

An ecological inference approach to the origins of proportional representation

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journals.sagepub.com/home/ssi**Alberto Penadés**

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Abstract

Facing a prospective majority of socialists during the early third of the 20th century, some secular conservative and liberal parties pooled their votes to raise the majority threshold for the left, while others raised it by enacting some form of proportional representation. We use vote transfers, estimated by a new method of ecological inference, to explain those far-reaching choices. We provide a new conceptualization and measurement of the segmentation of the electoral market to test a proposition within the Boix-Rokkan framework: proportional representation reform was chosen when vote transfers foretold coalition failure. To substantiate our claim, we investigate two most similar cases, Denmark during 1910–1918 and New Zealand during 1928–1931, that diverged in the explanatory variable and in the response.

Keywords

early democracies, ecological inference, electoral reform, party system change, proportional representation, vote transfers

Résumé

Face à une majorité potentielle de socialistes au cours du premier tiers du 20^e siècle, certains partis conservateurs et libéraux laïques ont mis leurs voix en commun afin de relever le seuil de la majorité pour la gauche, tandis que d'autres l'ont relevé en adoptant une forme ou une autre de représentation proportionnelle. Nous utilisons les transferts de votes, estimés par une nouvelle méthode d'inférence écologique, pour expliquer ces

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choix d'une grande portée. Nous proposons une nouvelle conceptualisation et une nouvelle mesure de la segmentation du marché électoral pour tester une proposition dans le cadre de Boix-Rokkan : la réforme de la représentation proportionnelle a été choisie lorsque les transferts de voix annonçaient l'échec de la coalition. Pour étayer cette affirmation, nous étudions deux cas très similaires, le Danemark entre 1910 et 1918 et la Nouvelle-Zélande entre 1928 et 1931, qui divergent au niveau de la variable explicative et de la réponse.

Mots-clés

changement de système de partis, démocraties précoces, inférence écologique, réforme électorale, représentation proportionnelle, transferts de voix

Introduction

Proportional representation (PR) stands out as one of the most important institutional innovations introduced by early modern democracies. Its implications are far-reaching, spanning from the political system (Lijphart, 1990) to the economic sphere (Persson and Tabellini, 2004) and even into the social fabric (Manow, 2009). The first national election operating under the banner of this voting method occurred in Belgium in 1900. Subsequently, an array of so-called PR systems supplanted the greater part of the once-dominant majoritarian rules in established democracies during the initial third of the 20th century (Ahmed, 2012; Boix, 1999; Colomer, 2004; Penadés, 2005). Within this process, party elites made discerning choices. Our focus lies in exploring the decisions undertaken by secular right-wing parties in the context of electoral competition vis-à-vis socialist parties. Our point of departure aligns with Stein Rokkan's (1970) qualitative insight: elites favored a new electoral system when they lacked the ability to collaborate effectively within the electoral arena to counteract socialist parliamentary growth.

In order to raise the majority threshold for the left, the right could pursue two courses of action: either electoral realignment or rule change. Forming a united front, either through explicit coalition or implicit coordination, increases the fraction of votes needed for the left to secure a majority. The same effect occurs with the introduction of PR in multiparty competition. Taking into account the manifold potential consequences of the choice, the widespread preference within the secular right, all else being equal, likely leaned toward preserving a majority system (Penadés, 2011; Rokkan, 1970). However, as our analysis shows, all else was never equal, and we assume the strategy was chosen conditioned on being feasible and effective at hindering the left from reaching a majority status.

The structure of electoral markets is crucial in elucidating these choices (Boix, 2010). This article advances a fresh conceptualization and measurement technique employing vote transfers to uncover structural constraints in the electoral market. In particular, we leverage a new ecological inference method (Pavía and Romero, 2021, 2022) for the analysis of historical election records to estimate the magnitude, direction, and location of vote transfers in early democracies. We conceptualize electoral segmentation as the

mutual inability of two parties to attract each other's voters. Our measurement is capable of separating territorial from non-territorial segmentation, allowing us to assess the mutual unwillingness of voters to coordinate within the same district. By gauging the extent and direction of vote transfers and considering the inherent biases in majoritarian systems, we shed light on the prospects of established liberal and conservative party elites. They engage in coalition attempts when their electorates are likely to effectively combine to prevent or delay the access of the socialist left to power, opting for electoral reform otherwise. We illustrate this through a comparison between Denmark and New Zealand.

The scope of our claim is limited to the secular right, typically partitioned into liberal and conservative options, as they compete with a socialist party. In the context of early democracies, the presence of a socialist party is an almost necessary condition for the implementation of PR, whereas the presence of a Catholic party is a sufficient condition (Penadés, 2011). This category encompasses approximately half of the early democracies that embraced PR. Rokkan's (1970) perspective aimed at covering religious parties and cited Belgium, but this extensively scrutinized case, notably examined in studies by Emmenegger and Walter (2019), Barzachka (2014), Ahmed (2010), and Calvo (2009), showcases a distinct scenario where the socialist threat rationale does not directly apply.

In a similar vein, we find that our argument does not extend to cases of newly formed states marked by national divisions that opt for PR, like the Republic of Ireland or Czechoslovakia. Nonetheless, considerable variation exists elsewhere: Australia, France, New Zealand, Spain, and the United Kingdom adhered to majoritarian systems in the face of socialist party mobilization, whereas Denmark, Finland, Iceland, Norway, and Sweden adopted PR (Penadés, 2005).

We compare two most similar cases, Denmark and New Zealand, which diverge in terms of the explanatory variable (electoral segmentation) as well as in the response variable (reform vs realignment), while having virtually everything else in common. When facing the prospect of a left-wing majority, Denmark underwent electoral system reforms in 1915 and again in 1920. In contrast, New Zealand maintained its plurality system, relying on an electoral coalition of right-wing parties in 1935. We posit that the pattern of vote transfers provides the information basis for the diverging choices made by the party elites in each case: Danish parties had more disjoint electorates, whereas in New Zealand they shared a larger common pool of voters. Voter exchange was feasible and effective in the latter case but not in the former. In our analysis, we show evidence compatible with the hypothesis that vote flows were a major driver of choices.

We carry out a three-step empirical analysis. First, we examine the partisan bias of the electoral systems: who was harmed and who benefited from the existing rules? Second, we investigate how the segmentation of the electorate constrained electoral coalitions. To what extent did right-wing parties share a similar electorate versus a socially distant one? How much could coordination among voters of right-wing parties be reasonably expected? Third, we combine this information to predict the probable electoral outcomes and seat performance of a right-wing electoral coalition. Was it an effective approach to confronting the influence of socialists in parliament?

