, Switzerland and Austria

The first one contains countries that easy catch all infections, the second one is more conservative. However, France belongs once to infectious community once to resistance community.



Minimum spanning tree based on correlations sales



Eigenvalues obtained for correlation sales matrix 50x50 based on record sales from 1978

Agent-Based Modeling of the global phonographic market

1. The global phonographic market contains 100 subnetworks that represent local national markets (their size is randomized from uniform distribution expressed in logarithmic scale)

2. Each of national markets has a Barabasi-Albert network structure. Capitals in these subnetworks are defined by nodes with the highest connectivity

3. All the 100 national subnetworks are connected by their capitals only. The weight of connections between capitals w_{ij} is chosen randomly from normal distribution (and represents cultural connections between countries)

4. Each product (song) has different attractiveness expressed by the parameter ***a*** that belongs to [0,1]

5. The initial node for each product life-cycle is chosen randomly from the entire global phonographic market network

6. In the next consecutive step, the product (song) might be contagious to nearest neighbour ***j*** with the probability:

$$p_j(a) = \frac{a}{c_j} \qquad (3)$$

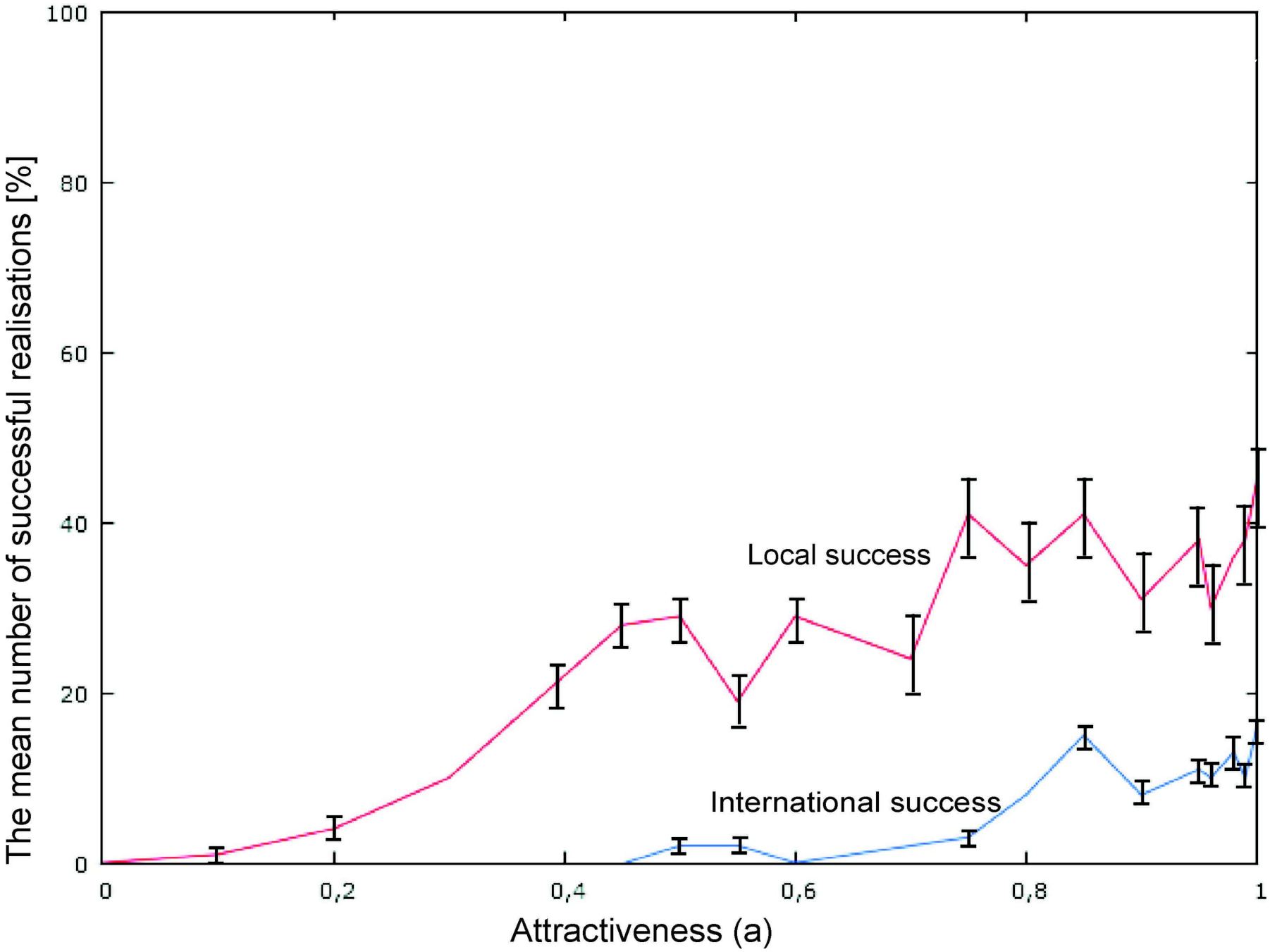
where c_j is the connectivity of node ***j***.

