# The 2017 election in Papua New Guinea

Terence Wood and Maholopa Laveil

## Abstract

This paper draws on the Papua New Guinea Election Results Database alongside other data to study the 2017 General Election in Papua New Guinea. The paper shows that the 2017 elections suffered significant problems, even by the standards of other countries of similar levels of development. Amongst other issues, the paper finds worrying patterns of roll inflation in parts of the Highlands. In terms of election outcomes, we find some evidence that women candidates are becoming more competitive, although improvements are modest and trends uncertain. We also demonstrate that the relationship between candidate numbers and incumbent re-election, first found by David Hegarty in the 1980s still exists and is statistically robust. Finally, we conduct an in-depth study into the Limited Preferential Voting (LPV) system. We find LPV brought an increase in invalid ballots and a boost in women candidate competitiveness, but that many other anticipated changes appear not to have eventuated. However, importantly, in 2017 it appears some voters cast their second and third preferences along national lines as a protest vote against the Prime Minister's party. Voting on national issues is thought to be rare in Papua New Guinea, and if LPV is facilitating it, the system may ultimately bring larger political changes, although this is far from guaranteed.

**The 2017 election in Papua New Guinea**

Terence Wood

Maholopa Laveil

Terence Wood is a research fellow at the Development Policy Centre.[1]

Maholopa Laveil is an economics lecturer at the University of Papua New Guinea

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http://devpolicy.org/pngelections/

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# 1. Introduction

The 2017 general election in Papua New Guinea was the country's ninth post-independence. In this paper we build on earlier work analysing electoral data from Papua New Guinea (in particular, Wood 2017). We provide the first detailed analysis of election results from the 2017 general election in Papua New Guinea.

This paper is part of a larger project – the Papua New Guinea Election Results Database – in which we are preserving election results from Papua New Guinea and making them available for the public and researchers: http://devpolicy.org/pngelections/. We are very grateful to the PNG Electoral Commission for its willingness to make 2017 election results available. We have tidied and standardised the 2017 data provided to us, and have combined it with the election results dataset. (Full details on how the earlier dataset was compiled can be found in Wood 2017.)

As you read the rest of this paper, please be aware that the database is not 100 per cent complete. In some years a small number of electorates are missing data. Only limited data are available for most electorates in 2007.

These issues should have only very minor impacts on the analysis below, but will need to be taken into account when additional analysis is undertaken.

# 2. Country context and election basics

Papua New Guinea is a comparatively poor developing country. In 2017 its GDP per capita was $2,489 USD.[2] It is also poorly governed. In 2017 it was in the bottom quartile of all states for government effectiveness in the World Bank's World Governance Indicators.[3]

Papua New Guinea is home to over 800 languages (Reilly 2001, p. 763) and is the world's most linguistically fragmented country (Fearon 2003, p. 216; Reilly 2006, p. 57). Papua New Guinea is a unicameral parliamentary democracy. Two types of MP are elected to parliament. The first are elected from 'open' constituencies. There are 89 open constituencies in Papua New Guinea. The second type of MP comes from so-called 'provincial-seats'. One provincial MP is elected per province. This person serves both in

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[2] https://databank.worldbank.org/data/reports.aspx?source=world-development-indicators

[3] http://info.worldbank.org/governance/wgi/wgidataset.xlsx

the national parliament and, usually, as the provincial governor. Neither the number of open electorates nor the boundaries of open electorates have changed since independence. From independence until 2007, there were 20 provinces; in 2012 this number increased to 22. Malapportionment is a major issue in Papua New Guinea.[4] Table 1 compares the number of registered voters in the smallest, median and largest open and provincial electorates.[5] Readers seeking a map of the country's electorates can access one at: https://tinyurl.com/y2lwerd4

**Table 1 – Malapportionment in Papua New Guinea in 2017**

|  | Open Seats | Provincial Seats |
|---|---|---|
| **Minimum** | 22,361 | 31,833 |
| **Median** | 49,267 | 197,261 |
| **Maximum** | 143,497 | 486,384 |
| **Ratio Max to Min** | 6.4 | 15.3 |

