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Science walks on two legs, but social sciences try to hop on one

When invited to give this keynote presentation, I hesitated between a broad topic and a specific one. The broad one is that science walks on two legs, but social sciences try to hop on one. They focus on empirical analysis that answers the question "How things are?" but neglect the logical quantitative models that answer the question "How things *should be* on logical grounds?" This is the question that guides empirical inquiry. In its absence too much of what passes as quantitative political science boils down to mindless application of canned statistics programs. Junk in, junk out. Even good data processed in ways that sin against logic lead to faulty or suboptimal results.

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I have criticized these lazy habits in my book on *Making* Social Sciences More Scientific: The Need for Predictive Models (2008). Hands-on advice on how to do a better job is given in my book manuscript freely available on the Internet: Logical Models and Basic Numeracy in Social Sciences (2014).

For this presentation, however, I finally chose a specific topic that is of substantive interest in political science. Incidentally, it offers a specific example of how to walk on two legs, logical and empirical. My approach is definitely quantitative, but I see little need to apply statistics. My talk focuses on how to test the validity of the so-called Duverger's law (1951, 1954) at the nationwide level. This research is as yet unpublished, and I hope to get useful feedback from you. But first, let us see what the so-called Duverger's law is about.

The tendency called Duverger's law

Countries such as United Kingdom, Canada and the US allocate their legislative assembly seats by the Single Member Plurality (SMP) rule, also called First-Past-The-Post. Each electoral district has just one seat, and the candidate with most votes wins this seat. The so-called Duverger's law is best expressed as: "Single Member Plurality tends to go with two major parties".

This works in both directions. Single Member Plurality tends to lead to only two major parties. And two-party systems tend to originate from SMP rule (Colomer 2005). Indeed, Duverger explicitly stated that other widely used electoral rules tend to lead to more than two major parties. (For broad analysis of electoral and party systems, see Lijphart [1994] and Taagepera [2007].) So, "SMP tends to go with two major parties." This statement has become widely quoted in political science (Grofman, Blais and Bowler 2009). But its law-like nature remains disputed. Laws are absolute. They do not say: "You should *tend* to drive on the right side of the road". They do not say: "Opposite electric charges *tend* to attract each other." No, they always attract, period.

So, instead of Duverger's law I'll rather talk of Duverger's *tendency*, until law-like firmness is demonstrated. Maurice Duverger himself would agree. Thirty years ago (1984) he claimed merely a tendency, saying that it's the *American* authors who have called it Duverger's *law*, especially Riker (1982). The question is, how strong is this tendency?

This tendency would have law-like firmness if two complementary conditions were satisfied. First, if SMP rule always led to two-party systems; and conversely, if all two-party systems originated from SMP rule.

In contrast, suppose only one-half of all SMP elections led to two-party systems, and only one-half of all two-party systems originated from SMP rule. This would mean complete randomness, and Duverger's tendency would be completely rejected. Where do we stand in reality, between these two extremes? By the way, are we talking about votes or seats? Is it votes parties receive in electoral districts, or seats they win in the national assembly? Duverger implied both. First, in each electoral district only two parties emerge to compete for votes. Then, by some quite fuzzy process, these parties turn out to be the same two parties in each district, so that assembly seats go only to these two parties. OK, such connection may exist. But we would have to test the presumed tendency at both levels –district votes and assembly seats.

To carry out such a test, we must define what we mean by having two and only two major parties. Duverger's statement implies that either there are two major parties, or there are not. But is it really such an either-or situation? And can we tell which way it is? Here we face trouble.

Let us begin with a single electoral district. A vote distribution 50-50-0 would clearly be two-party, while 34-33-33 clearly would not – this is an almost perfect 3-party situation. But suppose we have 40-40-20. I have checked that knowledgeable people cannot agree on whether this constellation is or isn't two-party. When also allowed to say "hard to tell", they most often do so. So, here we have something that can gradually vary from being fully two-party to not being at all

two-party. I'll call this variable "two-partyness". Before we can even start to test the validity of Duverger's tendency we must define an operational way to measure this two-partyness. This is harder than it may look.

Why the Laakso-Taagepera effective number of parties can misread two-partyness

Almost 40 years ago Markku Laakso and I devised the Laakso-Taagepera effective number of parties (Laakso and Taagepera 1979). This effective number undercounts the smaller parties, using the following device. Use relative vote or seat shares of parties, so that they add up to 1. Square them, sum them, and then take the inverse. For instance, 40-40-20 sums up to 0.402+0.402+0.202=0.36. Then the effective number is 1/0.36=2.8 – slightly less than 3. This effective number is quite useful in investigating how an increasing number of parties affects various political and economic outputs. It seemed that two-partyness, too, could be measured simply by looking at how close the effective number is to 2. But it does not work out.

Consider again a single district. If the votes are 50-50-0, this is clearly a perfect two-party constellation. And the effective number is 2.0, indeed. This is nice. What is less nice is that the effective number is also 2.0 for constellation

66–17–17. Hardly anyone would call this a two-party constellation. Which of the two 17% parties would we include and which one would we exclude? Then how can this lead to 2.0 effective parties?