The methodological contribution of this research resides in using ecological inference to produce an estimation of vote transfers and an index for the segmentation of

electorates that enables an exploration of actual coordination challenges, across as well as within constituencies. By operationalizing the degree of segmentation within the parties' electorates through an estimation of vote flows, and separating geographical and non-geographical segmentation, we can quantify these difficulties.

From a theoretical perspective, our contribution lies in the clarification of Rokkan's (1970) 'socialist threat' hypothesis and its scope, and the refinement of Boix's (2010) propositions on the structure of electoral markets. In terms of empirical implications, we insist in the dual options confronting the right-wing, namely, realignment or reform, as a means to rise the majority threshold for the left. This stands in contrast to the tendency to perceive realignment as an instance of 'British exceptionalism'. We identify the conditions that precipitate each outcome within the class of cases settled by the secular right.

On the origins of PR

The historical turn in democratization studies has produced a substantial body of research focused on the genesis of PR (Emmenegger and Petersen, 2017; Kreuzer, 2010). Stein Rokkan's (1970) 'socialist threat' hypothesis was operationalized as a testable proposition concerning the choices of right-wing parties by Carles Boix in two agenda-setting papers. The first paper accentuates the role of voter coordination failure as the mechanism prompting PR reform (Boix, 1999), while the second underscores the structure of the electoral market – competitive versus segmented – coupled with the relative strength of right-wing parties (Boix, 2010). While Boix's (1999) rational coordination mechanism has been subject to critical scrutiny on historical grounds (Kreuzer, 2010) and in detailed case studies (Schröder and Manow, 2020; Walter, 2021), we place our contribution as a continuation of his line of research on the structure of the electoral market (see also Penadés, 2008, 2011). As for the nature of the threat that triggers a reaction, it has been variously construed, ranging from the straightforward electoral vulnerability of individual candidates (Leemann and Mares, 2014) to an existential threat, rooted in the potentially revolutionary implications of a socialist triumph (Ahmed, 2012; Gjerløw and Rasmussen, 2022). We interpret threat as the prospect of a leftist parliamentary majority.

At a general level, PR emerges as one possible response to the combined realities of multiparty systems and nationalized party structures (Caramani, 2004; Colomer, 2005). Rokkan (1970) suggested that the very earliest initiatives to introduce PR were motivated by a desire to safeguard minorities, linking them to the process of national consolidation rather than working-class mobilization. Rokkan's proposition regarding 'minority protection' has been viewed as a precursor to the examination of partisan biases in electoral systems as the driving force for electoral reform (Calvo, 2009; Leemann and Mares, 2014). The distortion effects of majoritarian systems on party representation have their origins in the geographic dispersion of vote distributions, constituting a rationale for PR not necessarily tied to a socialist threat (Calvo, 2009; Rodden, 2009; Walter and Emmenegger, 2023). The end result may be often described as 'majority protection' and the perpetuation of partisan effects through electoral reform, rather than minority protection (Walter and Emmenegger, 2019).

Electoral bias does not stand as an alternative to Rokkan's socialist threat hypothesis; it sets the stage where specific threats may happen. Leemann and Mares (2014) show that both the socialist electoral threat and partisan effects influenced voting patterns for or against PR among individual politicians in Wilhelmine Germany. Their analysis centers on electoral vulnerability and partisan effects from the point of view of individual candidates. In contrast, our study considers representation bias and the pattern of individual vulnerabilities through the lens of political parties. We should anticipate that parties most adversely affected by the electoral system will actively seek either electoral coalition or reform, with reforms generally aligned with self-interest.

A large part of the existing literature assumes that parties are primarily motivated by the pursuit of seats and achieving optimal electoral outcomes. However, there are additional important incentives behind the endorsement of PR, chiefly organizational in nature: fostering party development, voters' mobilization, ideological purity, internal conflict management, and coalition management have been convincingly suggested (Cox et al., 2019; Kreuzer, 2001; Lago, 2021; Penadés, 2008). Correspondingly, these are also possible reasons not to endorse it, as evidenced by the antipathy of some old elites toward list systems. Long-term sophisticated reasons could also be considered, especially if PR systems lead to governments leaning more to the left, to more redistribution, and to higher spending (Iversen and Soskice, 2006; Persson and Tabellini, 2004). Yet, no universal option for or against PR can be observed within any political family across space and time (Penadés, 2005, 2008).

In summary, while we acknowledge the possibility of other motivating factors, we propose a general explanation grounded on the structure of competition and instrumental calculation. Although organizations often harbor multiple and potentially conflicting motivations – a phenomenon demonstrated through intra-party divisions regarding PR, as substantiated by comprehensive case studies (Cox et al., 2019; Emmenegger and Walter, 2019; Leemann and Mares, 2014) – our premise assumes that right-wing parties, our unit of analysis, aim to exert control over the legislative apparatus and pre-empt a left-wing majority. These calculations encompass both electoral distortion and the entry of socialist parties.

Socialist threat and vote transfers: Realignment or reform

This is our expectation: right-wing parties negatively impacted by the majoritarian electoral system in the context of socialist party growth, and unable to impede its expansion through separate competition, will seek electoral coordination if the mutual segmentation of their electorates is low. Conversely, they will pursue PR electoral reform if segmentation is high. Let us now substantiate this Rokkanian assertion.

Against the backdrop of party system change, epitomized by the ascent of mass parties representing the working class, Rokkan (1970: 158) specifically contended that the pre-existing majoritarian systems 'could have been maintained' even with the entrance of socialist parties, if 'the parties of the property-owning classes had been able to make common cause [. . .]. But the inheritance of hostility and distrust was too strong'. He also cited the 'progressive merger' of rural and urban interests in the United Kingdom as a counterexample to instances such as Sweden, Norway, or Belgium.

Rokkan's early work on cleavage structures and the transition to mass politics in early parliamentary systems aimed to provide a parsimonious explanation for the political choices available to citizens following the advent of formal democracy (Lipset and Rokkan, 1967). Although Rokkan (1970) identified social cleavages (religious and rural/urban divides) that fractured the right as they confronted the socialist electoral challenge, he did not elaborate on the mechanisms underpinning the possible 'merger of interests' or the endurance of 'hostility and mistrust' between parties. Rokkan was aware of the potential utility of ecological inference for his endeavor in comparative political sociology (Dogan and Rokkan, 1967), but he did not bring it to this context. We believe that his terms can be given a precise and measurable meaning through estimated vote transfers. They might be explained in the language of a theory of social cleavages, but that is beyond our scope.

