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Ranking the Economic Freedom of North America using dominetrics

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Abstract

The Economic Freedom of North America is a widely used political economy indicator related to outcomes such as entrepreneurship, equity prices, housing prices, and migration. As a result, relative rankings are often mentioned in policy discussions. The ranking of regions based on economic freedom, however, involves many layers of subjectivity. We employ a ranking methodology called 'dominetrics' to remove one layer of subjectivity. Doing so creates six rankings reflecting different importance orderings of the underlying spheres of economic freedom. Our results show that preferences regarding which components of economic freedoms are most important influence final rankings.

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1. Introduction

The Economic Freedom of North America (EFNA) index is a widely used political economy indicator (Ashby et al., 2011). It measures and ranks all 50 U.S. states and 10 Canadian provinces on the extent to which their policies are consistent with economic freedom. It has been used to help explain a wide variety of economic phenomena in economics and finance. This list includes entrepreneurship (Hall and Sobel 2008; Sobel et al. 2007), service industry growth (Gohmann et al. 2008), migration flows (Ashby 2007), income inequality (Ashby and Sobel 2008), eminent domain (Kerekes 2011), equity prices (Lawson and Roychoudhury 2008), city growth (Stansel 2011), and housing prices (Campbell et al. 2008).

The EFNA is based on a definition of economic freedom that can be found in Gwartney et al. (1996, p. 12), who state: "Individuals have economic freedom when (a) property they acquire without the use of force, fraud, or theft is protected from physical invasions by others and (b) they are free to use, exchange, or give their property as long as their actions do not violate the identical rights of others." In making operational this definition, Ashby et al. (2011) divide 10 different variables into three areas: 1) Size of Government, 2) Takings and Discriminatory Taxation, and 3) Labor Market Freedom. Each of these subcomponents is placed on a scale from zero to ten, with higher values equaling higher levels of economic freedom. Each sub-component is then summed and averaged into a score for each area and then each area is summed and averaged to produce an overall economic freedom score for each region. For fuller details of their transformation of the raw data into economic freedom scores, we guide the interested reader to the appendices of Ashby et al. (2011).

An important question in measuring economic freedom is the weight to assign each component in the index. After all, some components or areas might be more important than other components in an individual's conception of economic freedom. The question of how to assign weights is a vexing one with no clear theory or information that can be used to completely avoid subjectivity. Ashby et al. (2011) therefore make the sensible decision to equally weight each sub-component within an area and then each area in the overall index. This approach, however, might influence scores and rankings across regions compared to other possible weighting approaches.

In this note, we use 'dominetrics' to remove one level of subjectivity from the EFNA index. Beaulier and Elder (2011) put forth a methodology called dominetrics that removes one level of subjectivity from NCAA basketball rankings by replacing the cardinal weights employed in the RPI ranking criteria with ordinal dominance rankings of basketball teams. Here we apply their approach to the ranking of US states and Canadian provinces. Doing so reveals that subjective weighting at the area stage matters for which states and provinces are considered to be most economically free.

2. Applying Dominetrics to EFNA

The creation of any ranking such as the EFNA involves subjectivity. Not only is the decision to weight each area in the index subjective, but also the very act of deciding which data is included in the index is subjective. Our intent here is not to suggest that the authors of the EFNA remove subjectivity (which is impossible), but instead to see how assumptions regarding the relative importance of each area drive the final rankings of states and provinces.

The dominetrics approach employed in Elder and Beaulier (2011) is straightforward. We begin with 60 states and provinces freedom from the sub-national index of Ashby et al. (2011)

for the year 2007. Denoting the economic freedom score of a state for a particular area as q_{ij} where $i>0, j>0$, we can define a state or province's summarized economic freedom score across k areas as:

$$S_{i,k} = \sum_{j=1}^{k} q_{ij}\,, where\ 1 \leq k \leq n$$

$S_{i,k}$ is therefore the sum of economic freedom for k factors for state or province i. For example, $S_{2,3}$ gives the sum of three factors that measure economic freedom for state 2. Denoting 'compare' as '~', let $S_{i,k} \sim S_{t,k}$ where $i \neq t$.