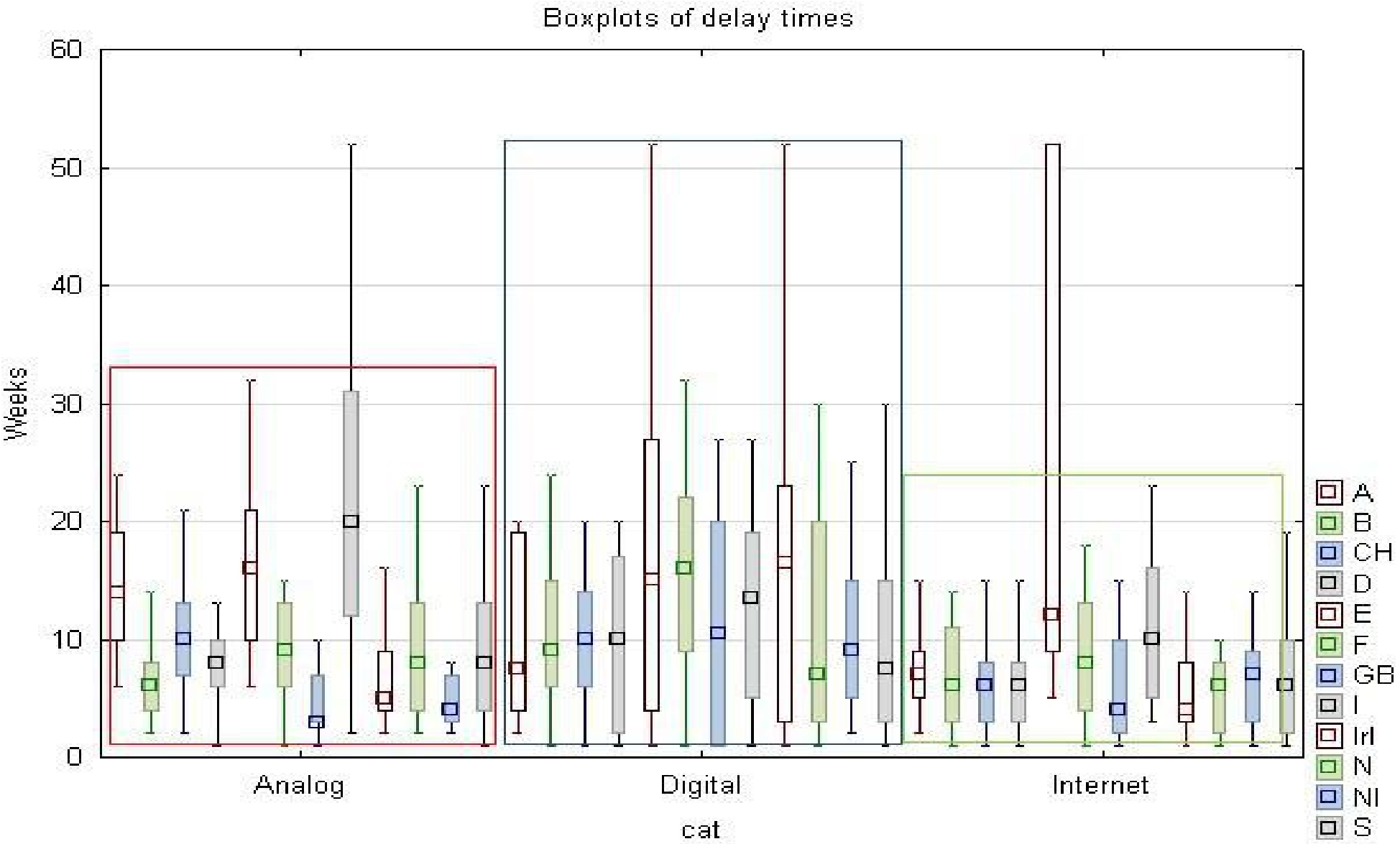
7. Whenever the product on the national market comes to the capital node i, the popularity is exported to all other capitals j as well, according to formula:

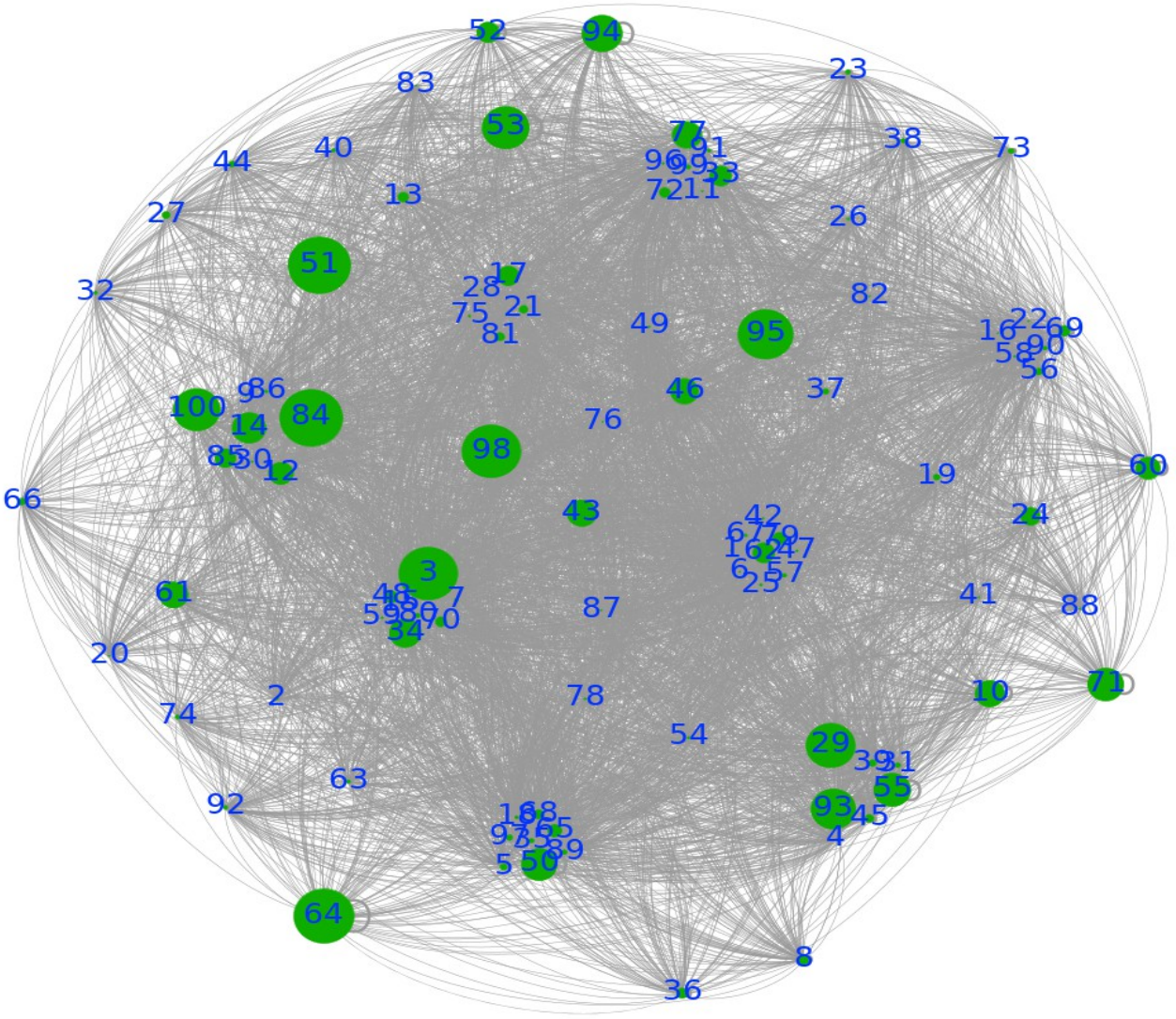
$$p_j(a) = w_{ij}\frac{a}{c_j} \qquad (4)$$

