NATIONAL RESEARCH UNIVERSITY

Nobel Prizes and the scientific community: Why do Russian scientists receive so few Nobel Prizes?

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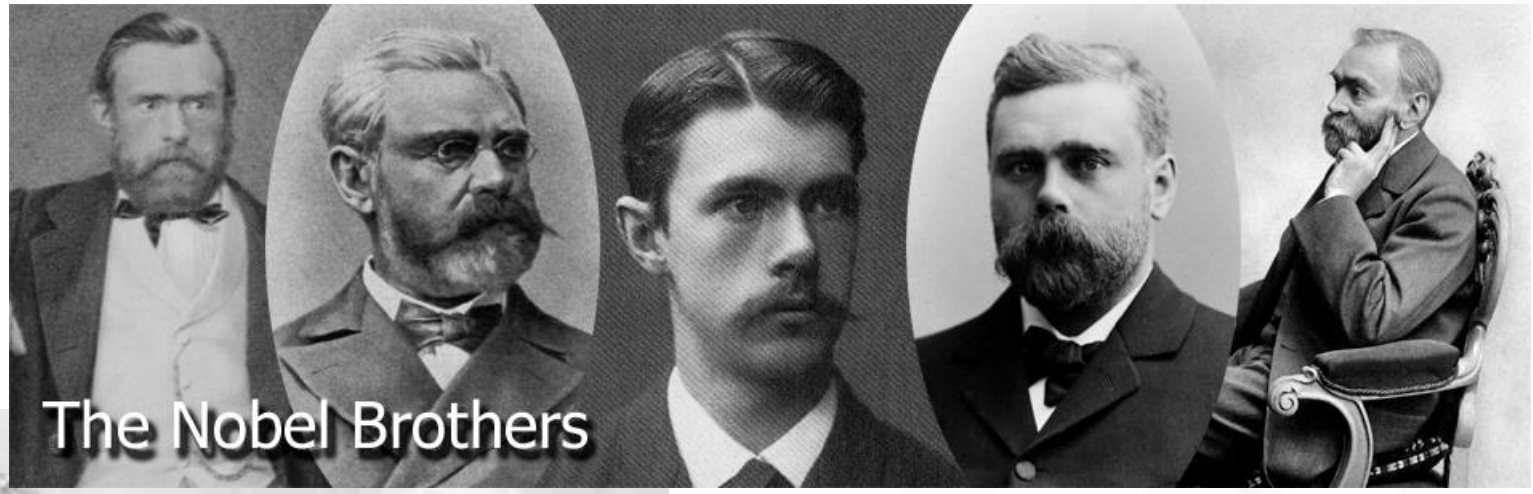
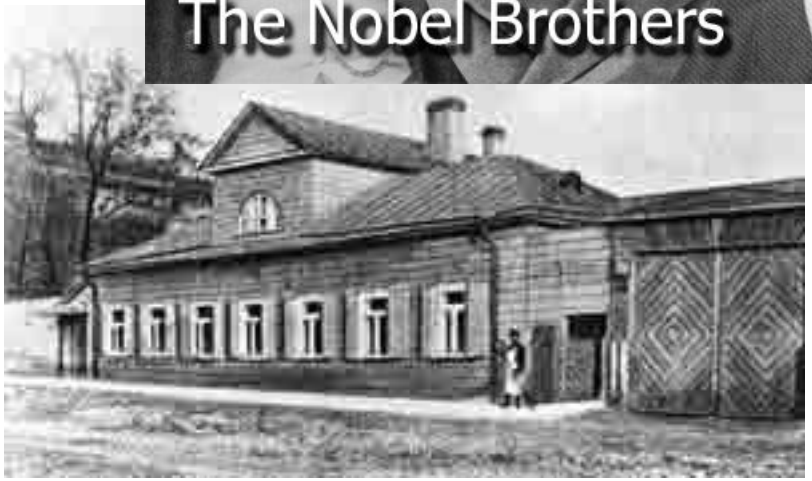
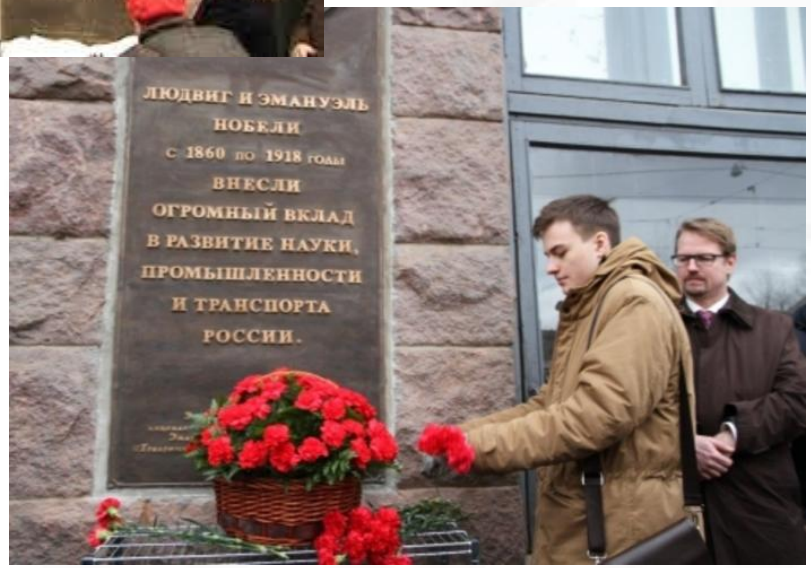
The Nobel Family in Saint Petersburg