If $S_{i,k} \geq S_{t,k}$ for all k, we say that state i dominates state t and assign a score of 1 to state i. If $S_{i,k} \leq S_{t,k}$ for all k, we say that state i is dominated by state t and assign -1 score to state i. For all other scenarios, we say it is unrankable between state i and state t.

We denote this new score as $\Phi_{i,t}$, "dominetrics score". Continue the comparison and obtain $\Phi_{i,t}$ for other t. Hence we have a vertical sequence of dominetrics score for state i. Take the sum of the sequence, and we will have:

$$\psi_i = \sum_{for\ all\ other\ t} \Phi_{i,t}$$

where ψ_i is the summarized dominetrics score for each state and province. We then rank them in order from the highest summarized dominetrics score to the lowest. More importantly, however, we can produce up to n! different rankings based on different importance orderings. This is important with respect to the EFNA ranking, because there each area is assigned an equal weighting. Thus there is no explicit underlying ranking of each area. So in order to apply dominetrics to EFNA area rankings, we produce dominetrics scores for all possible importance orderings. Since there are three areas of the index, this gives us six importance orderings. For example, one importance ordering is Area 1: Size of Government >Area 2: Takings and Discriminatory Taxation > Area 3: Labor Market Freedom.

Before proceeding with the results, numerical examples will be used to illustrate the underlying calculations. Consider the three highest ranked states in 2007 using the EFNA: Delaware, Tennessee, and Texas. (Note the ranking tie at number 2 between Tennessee and Texas). Among these three states, Delaware has the highest score in the size of government area, barely beating out Texas. Delaware also has the highest score in Takings and Discriminatory Taxation but comes in third in labor market freedom.

Table 1. Area Data and Overall Economic Freedom Rankings for Three States in 2007

Fraser Rank	State/Province	Size of Government	Takings and Discriminatory Taxation	Labor Market Freedom	Overall Score
1	Delaware	8.5	8.9	7.0	8.2
2	Tennessee	7.5	8.0	8.5	8.0
2	Texas	8.4	8.0	7.5	8.0

Source: Ashby et al. (2011).

Under the subjective weighting approach of Ashby et al. (2011), each area receives equal weight of one-third, transforming the three area scores into an overall score of 8.2. Likewise, Tennessee's three area scores of 7.5, 8.0, and 8.5 turn into an overall score of 8.0 if equal weighting across the three general categories of economic freedom is employed.

In order to apply dominetrics to this simple three state example, we first must choose a preference ordering since dominetrics is not merely Pareto superiority. If it were, we could just ask if Delaware is Pareto superior to Tennessee by seeing if Delaware scores higher in at least one dimension and not worse than Tennessee in all others. The number of cases where a state is Pareto superior to another state is small, however, making rankings based on Pareto superiority problematic.

The "Net Dominance Metric" employed by Beaulier and Elder (2011) is much more than a Pareto superiority ranking. In order to see why, we first must choose a preference ranking across performance categories. Suppose that rather than equal weighting across the three categories, someone thought that the most important area was Size of Government, followed by Takings and Discriminatory Taxation and then Labor Market Freedom. To apply dominetrics to the states from Table 1, we merely need to see if each state dominates every other state based on this preference ordering.

Table 2 presents the results of this example. At first glance the results in Table 2 might seem puzzling. For example, why are there ones in the diagonal? This is a function of the fact that given that dominance criteria employ weak inequalities and therefore each state dominates itself. More importantly, however, the careful reader might wonder how Delaware dominates Tennessee as represented by the 1 in the second row of the third column (headers included in row numbering). The reasoning behind this result relates to the "compensation principle."

Table 2. Dominetrics Ranking, 3 State Example

State/Province	Delaware	Tennessee	Texas	Net Dominance Metric
Delaware	1	1	1	2
Tennessee	-1	1	0	-1
Texas	-1	0	1	-1

Source: Authors' calculations based on data in Table 1.

To illustrate the compensation principle, let Delaware be State A and Tennessee be State B. Applying the dominetrics approach describe earlier yields the following: $\sum_1^A \geq \sum_1^B (8.5 > 7.5), \sum_2^A \geq \sum_2^B (17.4 > 15.5), \sum_3^A \geq \sum_3^B (24.4 > 24.0)$. Thus Delaware can be said to dominate Tennessee if the ranking criteria across categories of economic freedom is Size of Government > Takings and Discriminatory Taxation > Labor Market Freedom. Note that Delaware dominates Tennessee even though Tennessee has a much higher score in the area of labor market freedom. Delaware's lead across the first two categories of economic freedom (17.4-15.5=1.9) compensates for Tennessee's 1.5 point lead in the third category. Thus Delaware receives a 1 in the second row, third column cell and Tennessee receives a -1 in the third row, second column cell.