Boix (2010) produces a nuanced comparative prediction of party strategies in the spirit of Rokkan's framework employing a measure of segmented versus competitive electoral markets, supplemented by a qualitative assessment of the electoral vulnerability of right-wing parties. However, Boix's concept of segmentation is systemic, quantified as the average index of geographic vote concentration for individual parties. In contrast, Rokkan's hypothesis is relational in nature, referring to the potential for coordinated alignment or mutual divergence between two specific parties. Geographical concentration does not show how much these parties' voters overlap or how ready they are to vote for each other's candidates. We believe that looking at how votes are transferred gives us the picture of these interactions.

We utilize the magnitude of vote transfers, estimated through ecological inference, to construct an index of pairwise electoral segmentation among parties. Our approach offers an added benefit: the demarcation of geography from preferences. It is pertinent to differentiate whether voters are segmented within districts or distributed across distinct districts. In cases like the rural/urban cleavage, it is reasonable to anticipate a substantial geographic component in electoral segmentation. However, in the vein of Rokkan's notion of 'hostility', it is expected that a noteworthy degree of mutual voter distancing persists even when two right-wing parties compete within the same district.

The hypothesis is that electoral reform was adopted when coordination was not feasible, as the choice was driven by the interest of preventing or at least postponing a leftist legislative majority. We assume, together with Rokkan, that this question trumped other potential considerations: Could it be done effectively? We offer an approximation of future prospects through basic simulations assessing the effectiveness of parties in stemming the electoral rise of socialist parties.

Could parties reasonably anticipate events to make informed decisions? The role of uncertainty and potentially unpredictable outcomes has been highlighted in various theoretical explanations for the emergence of PR. An uncertainty-driven shift to PR is posited as a response to suffrage extensions (Andrews and Jackman, 2005) or to the uncertain results of two-ballot majority systems (Blais et al., 2005). Nevertheless, such uncertainty is likely not all-encompassing, otherwise we would observe only risk-averse decisions such as opting for very large districts – the safest option – and selecting the D'Hondt rule, a maximin approach for average parties (Fernández-de-Córdoba and Penadés, 2009). The tinkering with formulas and constituencies in districted electoral systems to

systematically produce anticipated seat-to-vote distortions suggests that prospects often are well-informed (Walter and Emmenegger, 2019, 2023).

In line with Ahmed's (2010) observations, we acknowledge that decisions regarding electoral reform transpired in a changing context of decreasing uncertainty: one that did not fully incapacitate strategic planning but still retained room for errors. While we do not contend that our parties possessed precise information, historical parties, at any point in time, endured and prospered due to their comprehension of electoral interdependencies. Even within a pre-survey era, parties, after successive elections, likely developed a sufficient awareness not only of their own performance but also of the ebb and flow of voters moving between themselves and their competitors, with this more than probably impacting on their decision-making processes. Indeed, as Abou-Chadi and Stoetzer (2020) have shown in the current survey era, political parties' strategic choices are driven by vote transfers.

In summary, to test our hypothesis, we must investigate three main factors to sustain our expectation: the impact of existing rules amid socialist progress, the potential for unified right-wing support, and its effectiveness at countering a left-wing majority. If the current system left the right as a parliamentary minority and strategic realignment seemed unlikely, PR was adopted. If a strong united front was feasible and effective, it was pursued.

Denmark and New Zealand

We compare the vote transfers in the two country cases that are most similar yet yielded disparate outcomes. Specifically, we analyze the 1910–1913 election in Denmark, which preceded the electoral reform tried in 1918, and the 1928 elections previous to the anti-socialist electoral coalition of New Zealand in 1931, that would eventually lead to the fusion of the liberal (United) and conservative (Reform) parties.

Let us underline the controlled variation. The events occurred within contexts of well-established election practices featuring broad suffrage. Denmark had been conducting regular elections with male suffrage for the lower chamber since 1848, while New Zealand instituted male suffrage in 1852 and was the first country to adopt universal suffrage in 1893. This context was information-rich rather than marked by uncertainty due to new voters. Both cases involved secular conservative and liberal parties as the principal components of the right-wing spectrum, without prominent religious or identity-related issues. In addition, both nations had a relatively small size. The primary political division, apart from the fundamental socioeconomic dimension, was the urban/rural divide, present in both countries as they underwent late industrialization (Beramendi et al., 2019).

In both Denmark and New Zealand, robust social democratic parties emerged that eventually secured majorities: they represented an equally important and urgent threat. The Danish socialists triumphed in the elections and established a minority cabinet in 1924, 6 years after the introduction of a form of PR. Similarly, New Zealand's Labour Party secured a majority 4 years after the anti-socialist electoral coalition of 1931. Both socialist parties held moderate ideological positions, obtaining similar scores in Ahmed's (2013: 205) classification, although not the most moderate.

Table 1. Samuels and Snyder malapportionment index since early 20th century in DK and NZ.

Denmark			New Zealand	
Year	Electorate	Party votes	Year	Party votes
1901	0.0809	0.1466	1905	0.0789
1903	0.0900	0.1431	1908	0.0779
1906	0.1023	0.1185	1911	0.0670
1909	0.1160	0.1337	1914	0.0765
1910	0.1179	0.1407	1919	0.0820
1913	0.1229	0.1342	1922	0.0711
1918	0.0921	0.0932	1925	0.0909
			1928	0.0729
			1931	0.0763
			1935	0.0701
			1938	0.0775

Source: Compiled by the authors using data from CLEA (Kollman et al., 2019) for Denmark and from <http://www.jackvowles.com/nzelect.html> for New Zealand.

Both countries over-represented the rural areas in their electoral systems. While this phenomenon was less pronounced in New Zealand (see Table 1), the potency of partisan effects was significant enough to reverse the results of the 1917 election; although the Conservatives secured more seats, they did not garner a majority of votes. In terms of electoral rules, both countries employed a simple plurality system, with New Zealand briefly experimenting with a two-ballot majority during 1908–1910. There is no indication of gerrymandering in either case: New Zealand established an independent Electoral Commission in 1887, with only two out of seven members having political designations, and Denmark maintained a stable, contested framework for the number and boundaries of constituencies (Elklit, 2002; McRobie, 1995).

The most noticeable distinction between the two cases was Denmark’s more fractured party system, encompassing a left-leaning splinter of the old Liberal Party, known as the Radical Party (often referenced as the Social Liberal Party in English sources), which held significant strength in rural areas. In contrast, New Zealand’s fourth party, the Country Party, wielded much less influence and was more distinctly rural in nature. While both countries had histories of liberal-labor cooperation, Denmark’s collaboration involved socialist-radical interaction.

In New Zealand, the ascent of the Labour Party instigated a political and electoral alliance between conservatives and liberals (Reform and United parties). In contrast to the well-known British case, this alliance culminated in a robust electoral coalition post-1928 and the establishment of a unified anti-socialist party in 1936 – a development that had occurred in Australia three decades earlier. Similar to the Australian case, the coalition followed a period of deep crisis for the liberals, who initially seemed electorally threatened, but rebounded through the support of urban interest groups. This resurgence paved the way for a coalition formation during the party’s resurgence (Gustafson, 1986; Loveday, 1977).