The Nobel Family Memorials in Saint Petersburg



The Nobel Prize

The Nobel Prize "Chauvinism"

Table 4.4. *Nobel prize nominations made in favor of "own country" candidates by nominators of major countries, 1901–1915*

Nominator's country	Percentage of nominations (*N* in parentheses)	
	Physics	Chemistry
Germany	52 (97)	57 (94)
France	76 (80)	83 (53)
Great Britain	75 (39)	48 (14)
United States	48 (16)	57 (17)
Sweden	8 (6)	15 (10)
Netherlands	52 (13)	0
Italy	46 (17)	23 (3)

Sources: Nobelprotokoll, KVA; Protokoll, NK, fysik, NK, kemi, 1901–1915.

Table 4.5. *Nobel prize nomination "chauvinism" index, 1901–1915*

Nominator's country	Physics	Chemistry
Germany	37	33
France	62	71
Great Britain	61	39
United States	44	53
Sweden	5	12
Netherlands	47	– 0.4
Italy	44	20
Other Nordic countries	8	22
Central and Eastern[a] Europe	3	6
Other countries[b]	– 2	33

Note: The "chauvinism index" is constructed as follows (using Germany as an example):

$$\frac{N \text{ Germans nominated by Germans}}{N \text{ German nominators}} - \frac{N \text{ Germans nominated by non-Germans}}{N \text{ non-German nominators}} \times 100$$

[a]Austria, Czechoslovakia, Hungary, Poland, and Russia.
[b]Belgium, Canada, Spain, and Switzerland.
Sources: Nobelprotokoll, KVA; Protokoll, NK, fysik, NK, kemi, 1901–1915.

Source: Crawford, E. (1984). The Beginnings of the Nobel Prize Institution.

Russian Scientists Recipients of the Nobel Prize, 1947-2013

Physics*
в 1958 - Павел Черенков, Игорь Тамм и Илья Франк,
в 1962 - Лев Ландау,
в 1964 - Николай Басов и Александр Прохоров,
в 1978 - Петр Капица,
в 2000 - Жорес Алферов,
в 2003 - Виталий Гинзбург.

Chemistry*
в 1956 - Николай Семенов

Economics*
в 1975 - Леонид Канторович

Physiology and Medicine*
никто со времён Ивана Павлова (1904)

*Working in Russia during the year of the award

Question

Problem:
The number of awards is too few, compared to the contribution of Russian scientists to science

Question:
«Why Russian scientists do not (often) receive international awards such as the Nobel Prize?»

Processes contributing to recognition by the Nobel Prize

1. Development and the achievements of the national science
2. Incorporation of national achievements in the international science
3. The work of the Nobel committee (the collection of nominations, evaluation process, the selection by consensus or by other means)

Suggested Factors that May Influence the Bestowal of Nobel Prizes to Russian Scientists

Internal factors:

1. Lack of conditions (financing, purchase of equipment and materials, the bureaucratization of public institutions, decent salary and housing) for research, forcing scientists to emigrate, and enthusiasts to continue to work in the country,

2. Status and the lack of respect for science in modern Russia,

3. Poorly developed system of scientific communication, where colleagues do not notice the discoveries of fellow Russian scientists,

4. Self-criticism among domestic scientists who do not promote the achievements of their colleagues, which leads to a small number of Russian scientists among the nominators for the Nobel Prize.