The compensation principle does not always lead to a dominance relationship. To see why, let Texas be State A and Tennessee be State B. The resulting relationship is $\sum_1^A \geq \sum_1^B (8.4 > 7.5), \sum_2^A \geq \sum_2^B (16.4 > 15.5), \sum_3^A \leq \sum_3^B (23.9 > 24.0)$. Thus there is no dominance relationship between Texas and Tennessee because the lead Texas build up across the first two

categories was not enough to compensate for the gap between Tennessee and Texas in the area of labor market freedom. Therefore each state receives a zero in the cell corresponding to its relationship with the other state since neither state dominates the other.

The fourth column of Table 2, the "Net Dominance Metric" is created by summing across each row and then subtracting one (to account for the fact that each state dominates itself). Thus Delaware has a dominetrics score of 2 and Texas and Tennessee are tied at -1. A dominetrics ranking of these three states would therefore place Delaware in the first spot and Tennessee and Texas tied for second. For the results below we merely extend this approach from three states to all fifty states and provinces. In addition, we calculate dominetrics rankings for all six possible importance orderings.

3. Results

For each importance ordering, we produced rankings of all sixty states and provinces in terms of economic freedom. To simplify the discussion of the results, Table 3 presents only the top 12 (because of a four-way tie at number 9) states and provinces from the sub-national ranking of Ashby et al. (2011) in column 1. (The full ranking of all fifty states across all six possible importance orderings is included in Appendix Tables 1-3). Column 4 gives the top 12 dominetrics ranking when the importance ordering is Area 1: Size of Government > Area 2: Takings and Discriminatory Taxation, and Area 3: Labor Market Freedom. Column 5 switches Areas 2 and 3 in the importance ordering.

While the picture not entirely clear due to ties in the Fraser ranking, the results in Figure 1 confirm that the underlying importance ordering matters at least for some states and provinces. Alberta, for example, 7th in the Fraser ranking, jumps up to 4th in the dominetrics ranking in Column 4 but is 10th in Column 5. In addition, Tennessee falls from a tie for 2nd in the Fraser ranking to 9th in both dominetrics rankings. Overall, however, the comparison between the Fraser ranking and the dominetrics ranking when size of government is most important seems stable, with changes of only one or two places in most cases.

Table 3. Dominetrics Rankings When Area 1 (Size of Government) Most Important, 2007

Fraser Rank	State/Province	Dominetrics Rank	(1,2,3)	(1,3,2)
1	Delaware	1	Delaware	Delaware
2	Tennessee	2	New Hampshire	Texas
2	Texas	3	Texas	New Hampshire
4	New Hampshire	4	Alberta	Virginia
4	South Dakota	5	Nevada	South Dakota
4	Virginia	6	South Dakota	Nevada
7	Alberta	7	Virginia	Georgia
8	Louisiana	8	North Carolina	North Carolina
9	Georgia	9	Tennessee	Tennessee
9	Nevada	10	Georgia	Alberta
9	North Carolina	11	Colorado	Nebraska
9	Utah	12	Nebraska	Colorado

Table 4 presents the same information in columns 1 through 3, with columns 4 and 5 now containing the dominetrics ranking when Area 2 (Takings and Discriminatory Taxation) is most important. Delaware is still number 1 across all three rankings but it seems as though a preference ranking for Area 2 would result in some changes across rankings. Alabama, for example, which is not even in the top 12 in the Fraser ranking (it is 13th). It jumps up to 8th in column 5 when the importance ranking is Area 2 > Area 3 > Area 1, however, but remains outside the top 12 in Column 4 when the ordering is Area 2> Area 1 > Area 1.