In Denmark, the liberal party reaped substantial benefits from the convergence of plurality rule, efficient vote distribution, and rural malapportionment. Leading up to the electoral reform of 1915, only the conservatives (referred to as the ‘Right’) – a minority yet controlling the Upper House – advocated for PR. The liberals (referred to as the ‘Left’), who had secured the majority in the Lower House between 1872 and 1909, aimed to sustain the status quo. On the other hand, the Conservatives faced significant setbacks due to their inefficient vote concentration in urban areas. The socialists, meanwhile, were focused on reapportionment, considering the double ballot as a potential facilitator for their electoral partnership with the Radical Party, which favored this approach. A minority radical government in 1909, with socialist support, unsuccessfully attempted reform through reapportionment. In 1915, under another radical minority cabinet, the conservatives consented to democratize the Upper House in exchange for a compromise on the electoral method. It is noteworthy that they had reached a juncture where blocking Senate reform in the foreseeable future was no longer feasible. A mixed system was tested in 1918 (with the 1915 election being uncontested due to wartime conditions). The minority Radical government remained in place, aided by socialist support. A full proportional system was embraced in 1920 after the so-called Easter Crisis, which was followed by a Liberal victory and subsequent government (Elklit, 1992, 2002; Miller, 1996: 8–17).

Methods and data

Ecological inference

To estimate the vote transfer matrices, we have used, with default options, the `nsiphom` algorithm (Pavía and Romero, 2022) available in the version 0.1.3 of the R package `lphom`. Currently, there are two major alternatives for ecological inference of `RxC` tables: `ei.MD.bayes` and `nsiphom`, available in the `eiPack` (Lau et al., 2020) and `lphom` (Pavía and Romero, 2021) R-packages, respectively. The algorithm programmed in the `ei.MD.bayes` function is based on a hierarchical multinomial-Dirichlet Bayesian model (Rosen et al., 2001), whereas the `nsiphom` algorithm is grounded on linear programming (Pavía and Romero, 2022). Both methods are capable of generating local (precinct, district, or polling station) transition matrices.

We have used the new `nsiphom` algorithm because of its practical advantages. As Pavía and Romero (2023) show, analyzing data from almost 500 elections for which the actual cross-distributions of votes are known, `nsiphom` produces estimates at least as accurate as `ei.MD.bayes` with less computational cost and in a simpler way. On the one hand, conducting an analysis employing `ei.MD.bayes` demands highly qualified analysts to tune all its arguments and is accompanied by significant costs in terms of time and computational skills. On the other hand, the `nsiphom` function is capable of producing highly accurate results in seconds with their default options. Moreover, the `ei.MD.bayes` solutions deteriorate when the number of units available is scarce.

Pairwise segmentation

Transfer movements indicate the degree into which parties can be seen as partial substitutes. When flows between parties are relatively low, we may say that their electorates

are segmented. In a districted system, electoral segmentation occurs via two complementary mechanisms: a class of candidates is dissuaded to compete in certain districts and a class of voters is dissuaded to vote for them. High party fidelity may indicate that the voters show a low propensity to shift their vote when different parties compete, but it can also indicate pure geographical segmentation. We shall use an indicator that can assess the total segmentation of the electorates, geographical and not geographical, as well as the component of segmentation that is due to low fluidity of votes between two parties within the same geographical units.

To synthesize transfer movements, we summarize pairwise flows through the *pairwise segmentation indicator*. This indicator measures the flux of vote transfers between parties via a standardized number within the $[-1, 1]$ interval. It takes the value of 1 if no votes are transferred between two parties, the value of -1 if all votes are transferred, and the value 0 if as many votes are kept as they are transferred. A value around 0.5 indicates that, for each party, about one in four votes moves from one party to the other; a value around 0.8 indicates that only about one in ten votes shift between parties on average. The indicator is an unweighted average between the parties. We are not concerned about their sizes, but about the relative fluidity of their electorates. The generalized measure, weighted by party size, would be the Goodman and Kruskal's (1954) gamma coefficient for rank correlation.

If F_i designates the fidelity of party i and T_j the proportion of transfers from party i to party j , our pairwise segmentation indicator for parties i and j is simply given by

$$PS_{ij} = \frac{(F_i + F_j) - (T_i + T_j)}{F_i + F_j + T_i + T_j}$$

The segmentation indicator can be calculated for transfers estimated at the national level, which includes the effect of the geographic distribution of candidates when party systems are not fully nationalized, and for the restricted level of the districts where competition between the two parties actually takes place.

Simulation of inertia in estimated vote transfers

The inertia analysis projects the estimated vote transfers at the local level toward the future. By default, we have assumed a census increase of 5% between elections. After applying the inertial process on the local matrices calculated for the transition between two elections in periods $t - 1$ and t , we assign seats to the winning parties and obtain a summary of the vote and seat percentages. To simulate future coalitions under inertia, we modify the inertia process by means of some attrition to the votes of the parties in the coalition, under the assumption that the coalition formed as 'anti-socialist' will not receive transfers from past socialist voters, even if the parties in the coalition did.

Data and pre-processing of the data

We analyze the cases of Denmark (DK) and New Zealand (NZ) using as a main tool the estimated transfer matrices based on district-level results. For Denmark, we study

transfers between 1910 and 1913. For New Zealand, we study transfers between 1925 and 1928. The data used for Denmark come from the Constituency-Level Elections Archive (CLEA), downloaded on September 2021. CLEA (Kollman et al., 2019) is a repository of detailed election results at the constituency level for lower chamber and upper chamber legislative elections from around the world. The New Zealand electoral results outcomes are available at <http://www.jackvowles.com/nzelect.html> and according to the owner of the webpage ‘they have been compiled over some years, and should now be almost wholly free of errors’.

There are two pre-processing issues in our datasets. First, the correspondence between constituencies across time, and, second, the party options that are included in the analysis.

Election district matching. An implicit assumption when applying ecological inference from aggregate data is that of stationarity in the electorates, that is, that electorates do not change between elections. Barring exceptional circumstances (such as in simultaneous elections), this assumption is (almost) always violated. When elections take place at two times not too far apart in time, this hypothesis is routinely assumed (e.g. Klima et al., 2016, 2019; Romero et al., 2020) as the bulk of electors in both elections are the same, that is, they are included in the intersection of both electorates.