Suggested Factors that May Influence the Bestowal of Nobel Prizes to Russian Scientists

External factors:

1. Peripheral status of Russian language in the world of science – journal articles in Russian are not read, and as a result, foreign scientists are not able to assess the contribution of Russian scientists

2. Russian scientists are unknown or insufficiently known in the international scientific community,

3. A small number of Russian winners and nomination letters from Russian scientists and allotted to Russian scientists,

4. Political factors and ideology that science can develop freely only in certain political and economic systems.

Data and Methods

Data:

1.Nobel Prize winners (N = 494) from 1947 to 2013 in physics, chemistry, medicine and economic sciences (Nobelprize.org)
2.Citation ranking from Essential Science Indicators (Thomson Reuters' Web of Science)
3.Economic indicators (OECD - Organisation for Economic Co-operation and Development)
4.Socioeconomic indicators (World Bank data)

Methods:

1.Descriptive statistics: Migration and collaboration patterns of Nobel Prize winners,
2.Descriptive statistics: Time trends in awarding Nobel Prizes by country,
3.Negative binomial regression models that evaluate the factors influencing the number of Nobel Prizes received by scientists of different countries.

Descriptive Statistics

Переменная	*Описание*	*Min*	*Max*	*Mean*	*Median*	*SD*
GERD per researcher	Среднее расходов (million current PPP $) на науку с 1981 по 2010 на ученого: Внутренние затраты и финансирование всех компаний, научно-исследовательских институтов, университетов, лабораторий, занимающихся научной деятельностью.	33.28	261.84	138.63	143.12	59.35
		Russia=33.28				
Total Researchers (FTE)	Среднее число ученых в стране (1981-2010): Кадровые данные по полной и частичной занятости ученных.	2159	883060	136879	36134	230315
		Russia=495257				
Research Positions in Labor Force	Среднее количество научных работников на тысячу занятости в стране с 1981 по 2010.	0.7	11.85	5.07	5.35	2.47
		Russia=6.9				
Prior Nobel Awards	Количество лауреатов Нобелевской премии в науках в стране до 1947.	0	38	4.3	0.5	9
		Russia=1				
Prior Nobel Awards81	Количество лауреатов Нобелевской премии в науках в стране до 1981.	0	137	11	2	27
		Russia=10				
Citation Ranking	Рейтинг цитирования (Web of Science) страны во всех областях (2003-2013).	1	82	21.09	19	16.53
		Russia=23				

Hypotheses

1 . Socioeconomic model

H1: The average spending on science from 1981 to 2010 per scientist (in million current PPP $),

H2: The prevalence of researchers – the average of researchers in a country per thousand labour force from *1981 to 2010,*

H3: The number of full-time equivalent (FTE) researchers.

2 . Socio-scientometric model

H4: Science leadership prior to 1947 (and 1981),

H5: Science status in 2013 – citation rating of a country across all disciplines,

H6: The average number of researchers in a country per thousand labour force from 1981 to 2010.