Table 4: Dominerics Rankings When Area 2 (Takings and Discriminatory Taxation) Most Important, 2007

Fraser Rank	State/Province	Dominetrics Rank	(2,1,3)	(2,3,1)
1	Delaware	1	Delaware	Delaware
2	Tennessee	2	New Hampshire	Tennessee
2	Texas	3	Texas	Texas
4	New Hampshire	4	Alberta	New Hampshire
4	South Dakota	5	Tennessee	South Dakota
4	Virginia	6	South Dakota	Virginia
7	Alberta	7	Virginia	Alberta
8	Louisiana	8	Nevada	Alabama
9	Georgia	9	North Carolina	Louisiana
9	Nevada	10	Utah	North Carolina
9	North Carolina	11	Colorado	Utah
9	Utah	12	Louisiana	Nevada

Table 5: Dominetrics Rankings When Area 3 (Labor Market Freedom) Most Important, 2007

Fraser Rank	State/Province	Dominetrics Rank	(3,1,2)	(3,2,1)
1	Delaware	1	Tennessee	Tennessee
2	Tennessee	2	Texas	Texas
2	Texas	3	Virginia	Virginia
4	New Hampshire	4	Louisiana	Louisiana
4	South Dakota	5	Delaware	Alabama
4	Virginia	6	Georgia	Delaware
7	Alberta	7	South Dakota	South Dakota
8	Louisiana	8	North Carolina	Georgia
9	Georgia	9	Alabama	New Hampshire
9	Nevada	10	New Hampshire	North Carolina
9	North Carolina	11	Utah	Utah
9	Utah	12	Kansas	South Carolina

Table 5 repeats the same process but with the importance orderings in columns 4 and 5 being those where Area 3 (Labor Market Freedom) are most important. Here we see a pattern similar to that in Tables 3 and 4. For one or two states, the importance ordering matters quite a bit. For example, Delaware falls from 1st in the Fraser ranking to 5th and 6th in columns 4 and 5, respectively. In addition, New Hampshire falls from being tied for 4th (so between 4th and 6th) to

10th and 9th. In other cases, however, the importance ordering only changes a ranking one or two places.

4. Conclusion

Delaware is the state with the most economic freedom at the sub-national level in 2007 according to Fraser Institute's ranking (Ashby et al. 2011). This result, however, is driven in part by the equal weighting of each of the three areas in the index. If labor market freedom were most important, however, then Delaware is only 5th or 6th and Tennessee would be the freest state. Tennessee, however, does not look so good when size of government (Area 1) is most important, falling from 2nd to 9th in both dominetrics rankings. Similar large changes can be seen in the full rankings presented in Appendix Tables 3-5.

Our analysis suggests that for some states, the subjective weights applied to each area of the index strongly influences the state's final ranking, at least compared to an ordinal ranking approach such as the one employed here. Further research is needed to better understand how much subjective weighting influences the final rankings. An obvious extension is to apply dominetrics to the nearly thirty years of available EFNA data. This would not only give a better idea of the degree to which the subjective weights across the three areas influences the final rankings, it would also allow for scholars to make comparisons across time.

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Appendix Table 1: Full State And Province List When Area 1 (Size of Government) is Most Important, 2007

Fraser Rank	State/Province	Dominetrics Rank	(1,2,3)	(1,3,2)
1	Delaware	1	Delaware	Delaware
2	Tennessee	2	New Hampshire	Texas
2	Texas	3	Texas	New Hampshire
4	New Hampshire	4	Alberta	Virginia
4	South Dakota	5	Nevada	South Dakota
4	Virginia	6	South Dakota	Nevada
7	Alberta	7	Virginia	Georgia
8	Louisiana	8	North Carolina	North Carolina
9	Georgia	9	Tennessee	Tennessee
9	Nevada	10	Georgia	Alberta
9	North Carolina	11	Colorado	Nebraska
9	Utah	12	Nebraska	Colorado
13	Alabama	13	Arizona	Kansas
13	Colorado	14	Utah	Louisiana
15	Arizona	15	Louisiana	Utah
15	Florida	16	Florida	Arizona
15	Kansas	17	Connecticut	Florida
15	Nebraska	18	Indiana	Connecticut
19	Maryland	19	Missouri	Indiana
19	Missouri	20	Kansas	North Dakota
21	Connecticut	21	Massachusetts	Oklahoma
21	Indiana	22	Oklahoma	Massachusetts
21	Iowa	23	Illinois	Missouri
21	Massachusetts	24	North Dakota	Alabama
21	North Dakota	25	Alabama	Wyoming
21	Oklahoma	26	Maryland	Illinois
21	South Carolina	27	Iowa	Maryland
28	Illinois	28	Wyoming	Idaho
29	Wyoming	29	Washington	Iowa
30	Idaho	30	Idaho	Washington
30	Minnesota	31	Minnesota	Minnesota
30	Oregon	32	Oregon	Arkansas
33	Kentucky	33	Hawaii	Hawaii
33	Mississippi	34	Pennsylvania	South Carolina
33	Pennsylvania	35	West Virginia	West Virginia
36	Arkansas	36	Arkansas	Pennsylvania
36	Washington	37	British Columbia	Oregon
36	Wisconsin	38	South Carolina	Wisconsin
39	Alaska	39	Kentucky	Kentucky