Between consecutive elections, however, it is not uncommon that the geographical boundaries of the voting units experiment some changes (Altman and McDonald, 2011) and sometimes even a complete restructuring (Pavía and López-Quilez, 2013) due to redistricting processes. When this happens, it is necessary to pre-process the data (i.e. to establish a correspondence between units and outcomes) before using any ecological inference algorithm (Klima et al., 2016). When detailed information about the shapes and geography of the election units is available, this process can be automated using spatial statistics tools (Pavía and Cantarino, 2017), but manual procedures must be followed when just units’ identifiers and electoral outcomes are available, as it happens in our datasets. In this study, we have followed the recommendations stated by Pavía-Miralles (2005: 1117–1118), who basically recommends matching those units that having the same labels (identifiers) in both elections do not show great alterations in the magnitudes of their corresponding censuses. In the case of DK, the use of this criterion was enough to link all the units from both elections, with the only issue being the need of omitting from the analysis the unit labeled Halvrimmen, as their outcomes for 1913 are missing. In the case of NZ, nevertheless, we were forced to omit five units in each election: Ashburton, Ellesmere, Ohinemuri, Taranaki, and Wakatipu, in the 1925 elections; and Auckland Suburbs, Central Otago, Hauraki, Mid-Canterbury, and New Plymouth, in the 1928 elections. We finally used 112 units in DK and 70 units in NZ.

Homogenization and merging of political options. The changes between elections are not limited to voting units, but they also affect to competitors. There are changes among the parties who compete in consecutive elections within the same country, with the party labels also varying among countries. Moreover, there are also cases where independent or local candidates and/or more than one candidate with the same ideological ascription compete in the same district. This introduces some noise that can be easily reduced by

Table 2. Denmark 1913 seats-votes deviation: malapportionment and efficiency components. Original deviation and simulated bias with uniform swing transfers.

Parties	Original distribution			Simulated C=L		
	Total vote	Districts mean	Seats	Total vote	Districts mean	Seats
C	0.229	0.212	0.063	0.252	0.238	0.089
L	0.275	0.319	0.375	0.252	0.293	0.339
R	0.187	0.219	0.277	0.187	0.219	0.277
S	0.296	0.234	0.286	0.296	0.234	0.295
Deviation	Total	Size effect	Efficiency	Total	Size effect	Efficiency
C	−0.167	−0.017	−0.150	−0.163	−0.014	−0.149
L	0.100	0.045	0.056	0.087	0.041	0.046
R	0.090	0.032	0.058	0.090	0.032	0.058
S	−0.010	−0.062	0.051	−0.001	−0.006	0.060

Source: Compiled by the authors using data from CLEA (Kollman et al., 2019). The size effect is the difference between the fraction of the aggregate votes and the mean of the constituency proportion distribution. The efficiency effect refers to the amounts of wasted votes and it is measured as the total deviation minus the size effect. The simulation to equal the conservative and liberal parties has been performed assuming a uniform swing. The correspondences between the main historical labels and the ones employed in this research are: C=Conservative ('Right') ↔ Højre; L=Liberal ('Left') ↔ Venstre; S=Socialist ↔ Socialdemokrater, R=Radical. See the methods section for details.

homogenizing labels and merging some outcomes. In particular, in order to ease communication and properly handle the data, we have, on the one hand, labeled with the same tag the votes gained for those candidates that compete under the same ideological ascription (see the notes given below Tables 2 and 3) and, on the other hand, as it is common practice (e.g. Klima et al., 2019; Plescia and De Sio, 2018; Puig and Ginebra, 2014; Vizcaino and Pavía, 2022), merged small political options in an 'Others' option. In all the elections, we have considered as political options at least: Conservative, Liberal, Socialist, and Others. In the case of DK-1910, we have merged nulls and Others, to which we have added 'unknown' and 'candidates against the reform of the constitution' in 1913. Regarding abstentions, they have been computed as differences between the numbers of electors and voters in the case of DK and have not been considered in the case of NZ because they are missing in the raw files.

Results

We shall proceed in the three steps already announced: inherited constraints from the status quo system, constraints from the electoral market, and decision making. First, we show that distortion effects made action necessary, but they were not sufficient by themselves to explain the final outcomes. Potentially, both conservative parties could be similarly hurt. Second, we estimate vote transfers between parties and compare the strength of electoral segmentation in our two countries. Segmentation was much lower in New

Table 3. New Zealand 1928 seats-votes deviation: malapportionment and efficiency components. Original deviation and simulated bias with uniform swing transfers.

Parties	Original distribution			Simulated C=L		
	Total vote	Districts mean	Seats	Total vote	Districts mean	Seats
C	0.364	0.374	0.342	0.336	0.346	0.250
L	0.309	0.305	0.342	0.336	0.333	0.421
S	0.273	0.259	0.237	0.273	0.259	0.237
Deviation	Total	Size effect	Efficiency	Total	Size effect	Efficiency
C	-0.022	0.010	-0.032	-0.086	0.010	-0.096
L	0.034	-0.003	0.037	0.085	-0.003	0.088
S	-0.037	-0.014	-0.022	-0.037	-0.014	-0.022

Source: Compiled by the authors using data from <http://www.jackvowles.com/nzelect.html>. The size effect is the difference between the fraction of the aggregate votes and the mean of the constituency proportion distribution. The efficiency effect refers to the amounts of wasted votes and it is measured as the total deviation minus the size effect. The simulation to equal the conservative and liberal parties has been performed assuming a uniform swing. The correspondences between the main historical labels and the ones employed in this research are: C=Conservative ('Reform') ↔ Government; L=Liberal ↔ United; and S=Socialist ↔ Labour. See the methods section for details.

Zealand than in Denmark. Third, we show how segmentation and distortion might have added up into a decision for explicit realignment in the former country and PR in the latter.

Bias: How were the effects for parties?

The pattern of partisan effects was very similar in both countries, but the effects were much larger in Denmark than in New Zealand. Both malapportionment and the geographical segmentation of the votes contributed to this.

We measure partisan bias as the simple distance between the seats and votes proportions for every party. Following an approach that goes back to Gudgin and Taylor (1980), we distinguish a size effect and an efficiency effect in the seats-to-votes deviation. The size effect is the difference between the fraction of the aggregate votes and the mean of the constituency proportion distribution of each party, and it accounts for the effect of malapportionment and turnout differentials in the seats-to-votes deviation. Since we do not have participation data for constituencies in New Zealand, we cannot further differentiate between the two components of the electoral size of the constituencies. The efficiency effect refers to the amounts of wasted votes, and it is measured as the total deviation minus the size effect.

Tables 2 and 3 show partisan effects in Denmark and New Zealand in the election previous to the critical juncture. The efficiency effect is measured for the real distribution of the votes (left-hand side panel of the table) as well as for a simulated distribution that equalizes the conservative and liberal party votes through uniform swing (right-hand

side panel of the table). The latter verifies the magnitude of the partisan bias in favor of liberals at the point of a hypothetical tie with conservatives. Size effects are constant because the simulation adds (subtracts) a constant of equal size in each district. The upper side of the table displays the results, real and simulated, including the mean of the constituency proportion distribution, while the lower side of the table displays the deviation and its two major components.