where ***w***ij represents the weight of cultural connection between capitals ***i*** and ***j***, chosen randomly from normal distribution (and represents cultural connections between countries).

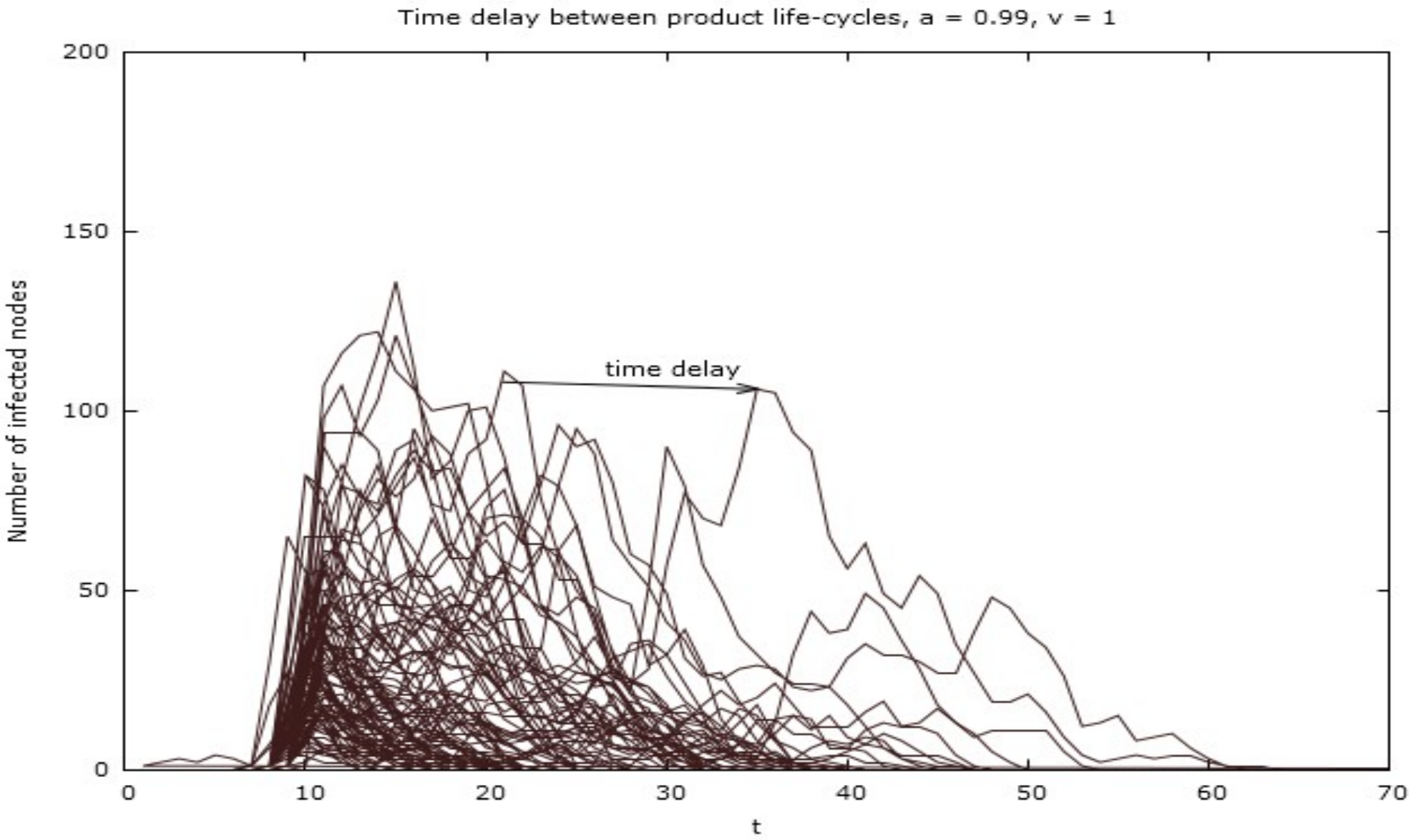
8. For all the contagious nodes, it is possible to introduce additional external parameter ***v*** (natural number) that represents time of being contagious in another steps of simulation. Economy usually determines v = 2 when customers buy a hit single from the retailer (who orders another part from record labels in the same week). In the second week, customers are affected and share their opinion about a song with the nearest neighbors, and so on