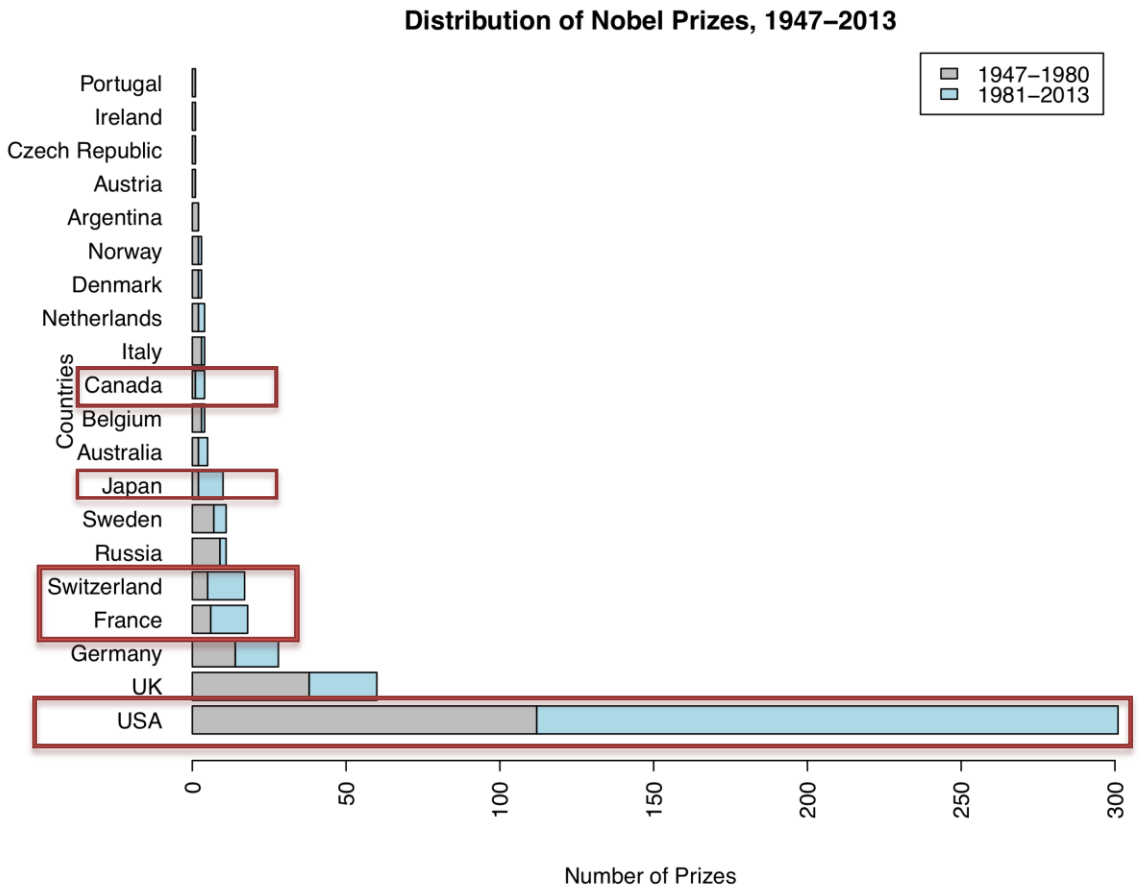
Results(1)

1. Migration and collaboration patterns of Nobel Prize winners:

a) *Distribution by country*

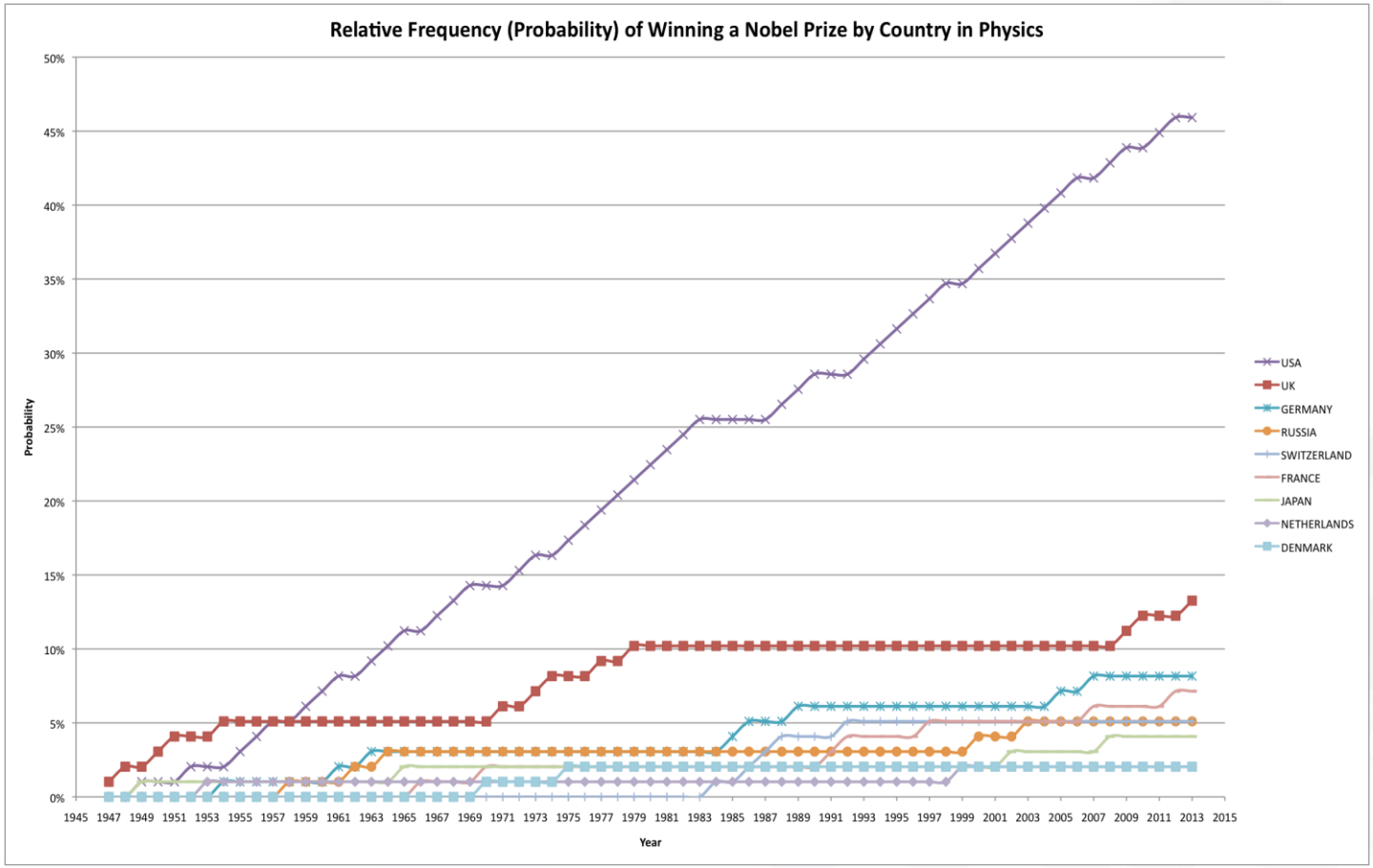
Before 1947:
Germany (N=38),
UK (N=26),
USA (N=25) and
France (N=15)