Both conservative parties had an inefficient distribution of the votes, especially in Denmark. It was partly compensated by favorable malapportionment in New Zealand, but aggravated by malapportionment in Denmark, where the party obtained a seat-vote differential of 16.7 negative percentage points. Liberals were blessed by partisan distortion in both countries, and so were Radicals in Denmark, but for New Zealanders the bonus was moderate (3.4 points) in comparison to Danish liberals (10 points). Socialists were always hurt by malapportionment, but they had an efficient distribution of their votes and a low seat-vote deviation in both countries. They could be satisfied with reapportionment. In neither of these countries did the socialists push for PR (Penadés, 2008).

The hypothetical equalization of the votes of the two parties verifies that the bias helping the liberals was not contingent on their being relatively larger than the conservatives. It was present in Denmark, where liberals were larger than conservatives, and in New Zealand, where liberals were smaller, and it would have been present in both countries if liberals and conservatives had had exactly the same number of votes, preserving the same geographical distribution of support.

The equalization of votes illustrates an important fact to understand the strategic setting in New Zealand: if liberals kept growing at the expense of the conservatives, they were likely to disproportionately hurt them. Liberals had experienced an electoral resurgence and obtained a result not far from the Conservatives in 1928. By hypothetically shifting 2.7 points from liberals to conservatives, we would make the advantage of the former move to 8.5 points, and the disadvantage of conservatives to negative 8.4 points. That is to say, the geographical equilibrium in New Zealand could produce results not dissimilar to the Danish case if the electoral growth of Liberals were to continue. Thus, although Danish Conservatives were hurt by the electoral system more clearly than in New Zealand, and the latter Conservatives could still claim the role of dominant party of the right, in a dynamic situation of party change the Conservative dominance in New Zealand was fragile. It could be reverted not only by socialist electoral growth but also by liberal growth, which was eroding the conservative Reform party in the cities (Lipson, 1948, chapter 9).

Hence, in the two countries the plurality system was biased in favor of the liberals, it was biased against the Conservatives, and it was relatively neutral regarding the socialists. Socialists could benefit from reapportionment, but not necessarily from reform. Conservatives in New Zealand seemed to benefit from the status quo, but that was only because of their relatively larger electoral size, and the recent growth of liberals could reveal its frailty in a three-way competition.

Segmentation: How divided were the electorates?

Using estimated transfers, we next show that the parties in Denmark were electorally divided within districts as well as across districts. Their voters had limited disposition,

Table 4. Estimation in percentages^a of vote transfers between the DK General elections of 1910 (by row) and 1913 (by columns).

	Conservative	Liberal	Socialist	Radical	Others	Abst.	Net exits	
Conservative	84.6	3.4	4.0	1.5	0.1	5.6	0.9	64,080
Liberal	11.6	69.3	3.0	6.4	3.1	6.5	0.1	115,444
Socialist	2.3	2.9	90.4	1.7	0.7	1.9	0.2	97,197
Radical	3.6	6.4	5.9	80.9	0.3	2.9	0.0	63,115
Others	12.2	27.8	10.6	31.7	4.7	4.8	8.1	10,913
Abstention	4.3	5.7	2.8	1.8	1.8	83.2	0.4	114,536
Net entries	21.8	5.0	24.8	6.2	1.6	40.6	0.0	21,968
	83,212	99,625	107,365	67,903	7,431	119,579	2,138	

Source: Compiled by the authors using data from CLEA (Kollman et al., 2019) after applying the *nsplhom* algorithm (Pavía and Romero, 2022) with default options. The correspondences between the main historical labels and the ones employed in this research are: Conservative ↔ Højre; Liberal ↔ Venstre; Socialist ↔ Socialdemokrater.

^aNumber of voters in the last column and row.

Table 5. Estimation in percentages of vote transfers over valid votes between the DK General elections of 1910 (by row) and 1913 (by columns).

	Conservative	Liberal	Radical	Socialist	Others
Conservative	89.6	3.6	1.6	4.2	0.2
Liberal	12.5	74.1	6.8	3.6	3.3
Radical	3.7	6.6	83.3	6.0	0.4
Socialist	2.6	3.0	1.7	92.1	0.7
Others	12.6	29.2	33.3	11.1	5.0

Source: Compiled by the authors using data from CLEA (Kollman et al., 2019) after adjusting to valid votes the global transfer matrix returned by the *nsplhom* algorithm (Pavía and Romero, 2022) with default options. The correspondences between the main historical labels and the ones employed in this research are: Conservative ↔ Højre; Liberal ↔ Venstre; Socialist ↔ Socialdemokrater.

and corresponding limited opportunity, to exchange their party choices. In contrast, a much larger proportion of liberal and conservative party voters showed a flexible disposition to shift from one label to the other in New Zealand, and their electorates overlapped geographically to a larger extent.

Table 4 summarizes the estimated vote transfers between the major parties in Denmark between 1910 and 1913, the last two elections to be celebrated with plurality rule. Table 5 merely recalculates the fraction excluding abstainers for comparability with New Zealand, where those data were not available. Table 6 summarizes the estimated vote transfers in New Zealand between 1925 and 1928, the last two elections in which the conservative Reform party and the liberal United party competed with each other, before forming an electoral coalition for the 1931 election that would subsequently become the National Party.

Table 6. Estimation in percentages^a of vote transfers between the NZ General elections of 1925 (by row) and 1928 (by columns).

	Conservative	Liberal	Socialist	Agrarian	Others	Net exits	
Conservative	55.3	25.7	12.6	2.2	3.2	1.0	298,820
Liberal	22.3	52.8	15.1	1.4	7.9	0.6	142,495
Socialist	7.9	19.5	67.9	1.2	2.8	0.7	181,395
Agrarian	35.6	1.3	14.4	48.7	0.0	0.0	2,398
Others	14.4	0.0	23.2	0.0	59.7	2.7	8,262
Net entries	52.0	31.3	12.7	0.4	3.7	0.0	51,180
	240,065	203,575	190,954	11,990	32,715	5251	

Source: Compiled by the authors using data from <http://www.jackvowles.com/nzelect.html> after applying the nsiphom algorithm (Pavía and Romero, 2022) with default options. The correspondences between the main historical labels and the ones employed in this research are: Conservative ↔ Government; Liberal ↔ Nationalist (1925) or United (1928); Socialist ↔ Labour; and Agrarian ↔ Country.

^aNumber of voters in the last column and row.