100
80
60
40
20
0
0
0,2
0,4
0,6
0,8
1
The mean number of successful realisations [%]
Attractiveness (a)
Local success
International success

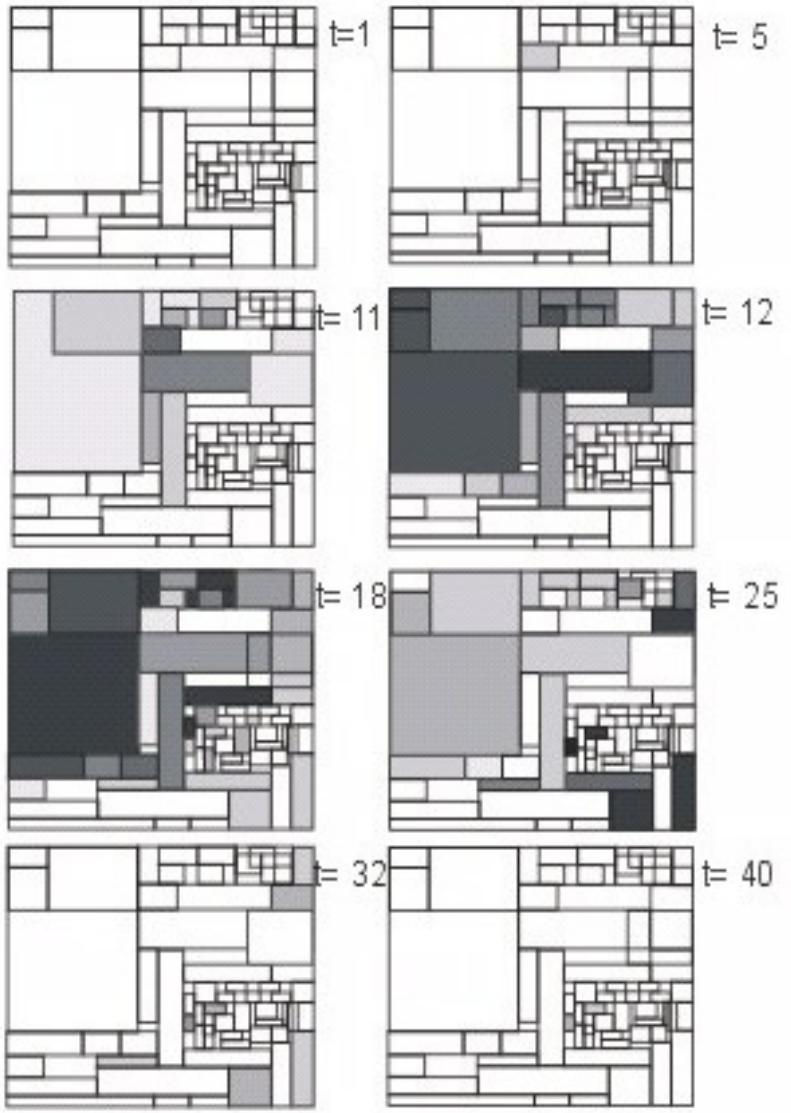

Boxplots of delay times
60
50
40
30
20
10
0
Weeks
Analog
Digital
Internet
cat
A
B
CH
D
E
F
GB
I
IrI
N
NI
S