After 1947:
USA (N=301),
UK (N=60),
Germany (N=28), and
France (N=18)



Results(1)

1*. The changes in probabilities of receiving a Nobel Prize based on the number of prior Nobel Prize winners in the country



Results (1)

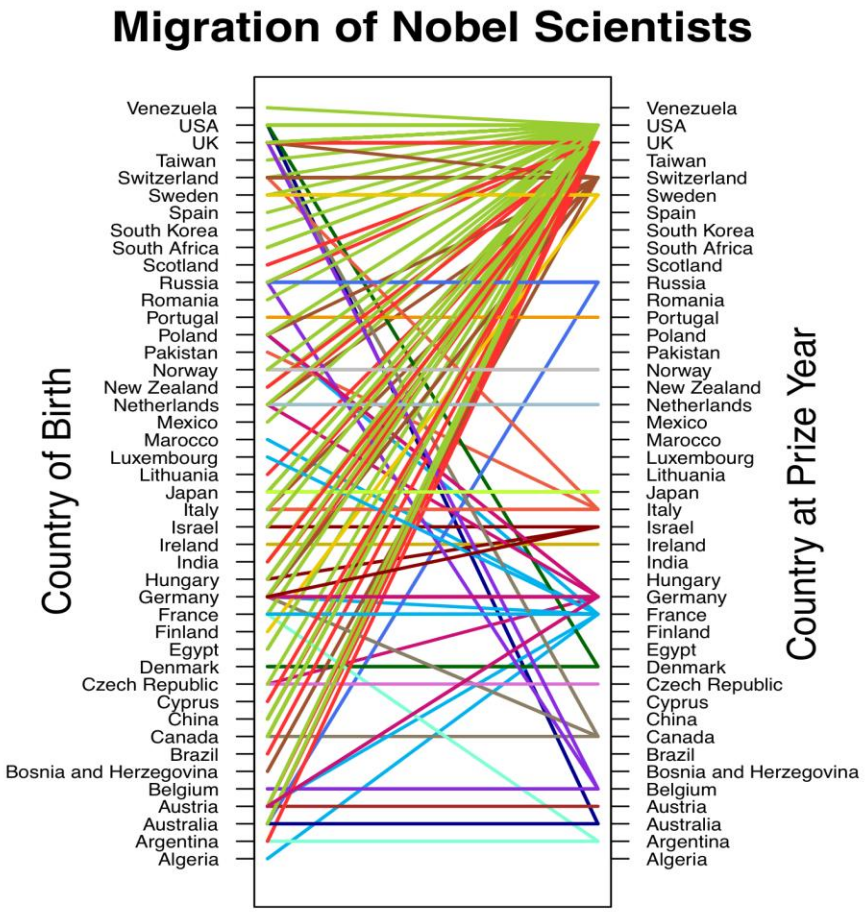
1. Migration and collaboration patterns of Nobel Prize winners:

b) Migration

Born in 43 different countries of the world
(23 European countries, 8 Asian, 4 South American
4 African, 2 North American и 2 Oceanic)
→ Scientists of 21 countries received a Nobel Prize

About one third of future Nobel Prize winners migrated and received their Nobel Prizes while working in a different country.