Table 7. Estimation of vote transfers for the DK General elections of 1910 (by row) and 1913 (by columns) by pairings of parties after restricted to the districts where each pair compete.

C versus L		C versus S		L versus S		R versus C		R versus S		R versus L	
59/122		55/122		43/122		45/112		25/112		47/112	
C	L	C	S	L	S	R	C	R	S	R	L
C	72.8 24.7	C	92.2 5.5	L	8.9 66.2	R	77.1 4.4	R	64.9 15.7	R	83.3 5.4
L	14.8 65.7	S	2.1 93.7	S	82.3 3.5	C	12.9 79.5	S	13.5 71.7	L	12.4 73.2

Source: Compiled by the authors using data from CLEA (Kollman et al., 2019) after applying the nsiphom algorithm (Pavía and Romero, 2022) with default options just considering for each pair of parties the districts where they compete. The correspondences between the main historical labels and the ones employed in this research are: C = Conservative ('Right') ↔ Højre; L = Liberal ('Left') ↔ Venstre; S = Socialist ↔ Socialdemokrater, R = Radical.

Number of seats contested.

C	L	R	S	Available seats
91	79	60	68	122

Conservative and liberals in New Zealand appear to be much more substitutes than in Denmark. We estimate that in Denmark in 1913 the conservatives transferred to liberals only one vote for every 25 that they managed to retain from their 1910 electorate, whereas the liberals lost to the conservatives one vote for every six they kept. The situation was far more fluid in New Zealand, where both Conservative and Liberal parties ceded to each other in 1928 almost one vote of 1925 for every two they kept loyal. The electorate at large appears to be rather more rigid in Denmark than in New Zealand (the average

Table 8. Estimation of vote transfers for the NZ General elections of 1925 (by row) and 1928 (by columns) by pairings of parties after restricted to districts where each pair compete.

C versus L			C versus S			L versus S			C versus A			L versus A			S versus A		
48/70			49/70			40/70			5/70			2/70 ^a			2/70 ^a		
C	L		C	S		L	S		C	A		L	A		S	A	
C	53.4	35.0	C	52.7	16.1	L	59.5	19.5	C	57.5	23.7	L	-	-	S	-	-
L	27.0	63.6	S	7.6	70.6	S	21.6	71.3	A	69.2	26.6	A	-	-	A	-	-

Source: Compiled by the authors using data from <http://www.jackvowles.com/nzelect.html> after applying the nsiphom algorithm (Pavía and Romero, 2022) with default options just considering for each pair of parties the districts where they compete. The correspondences between the main historical labels and the ones employed in this research are: C=Conservative ('Reform') ↔ Government; L=Liberal ↔ Nationalist (1925) or United (1928); S=Socialist ↔ Labour; and A=Agarian ↔ Country.

^aNot enough information available.

Number of seats contested.

C	L	S	A	Available seats
65	52	54	5	70

fidelity to parties was 84.8 in Denmark and 56.2 in New Zealand, excluding ‘others’), but to grasp the bearing of those figures on the potential for electoral coalition we must focus on the two-way party transfers.

Next, we estimate in Tables 7 and 8 the vote transfers between pairs of parties that actually competed and only in the districts that they did. The figures reveal an electorate in Denmark less stable across the liberal/conservative line than what is shown in the national picture, but still clearly less volatile than in New Zealand. The fidelity of conservative voters in Denmark in 1913 in places where liberal candidates could also be found in the field was 72.8%, 16.8 points below the overall estimate. As for the liberals, when conservatives were present, their fidelity was 8.3 points lower than the national result, reaching a more moderate 65.7%. The fraction of votes actually transferred when conservative and liberal parties competed among themselves increases substantially. When conservative voters of 1910 had the opportunity to vote for a liberal candidate in 1913, one in every four did, which reveals a level of ‘hostility’ that is considerably lower than the overall estimate (one vote lost for every 25 kept loyal). Likewise, the liberals ceded to conservatives one vote for every 4.5 they kept, which is also more fluid than what the country-wide picture reveals. The right-wing parties were no substitutes, but the notion of a coalition was not outrageous.

The estimation of votes transfers between Liberals and Conservatives in New Zealand estimated for the districts where they both competed in 1925–1928 is not very different from the overall pattern, but it is even lower (see Table 6). The very low retention capacity of conservative voters (53.4%) in the face of liberal competition reflects

Table 9. Pairwise segmentation of the electorates measured from vote transfers in Denmark (1910–1913) and New Zealand (1925–1928).

Pairs of parties	Denmark (1910–1913)		New Zealand (1925–1928)	
	Voters only	Voters and geography	Voters only	Voters and geography
C versus L	0.557	0.822	0.307	0.385
L versus R	0.796	0.843		
R versus S	0.649	0.916		
C versus R	0.800	0.940		
L versus S	0.847	0.928	0.522	0.554
C versus S	0.921	0.930	0.678	0.715

Source: Compiled by the authors after applying the PWS statistic to the transfers shown in Tables 4 and 6. The correspondences between the main historical labels and the ones employed in this research are: C = Conservative ('Right', 'Reform') party; Liberal ('Left' or 'United') party; R = Radical party; and S = Social democratic party/Labour party.

the comeback of the liberal party to the electoral contests almost on equal terms to the conservatives, which was the prelude to the coalition. There is little evidence of a strong social division between them. Rural interests rallied around the Country party in a few districts, too few to make a reliable estimation of transfers.

The index of pairwise segmentation adds to these qualitative comparisons. It is apparent from Table 9 that, in Denmark, the divide within the right (conservatives and liberals) as well as the divide within the left (radicals and socialists) had a substantial geographical component. The exchange of votes among the parties within blocks were not uncommon when they met, but they did not exchange many votes in the aggregate. Conservatives and liberal candidates only encountered each other in half of the districts, radicals and socialists in less than a quarter. The left/right divide, however, was deep: there were only small transfers from parties across blocks even when they were geographically possible.

The right was not so divided in New Zealand, and the left–right division was weaker than in Denmark. Conservatives and liberals competed in 69% of the districts, frequently in three cornered contests with Labour. The estimated segmentation was smaller for every pair of parties in New Zealand than in Denmark. Compared to the Danish case, the two right-wing parties shared very similar electorates, neither hostile nor geographically foreign to each other, as shown in the very low segmentation indicator.

Prospects: How did the alternatives look like?

In order to ascertain how the future could appear at the time that the parties made their choices, we have projected the results of the critical elections under different scenarios. These projections were based on estimated local-level vote transfers between the two preceding elections. Our premise is that these projected results offer a semblance of the implicit knowledge parties would rely upon for their choices. We do not claim precision, although the forecasts turn out reasonably well when they can be contrasted. They

Table 10. Anticipated seat distributions in Denmark in 1918 by simulation under plurality system based on previous election estimated transfers.