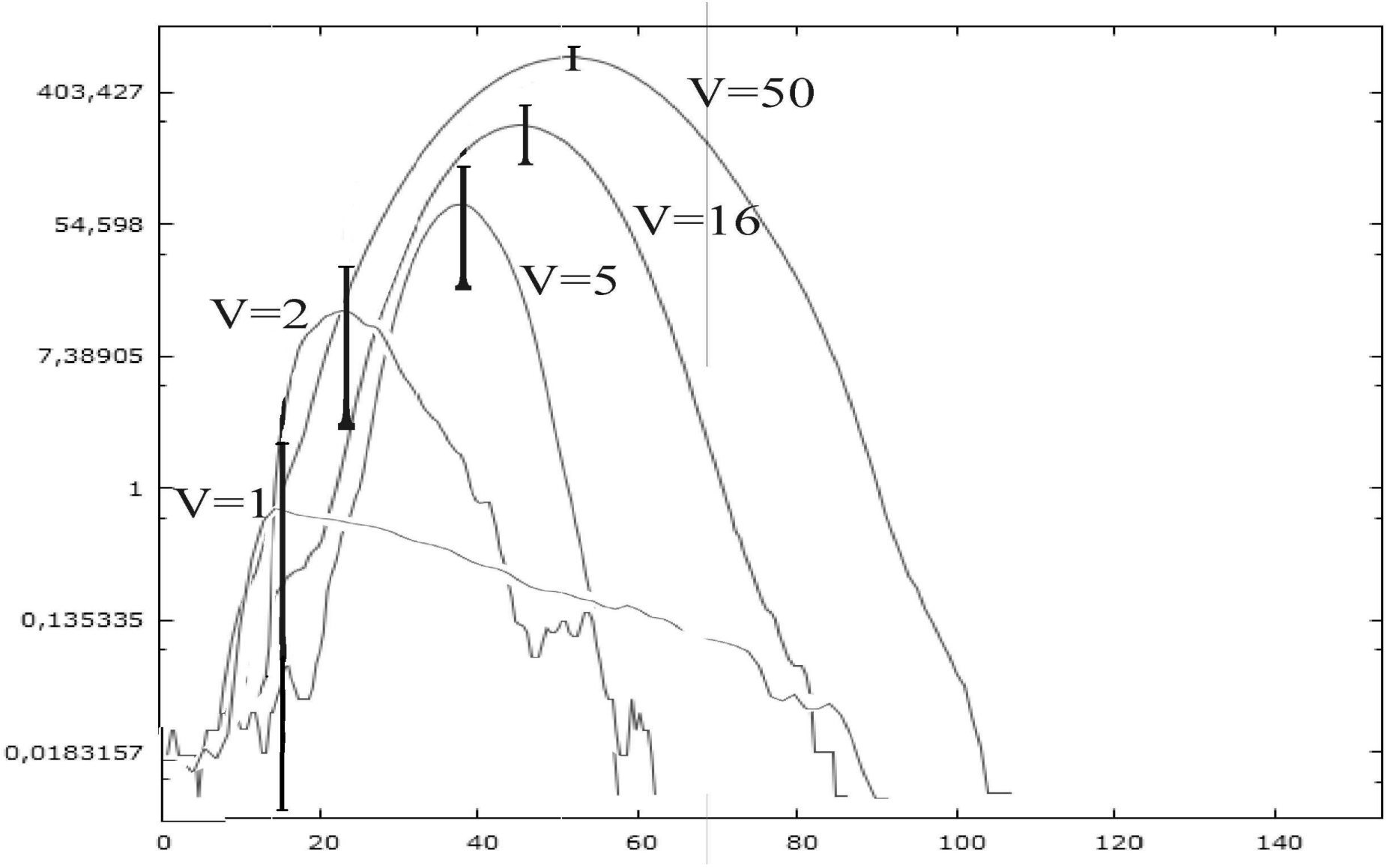
Phemomena observed in Analog and Digital may be explained after introducing clusters of countries to the global phonographic market