From its first post-independence election in 1977 until 2002 Papua New Guinea had a single member district plurality electoral system.[6] After 2002, the country adopted a limited preferential voting system (LPV). In this system, voters indicate their first, second and third preferences on the ballot. During counting, first preferences are counted first. If any candidate wins more than 50 per cent of first preference votes, they are deemed the winner. If no candidate wins more than 50 per cent of first preference votes, there is a second count. In the second count the lowest polling candidate is eliminated, and the second preferences of those voters who voted for the candidate are distributed among the other candidates. This process of lowest polling candidates being eliminated and their votes being redistributed following voters' second or third preferences is continued until a candidate wins more than 50 per cent of the remaining non-exhausted ballots. (Once a voter's first, second and third preferred candidates have been eliminated their vote is considered exhausted and excluded from all further considerations.) As we discuss later

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[4] Section 35 of the Organic Law on National & LLG Election states the maximum possible number of open seats in PNG is 91. Redistricting has been proposed in the past including by a 2014 Electoral Boundaries Commission report.

[5] As we discuss later, the electoral roll is inaccurate in PNG. However, we have no reason to believe it either overstates or understates malapportionment.

[6] Prior to independence, in the 1964, 1968 and 1972 elections, it used a form of optional preferential voting.

in the paper, at the time of writing it appears possible that Papua New Guinea will return to a single member district plurality system at the next general election.

## 3. Electoral Quality

### 3.1 Overall quality

Figure 2 shows data from the Electoral Integrity Project's global electoral quality dataset.[7] The y-axis of the chart reflects electoral quality as assessed by country experts. Quality can range from 100 (the best possible score) to 0 (the worst). The x-axis on the chart plots GDP per capita.[8] Each point on the chart is a country. Its location is determined by the quality of the country's most recent elections included in the dataset. Solomon Islands (2014 elections) and Papua New Guinea (2017 elections) are labelled and marked in red.[9] The chart also contains a line of best fit that plots the average relationship between GDP per capita and electoral quality. For reasons of legibility, the chart only includes countries with a GDP per capita of less than US$40,000.

The chart illustrates four points clearly. One, there is a positive relationship between economic development and electoral quality. As might be expected, countries with more resources are usually able to run better quality elections (Frank & Martínez i Coma 2017). Two, the 2017 elections in Papua New Guinea were of very poor quality (amongst the worst elections globally in recent years).[10] Three, the 2017 elections in Papua New Guinea were worse than average even for countries as poor as Papua New Guinea (this can be inferred from the fact that Papua New Guinea is below the line of best fit). And, four, the quality of the 2017 elections in Papua New Guinea was considerably worse than the quality of the 2014 elections in neighbouring Solomon

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[7] https://www.electoralintegrityproject.com/

[8] Technically, it is GDP per capita adjusted for purchasing power parity and in inflation (in 2011 $). GDP figures come from two years prior to the election in question so as to avoid any election effect on GDP.

[9] PNG's score in 2017 was derived from the assessments of 13 country experts. The median country in the Electoral Integrity Project dataset had 16 assessors.

[10] It is possible to make use of different variants of the EIP dataset. The variant in the chart here comes only from data provided by respondents who completed all electoral quality questions. Another variant makes use of data imputation to account for missing data. If the dataset with imputation is plotted, more countries are included, and PNG becomes less of a negative outlier. However, it is still well below average for a country of its GDP per capita.

Islands, a useful comparator. Solomon Islands is not identical to Papua New Guinea: geography and electoral violence pose greater challenges in Papua New Guinea. However, the differences are only of degree. Geography still poses major logistical challenges in Solomon Islands and conflict around elections is not unheard of. Solomon Islands also faces similar economic challenges to Papua New Guinea and has a broadly similar social context.[11]