39	Montana	40	Wisconsin	British Columbia
41	New Mexico	41	Montana	Ontario
41	West Virginia	42	Newfoundland	Montana
43	Hawaii	43	Ontario	New Jersey
43	Michigan	44	New Jersey	Mississippi
43	New Jersey	45	Michigan	New Mexico
46	California	46	Saskatchewan	Saskatchewan
47	Ohio	47	Alaska	Newfoundland
47	Vermont	48	Mississippi	Vermont
49	British Columbia	49	New Mexico	California
49	Rhode Island	50	Vermont	Michigan
51	New York	51	Manitoba	Manitoba
51	Newfoundland	52	California	Alaska
51	Ontario	53	New York	New Brunswick
54	Maine	54	New Brunswick	New York
55	New Brunswick	55	Rhode Island	Rhode Island
55	Saskatchewan	56	Ohio	Ohio
57	Manitoba	57	Nova Scotia	Maine
57	Nova Scotia	58	PE Island	Nova Scotia
59	PE Island	59	Maine	PE Island
60	Quebec	60	Quebec	Quebec

Appendix Table 2: Full State and Province List When Area 2 (Takings and Discriminatory Taxation) Is Most Important, 2007

Fraser Rank	State/Province	Dominetrics	(2,1,3)	(2,3,1)
1	Delaware	1	Delaware	Delaware
2	Tennessee	2	New Hampshire	Tennessee
2	Texas	3	Texas	Texas
4	New Hampshire	4	Alberta	New Hampshire
4	South Dakota	5	Tennessee	South Dakota
4	Virginia	6	South Dakota	Virginia
7	Alberta	7	Virginia	Alberta
8	Louisiana	8	Nevada	Alabama
9	Georgia	9	North Carolina	Louisiana
9	Nevada	10	Utah	North Carolina
9	North Carolina	11	Colorado	Utah
9	Utah	12	Louisiana	Nevada
13	Alabama	13	Alabama	Colorado
13	Colorado	14	Georgia	Georgia
15	Arizona	15	Missouri	Maryland
15	Florida	16	Arizona	Missouri
15	Kansas	17	Oregon	Arizona
15	Nebraska	18	Maryland	Oregon
19	Maryland	19	Massachusetts	Florida
19	Missouri	20	Florida	Massachusetts
21	Connecticut	21	Connecticut	South Carolina
21	Indiana	22	Iowa	Iowa
21	Iowa	23	Indiana	Illinois
21	Massachusetts	24	Illinois	Alaska
21	North Dakota	25	Nebraska	Indiana
21	Oklahoma	26	Oklahoma	Oklahoma
21	South Carolina	27	Alaska	Nebraska
28	Illinois	28	North Dakota	Connecticut
29	Wyoming	29	Kansas	Kansas
30	Idaho	30	Pennsylvania	North Dakota
30	Minnesota	31	Kentucky	Kentucky
30	Oregon	32	Montana	Pennsylvania
33	Kentucky	33	South Carolina	Montana
33	Mississippi	34	Washington	Mississippi
33	Pennsylvania	35	Wyoming	Wyoming
36	Arkansas	36	Minnesota	Minnesota
36	Washington	37	Idaho	Washington
36	Wisconsin	38	Wisconsin	Idaho
39	Alaska	39	Newfoundland	Wisconsin
39	Montana	40	Michigan	Newfoundland
41	New Mexico	41	Arkansas	Michigan