Countries where scientists move to:
USA and UK.



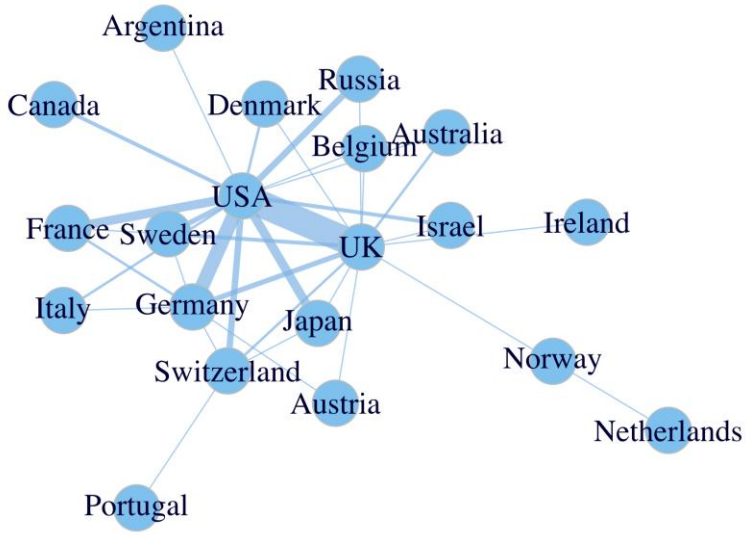
Results (1)

1. Migration and collaboration patterns of Nobel Prize winners:
c) Collaboration

US scientists are most likely to receive joint awards, often with scientists from other countries (N=72).

UK (N=40), Germany (N=21), France (N=10) и Switzerland (N=10)

Russian scientists often receive joint awards, in most cases with scientists from the US and the UK.



3a. Regression models and the factors influencing the number of Nobel Prizes (DV):

1)The results of the negative binomial regression, DV – the counts of Nobel Prizes per country (1947-2013)

	Модель 1 *Социоэкономическая*			**Модель 2** *Социо-наукометрическая*		
Independent variables (scaled)	Coefficient	S.E.	Odds Ratio	Coefficient	S.E.	Odds Ratio
Constant	1.454	.276	4.283	1.059	.252	2.884
GERD per researcher	.783	.289	2.189**			
Research Positions in Labor Force	.592	.286	1.806*	0.410	.243	1.507
Total Researchers (FTE)	.895	.262	2.448***			
Prior Nobel Awards				.944	.234	2.571***
Citation Ranking				1.013	.392	2.755**
Model Evaluation						
-2 Log likelihood		164.56			162.12	
AIC		174.56			152.12	
N		32			32	

*p<.05 **p<.01 ***p<.001 (two-tailed tests)

3b. Regression models and the factors influencing the number of Nobel Prizes (DV):

1)The results of the negative binomial regression, DV – the counts of Nobel Prizes per country (1981-2013)

	Модель 1 *Социоэкономическая*			**Модель 2** *Социо-наукометрическая*		
Independent variables (scaled)	Coefficient	S.E.	Odds Ratio	Coefficient	S.E.	Odds Ratio
Constant	.372	.335	1.45	-0.40	.387	.297
GERD per researcher	1.229	.334	3.417***			
Research Positions in Labor Force	.769	.324	2.157*	0.432	.236	1.54 .
Total Researchers (FTE)	.904	.280	2.47**			
Prior Nobel Awards 1981				.618	.386	1.855***
Citation Ranking				2.117	.158	8.31***
Model Evaluation						
-2 Log likelihood		127.3			107.96	
AIC		117.3			97.96	
N		32			32	

*p<.05 **p<.01 ***p<.001 (two-tailed tests)

Conclusions

1.Scientific leadership throughout the 20th century has not changed much, only the positions of leaders (US, UK, Germany and France) have slightly changed. However, if we consider the number of Nobel laureates per million of population then the most "gifted" countries become Switzerland, Sweden, USA, UK and Israel.

2.High levels of migration (31%) among the Nobel laureates confirm that creative and talented researchers are mobile. The US and UK are not only the centers of emigration for talented scientists, but also the workplaces of jointly recognized colleagues.

3.Spending on science (per scientist) and country's citation rating (science status) have strong predictive power in explaining the number of Nobel Prizes.

4.The choice of a prize winner is a political process and may be the result of weighing multiple factors (including age, subfield, discipline and committee preferences), and not only merit and contribution to science.

Thank you for your attention!

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