**Figure 2 – GDP per capita and electoral quality**
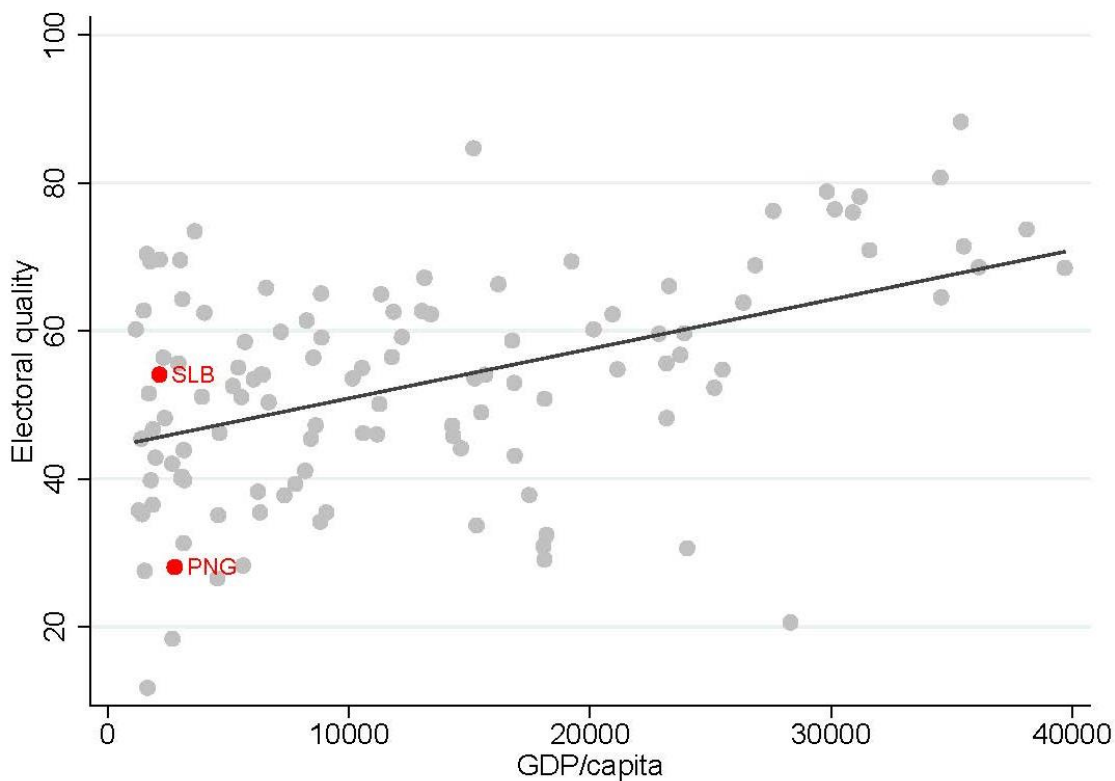


A number of well-resourced electoral observation missions were in the field during the 2017 elections. The most detailed reports from these missions were produced by Transparency International (Transparency International PNG 2017) and the Australian National University's Department of Pacific Affairs (Haley & Zubrinich 2018). The findings of these reports are inline with Papua New Guinea's low score in the Electoral Integrity Project data. The reports identified a long list of problems ranging from

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[11] As we were writing this paper, Solomon Islands held general elections in April 2019. Early reporting in the media suggest these elections were at least as well run as the 2014 general elections. Electoral Integrity Project data have not yet been modified to include the 2019 Solomon Islands elections.

electoral roll discrepancies, to vote buying, to ballot stuffing, to voter coercion and violence. While the worst electoral problems tended to be in the Highlands and major urban areas, issues were found throughout much of the country.

Not all aspects of electoral quality are readily tested using election results data, and it is not our intent here to cover ground that is best dealt with by observer reports. However, two contentious aspects of the 2017 elections can be usefully analysed using electoral data: the state of the electoral roll and inflated voter turnout.

## 3.2 The quality of the electoral roll

In the wake of the 2017 elections, concerns were raised about roll inflation. According to Markiewicz and Wood (2018, p. 15) the roll was higher than census-based estimates of voting aged populations in at least a fifth of electorates.[12] At the same time, a large number of eligible voters were disenfranchised and could not vote on the day of the election, despite having been on the provisional electoral roll. This post-provisional roll disenfranchisement appears to have been random (in that it did not obviously favour particular candidates) and associated with a last-minute attempt to use an algorithm to clean the roll of duplicate names (Markiewicz & Wood 2018).[13]

The combined effects of roll inflation and cleaning can be seen in Figure 3, which plots roll size, estimated voting aged population from the census, and total votes cast over time. Roll data are not available for elections prior to 1997.[14] All data are from the election results database except pre-2012 roll figures, which are from (PNGEC 2009).

The chart illustrates:

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[12] Because census data in PNG are themselves of poor quality, and may understate population size, Markiewicz and Wood offered a conservative estimate, with the qualifier "at least". They based their estimate on electorates where the roll was greater than 120 per cent of the estimated population from the census. If a cut-off point of 100 per cent is used instead, just over 60 per cent of open electorates have rolls greater than census population estimates.

[13] In addition, there were also cases of people being prevented from enrolling by particular candidates or their supporters.