Party/coalition	Predicted inertia	Coalition	Double coalition	1918 distribution
C and L	(38.4)	50.9	48.2	(47.9)
R and S	(61.7)		51.8	(49.3)
C	7.1 (+0.8)			15.7
L	31.3 (−6.2)			32.1
R	30.4 (+2.7)	24.1		22.9
S	31.3 (+7.9)	25.0		27.9

Source: Compiled by the authors using data from CLEA (Kollman et al., 2019). The correspondences between the main historical labels and the ones employed in this research are: C = Conservative ('Right') ↔ Højre; L = Liberal ('Left') ↔ Venstre; S = Socialist ↔ Socialdemokrater; R = Radical. The inertia has been computed after assuming that the last vote transfer estimated continues in the next election. See the methods section for details.

Table 11. Anticipated seat distributions in New Zealand in 1931 by simulation of previous election estimated transfers compared to effective coalition results.

Party/coalition	Predicted inertia	Predicted coalition	1931 result
C and L		60.0	60.0
C	18.6 (−15.6)		
L	35.7 (+2.8)		
S	37.1 (+12.1)	38.6	34.3
A	1.4	1.4	0.0
O	7.1	1.4	5.7

Source: Compiled by the authors using data from <http://www.jackvowles.com/nzelect.html>. The correspondences between the main historical labels and the ones employed in this research are: C = Conservative ('Reform') ↔ Government; L = Liberal ↔ United; and S = Socialist ↔ Labour. See the methods section for details. The inertia has been computed after assuming that the last vote transfer estimated continues in the next election. See the methods section for details.

summarize the effect of the electoral system, the political segmentation of the electorate, and the past electoral behavior.

Tables 10 and 11 display the projected distributions of seats if we observed an iteration of the same vote transfers, including the transfers from a growing electorate. In addition to the pure inertial results, they include the possible result of coalitions under some degree of polarization: the attrition to the parties forming a coalition is made equivalent in size to the votes expected to be received from the left if the right-wing front did not form. In Denmark, we calculate the results of two possible coalition patterns: a right-wing electoral coalition and a double coalition, in which the left reacts defensively building its own alliance.

Denmark. If the same pattern of electoral transfers of 1913 had persisted in Denmark under the status quo rule and with no coalition (Table 10), the sum of parliamentary

forces of socialists and radicals would have controlled the Lower Chamber with 61% of the seats and only 49.7% of the votes, while the sum of liberal and conservative votes would have amounted to 48.8% of the total but would have suffered a heavy penalty in representation. Although a mixed electoral system was finally used, the sum of the two parties of the left eventually added to 49.3% of the vote, and the sum of the two parties of the right to 47.7%, so our prediction was not unlikely. However, if liberals and conservatives had combined their electorate support, they could have defeated the left under the old rules in enough districts to barely keep a majority. One problem was the very narrow margin of foreseeable victory: any increased attrition in their expected votes would put them on the verge of failure. A bigger problem was that the electoral coalition game could be played by the left too and, on the basis of past transfers, the left had the odds in their favor. Therefore, given the market segmentation and the status quo rules, making a common front was not an effective way to contain the left in parliament. The choice made by the right-wing parties, a biased representation method for ‘majority protection’ (Walter and Emmenegger, 2019), only seems natural.

The parties faced the alternatives with the common dose of uncertainty in politics. They had a rational basis to believe that the left could benefit from the present system and win a landslide. The mixed system of PR (Elklit, 1992) reflected the fact that the information was rich enough to define a set of rules under which the right could raise the majority threshold for the left more effectively than under single member plurality elections.

New Zealand. As shown in Table 11, the results of the coalition of conservatives and liberals in New Zealand in 1928 could be accurately predicted using the transfers estimated between 1921 and 1925 and projecting them into the future with an attrition constraint natural for a polarizing coalition, equivalent to the expected transfers from the socialists to the right without coalition. For the set of districts where the analysis can be done (70 of the 76 non-Maori constituencies), the coalition obtained the same proportion of seats that could have been predicted iterating the vote transfers minus the attrition.

In most of the 1931 constituencies, the coalition followed the rule of letting the stronger local party run in each district. The coalition presented 39 conservative (Reform) candidates, in almost every one of the 41 districts where the party had come stronger than the liberals (United) in 1929. Likewise, the coalition presented 26 liberal (United) candidates in the 31 districts in which the party had obtained more votes than the conservatives. They exchanged some positions and also presented some common candidates without party identification.

The result of the coalition was clearly superior for the participating parties compared to running separately, and specially for the conservatives, who managed to win more than half of the coalition seats. The coalition parties successfully reduced the potential parliamentary growth of the Socialists, compensated the inefficient distribution of the Conservatives, and avoided a parliament without majority where the socialists would have had coalition power. It was a rational and effective way to raise the majority threshold for the socialists without incurring the cost of lowering the inclusion threshold and facilitating the entrance of further competitors. Facilitating the coordination of similar

electorates was beneficial to the right parties, at least for the time being, until the Depression eventually facilitated a majority for Labour.

Conclusion

Vote transfers reveal to what extent the parties shared electorates that were relatively more or less segmented. Segmentation may occur because the electorates were disjoint, or because they were mutually hostile, or, more commonly, because of both reasons. Hence, segmentation indicates to what extent it was feasible for parties of the right to cooperate in the electoral arena under majoritarian rules when single-party majorities were absent. They also reveal the tendencies for potential spontaneous voter realignment under the old rules. Hence, vote transfers provide an informational basis, in a pre-survey era, for the decisions taken to face the rise of socialism. If right-wing parties foresee a socialist majority, they may either converge or change the rules to more effective electoral rules to contain that majority. We assume that parties made their decisions informed by the interdependencies of the electoral market, and in the light of likely consequences of the old ones.

The *nsplphom* algorithm used to estimate vote transfers in Denmark and New Zealand has demonstrated to be a useful tool for explaining the institutional and coalitional choices of right-wing parties in a situation of party system change. The ability of the algorithm to provide estimations for different levels of aggregation of districts is a powerful tool to map out the relative affinities between the electorates of different parties, and to disentangle the geographical effects from the sheer propensity or reluctance of the voters to shift their vote. In the light of information provided by transfers, the decision of the parties of the right to form a coalition in New Zealand and to reform the electoral system in Denmark both made sense as the best way to raise the majority threshold for the left.

As future research, we anticipate that the use of this ecological inference technique will map the segmentation of electoral markets in early democracies where data are available. This mapping will document the direction of mobilization of new voters as well as the flows between parties. With this tool, we aim to shed light on basic strategic and institutional choices, such as the electoral system, across democracies of the first wave.

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