This is so because 66–17–17 deviates from the two-party image in *two opposite* directions. It is too much "one-party" because the top party dominates too much. And it is also too much "three-party" because the second and third parties carry equal weight. Here excessive "one-partyness" and excessive "three-partyness" do *not* average out into to a happy mean of two parties, as the effective number would suggest. To the contrary, these two excesses compound the deviation from two-partyness. I am very proud of the Laakso-Taagepera effective number, but let's face it: When it comes to testing Duverger's tendency, the effective number can be awfully misleading,

Measuring two-partyness of votes in a district

So Brian Gaines and I published two new options for measuring two-partyness (Gaines and Taagepera 2013). I prefer the simpler one. Use relative vote shares, so that they add up to 1. Rank parties by these vote shares: v1>v2>v3>...Now take the *sum* of the two largest shares. Multiply it with the *difference* between the second- and third-largest. Then *divide* by the largest share. This yields a measure of two-partyness:

$$T = (v1+v2)(v2-v3)/v1.$$

This index is zero whenever the second and third largest parties are equal. So, for 66-17-17 two-partyness is zero, as it should be. The index reaches the top value of 1 only when we have 50-50-0. For the doubtful constellation 40-40-20, index T is 0.40 – somewhat less than one-half. When experts estimate to what extent a constellation qualifies as two-party, their average estimate agrees well with this index.

OK, this more or less takes care of measuring two-partyness as far as district votes are concerned. But what about nationwide *seats*? Here the picture becomes more complex. This is what my unpublished research addresses.

Ideal Duvergerian two-party system: Tilted balance

Proponents of SMP rule claim that it leads to several desirable outcomes. *First*, it leads to a comfortable single-party majority, so that the government can act decisively. *Second*, it leads to a single vigorous opposition party that keeps the government on its toes and can take over after new elections. *Third*, SMP rule favors regular alternation in power, so that neither major party becomes stale. *Forth*, it even offers proportional representation of sorts in the long run, as the two major parties tend to win an equal number of elections. (It may seem that long-term parity and alternation in power are the same thing, but actually one can have appreciable parity with little alternation, and vice versa.)

I take these four features to characterize an ideal Duvergerian two-party system, at the level of nationwide seats. To repeat:

- All elections lead to comfortable majority;
- All elections lead to vigorous opposition;
- There is long-term parity in number of elections won; and
- There is regular two-party alternation.

Now let us develop indices of closeness to these four ideals. For parity in number of elections, the Gaines-Taagepera index of two-partyness will do. For alternation, we can measure the proportion of elections at which the identity of the largest party changes. (Actually, the square root of this proportion works better.) For comfortable majority and vigorous opposition, however, things become messier.

For votes in a district, the Duvergerian ideal is indeed a very narrow victory, something close to 50-50-0. But for nationwide seats in a given single election, the Duvergerian ideal is not at all close to 50-50. This would mean an overly precarious majority. The ideal here is a more comfortable majority. Maybe something like 56-44-0 might be felt to be optimal. I call this "tilted balance". But how do we measure such tilted balance?

I first devised indices that expressed what we'd truly like to measure. But these indices became much too complex to be used in practice. This often happens. Then, instead, I looked for simpler indices that led to roughly similar results. For comfortable majority, I simply measure the proportion of elections at which the largest party has at least 52.0% of the seats. For vigorous opposition, I measure the proportion of elections at which the second-largest party has at least 30.0% of the seats. To repeat, the four indices for nationwide two-partyness are as follows:

- For parity in number of elections, Gaines-Taagepera index of two-partyness;
- For alternation, square root of the proportion of elections at which the identity of the largest party changes;
- For comfortable majority, the proportion of elections at which the largest party has at least 52% of the seats;

• For vigorous opposition, the proportion of elections at which the second-largest party has at least 30% of seats.

All these indices can range from 0 to 1. To qualify as a Duvergerian two-party system, all four qualities must be present. A zero value on any one index would disqualify a system. Therefore, the overall index of nationwide two-partyness must be taken as the *geometric* mean of the four indices. (With arithmetic mean, high values on three indices could compensate for a flat zero on one index.)

Testing two-partyness of SMP and other elections

Next, I applied these indices to all elections in a classical handbook of election results (Mackie and Rose 1991). This process was not always straightforward. The identity of the major parties may change over time. For example, United Kingdom shifted in the 1920s from Conservative-Liberal contest to Conservative-Labour contest. This started a new period for the purposes of measuring alternation and parity. Delineating such periods involved judgment. But the broad results were fairy robust. They are shown in Table 1.