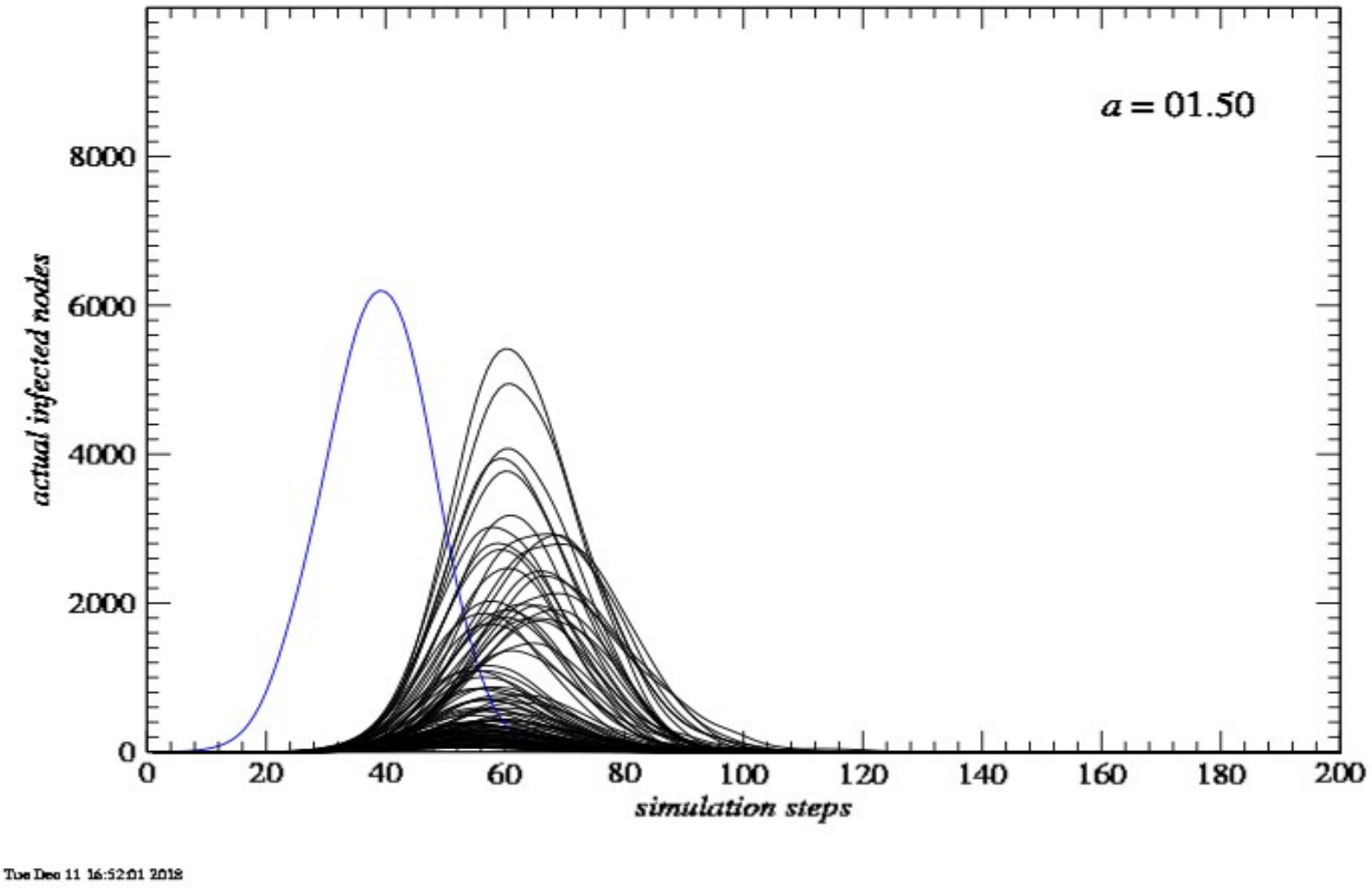
Product life-cycle is a bunch of local trajectories



Spatial product life-cycle v=2, a=1



The average number of infected nodes for a=1 and various nodes' durabilities v



Product life-cycle for extended v=15, a=1.5