41	West Virginia	42	Mississippi	Arkansas
43	Hawaii	43	New Jersey	New Mexico
43	Michigan	44	West Virginia	Ohio
43	New Jersey	45	British Columbia	New Jersey
46	California	46	New Mexico	West Virginia
47	Ohio	47	Ohio	California
47	Vermont	48	Hawaii	British Columbia
49	British Columbia	49	California	Hawaii
49	Rhode Island	50	Saskatchewan	New York
51	New York	51	Ontario	Rhode Island
51	Newfoundland	52	Vermont	Vermont
51	Ontario	53	New York	Saskatchewan
54	Maine	54	Rhode Island	New Brunswick
55	New Brunswick	55	Manitoba	Maine
55	Saskatchewan	56	New Brunswick	Ontario
57	Manitoba	57	Maine	Manitoba
57	Nova Scotia	58	Nova Scotia	Nova Scotia
59	PE Island	59	PE Island	PE Island
60	Quebec	60	Quebec	Quebec

Appendix Table 3: Full State and Province List When Area 3 (Labor Market Freedom) Is Most Important, 2007

Fraser Rank	State/Province	Dominetrics	(3,1,2)	(3,1,2)
1	Delaware	1	Tennessee	Tennessee
2	Tennessee	2	Texas	Texas
2	Texas	3	Virginia	Virginia
4	New Hampshire	4	Louisiana	Louisiana
4	South Dakota	5	Delaware	Alabama
4	Virginia	6	Georgia	Delaware
7	Alberta	7	South Dakota	South Dakota
8	Louisiana	8	North Carolina	Georgia
9	Georgia	9	Alabama	New Hampshire
9	Nevada	10	New Hampshire	North Carolina
9	North Carolina	11	Utah	Utah
9	Utah	12	Kansas	South Carolina
13	Alabama	13	South Carolina	Colorado
13	Colorado	14	Colorado	Maryland
15	Arizona	15	Florida	Kansas
15	Florida	16	Maryland	Florida
15	Kansas	17	Nebraska	Nevada
15	Nebraska	18	Nevada	Arizona
19	Maryland	19	Arizona	Mississippi
19	Missouri	20	North Dakota	Nebraska
21	Connecticut	21	Mississippi	North Dakota
21	Indiana	22	Oklahoma	Massachusetts
21	Iowa	23	Massachusetts	Oklahoma
21	Massachusetts	24	Idaho	Missouri
21	North Dakota	25	Indiana	Indiana
21	Oklahoma	26	Missouri	Idaho
21	South Carolina	27	Wyoming	Iowa
28	Illinois	28	Alberta	Alberta
29	Wyoming	29	Connecticut	Wyoming
30	Idaho	30	Illinois	Illinois
30	Minnesota	31	Iowa	Kentucky
30	Oregon	32	Arkansas	Connecticut
33	Kentucky	33	Minnesota	Arkansas
33	Mississippi	34	Kentucky	Oregon
33	Pennsylvania	35	Pennsylvania	Minnesota
36	Arkansas	36	New Mexico	Pennsylvania
36	Washington	37	Oregon	New Mexico
36	Wisconsin	38	Wisconsin	Wisconsin
39	Alaska	39	Montana	Montana
39	Montana	40	West Virginia	Alaska
41	New Mexico	41	Hawaii	Rhode Island

41	West Virginia	42	Rhode Island	Vermont
43	Hawaii	43	New Jersey	Washington
43	Michigan	44	Vermont	California
43	New Jersey	45	Washington	New Jersey
46	California	46	California	Ohio
47	Ohio	47	Ohio	West Virginia
47	Vermont	48	Alaska	Maine
49	British Columbia	49	Maine	Hawaii
49	Rhode Island	50	Michigan	Michigan
51	New York	51	Ontario	New York
51	Newfoundland	52	British Columbia	British Columbia
51	Ontario	53	New York	Ontario
54	Maine	54	Newfoundland	Newfoundland
55	New Brunswick	55	New Brunswick	New Brunswick
55	Saskatchewan	56	Saskatchewan	Saskatchewan
57	Manitoba	57	Nova Scotia	Nova Scotia
57	Nova Scotia	58	PE Island	PE Island
59	PE Island	59	Manitoba	Manitoba
60	Quebec	60	Quebec	Quebec