When proportional representation is used, we would expect the overall index of two-partyness to be 0. This was indeed the case, except for *Malta*. We should set the criterion on overall index of two-partyness so as to maximally discriminate between SMP and other electoral rules. It turns out that a cutoff at 0.50 will do. But for SMP rule results were mixed. For them, the overall index of two-partyness surpassed 0.50 only in 75% of the periods delineated. For instance, the *US House* failed in 1950-1988 because the Republicans hardly ever won; so parity suffered. *India* 1952-1984 flunked completely, because of absence of vigorous opposition.

On the other hand, *Australia* passed the two-partyness test, although it does not use SMP. In Australia's so-called Alternative Vote voters rank all candidates, and the weakest is eliminated. With Australia and Malta qualifying, fully 25% of all two-party systems originated from outside the SMP rule.

Recall that Duverger's tendency would be completely absent, if only one-half of all SMP cases led to two-party systems, and if only one-half of all two-party systems originated from SMP rule. The actual results of 75% and 75% mean that the degree of connection between SMP and two-partyness is just halfway between non-existence and perfect existence.

Prospects improve, if we extend Duverger's tendency to include all single member elections that are carried out in

Country, period, no. of elections	Тр	Та	Tm	Tv	ΤN
Single Member Districts					
New Zealand 1931-1987, 19	.73	.65	.89	.95	.80
Canada 1878-1945, 17	.89	.69	.82	.76	.79
US House 1856-1898, 22	.69	.60	.83	.77	.72
US House1900-48, 25	.79	.43	.84	.88	.71
Australia 1910-43, 14ª ALT. VOTE	1.00	.76	.50	.64	.70
Australia 1946-87, 18 ^b ALT. VOTE	.50	.47	.94	.94	.68
UK 1922-87, 19	.58	.65	.63	.79	.66
Canada 1949-1988, 14	.75	.60	.57	.57	.62
UK 1885-1918, 9°	.80	.67	.56	.44	.60
US House 1950-88, 20	.05	.32	.95	1.00	.35
New Zealand 1911-1928, 6	.09	.50	.33	.52	.30
New Zealand 1890-1908, 7	.00	.38	1.00	.43	.00
India 1952-84, 8	.14	.61	1.00	.00	.00
France 1958-88, 9 TWO ROUNDS	.50	.47	.22	.00	.00
Arithmetic mean	.54	.56	.72	.62	
Multi-seat Districts					
Malta 1947-87, 11	.83	.67	.45	.82	.67
Germany 1949-87, 11 ^d	.10	.52	.09	1.00	.26
Austria 1919-86, 18	.80	.53	.00	1.00	.00

Elections data from Mackie and Rose (1991); India: Lijphart (1994).

a: Labour vs. various right-wing labels.

b: Liberals and Country/National Party counted as single party.

c: Conservatives and Liberal Unionists counted as single party.

d: CDU and CSU counted as single party.

Two-partyness scores on the basis of nationwide seats in the first or only chamber: Tp (parity), Ta (alternation), Tm (comfortable majority), Tv (vigorous opposition), and the overall nationwide score TN=(TpTaTmTv)1/4. Component scores below 0.50 are shown in bold.

a single round. This means including Australia's Alternative Vote. Then 79% of all such periods would lead to Duvergerian two-party system. This is a minor improvement. But out of the observed Duvergerian two-party systems fully 93% originate from either SMP or Alternative Vote. This is quite impressive. The combined degree of connection rises from halfway between no fit and perfect fit to three-quarters.

Conclusion: A tendency falling short of qualifying as law

In sum, Duverger's tendency is in evidence to an appreciable degree, at the level of nationwide seats. It would be even more so, if it were not restricted to SMP but included all single *member* single *round* rules. However, such an appreciable tendency still does not suffice to qualify as a law in the scientific sense.

True, such laws always apply with the provision *ceteris paribus* – everything else being the same. Duverger's tendency could qualify as Duverger's law, if and only if we could specify in advance in which way *ceteris* is not *paribus* in the deviant cases. This would mean identifying broad factors that *predictably* prevent certain SMP periods from being two-party, and also predictably allow some Proportional Representation rules to generate Duvergerian two-party systems. I do not see any such broad factors. Each deviant case has a different story behind it.

In conclusion, what have we achieved?

- First, I have specified four distinct features of the ideal Duvergerian two-party system, at the nationwide level. This is the stage of qualitative thinking.
- Second, I have devised simple robust ways to measure these features. Here quantitative thinking begins.
- *Third*, I have applied these measures to a number of cases where Duverger's law should or should not hold. This step was quantitative, but with some qualitative elements.
- *Fourth*, setting the criterion so as to maximally discriminate between SMP and other electoral rules, only ³/₄ of the SMP elections qualify as two-party, and only ³/₄ of all elections that produce Duvergerian two-party systems result from SMP rule.

Thus, there is moderate empirical confirmation of a Duverger's tendency. But to claim the existence of a "Duverger's law" would seriously water down the meaning of what a scientific law is.

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In 1992 he received 23% of the votes in Estonia's presidential elections and was the founding dean of a new Western-style School of Social Sciences at Tartu. In 2003 he was founding chair of a new political party, which soon went on to win the prime minister's post.



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