[14] Previously, we have not had access to roll data for any elections prior to 2012. We are grateful to the late Bill Standish for providing us with an old electoral commission report that has allowed us to extend our timeseries of roll data. It is possible that census-based estimates understate the voting aged population. However, it is very unlikely that census issues explain all of the roll inflation observed here.

- The extremely rapid rise in the roll associated with the deeply troubled 2002 elections. (In 2002 roll inflation was not only massive but actual voter turnout substantially exceeded estimates of the voting aged population.)
- The mostly successful attempts to clean the roll prior to the 2007 elections.
- Rapid growth in the roll again prior to the 2012 election. In 2012, voter turnout was 93 per cent of estimated voting aged population.
- More modest growth of the roll (6 per cent) between 2012 and 2017.

**Figure 3 – Voting aged population, roll and votes cast**
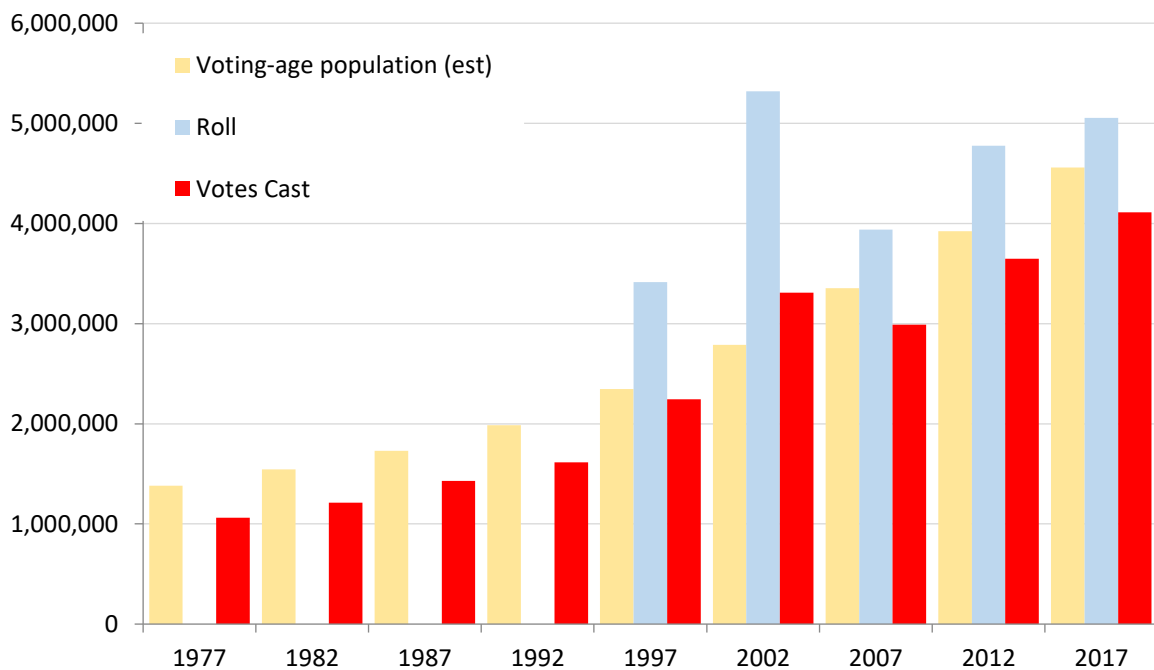


The constrained growth in the roll between 2012 and 2017 would appear to be a success compared to the overly rapid roll growth in the 2007 to 2012 period. However, part of this apparent success is the failed roll clean described before, which left many real voters disenfranchised.

Patterns in roll and turnout change have not been even across the country. Figure 4 is the same as Figure 3, except it is focused solely on the Highlands region.

As can be seen, in the Highlands the number of registered voters has exceeded estimates of the voting-aged population in every election that we have data for.

Turnout, as measured by the number of votes cast divided by the number of registered voters is also very high in the Highlands – turnout was 94 per cent in 2017. As a result

of an inflated roll, and very high turnout, the actual number of ballots cast in the Highlands has exceeded the estimated population there in every election since 1992.

This finding fits well with reports of electoral malfeasance, including roll fraud, in parts of the Highlands spanning a number of elections (Gibbs et al. 2004; Haley & Zubrinich 2013; Standish 2007).

**Figure 4 – Voting aged population, roll and votes cast (Highlands region)**
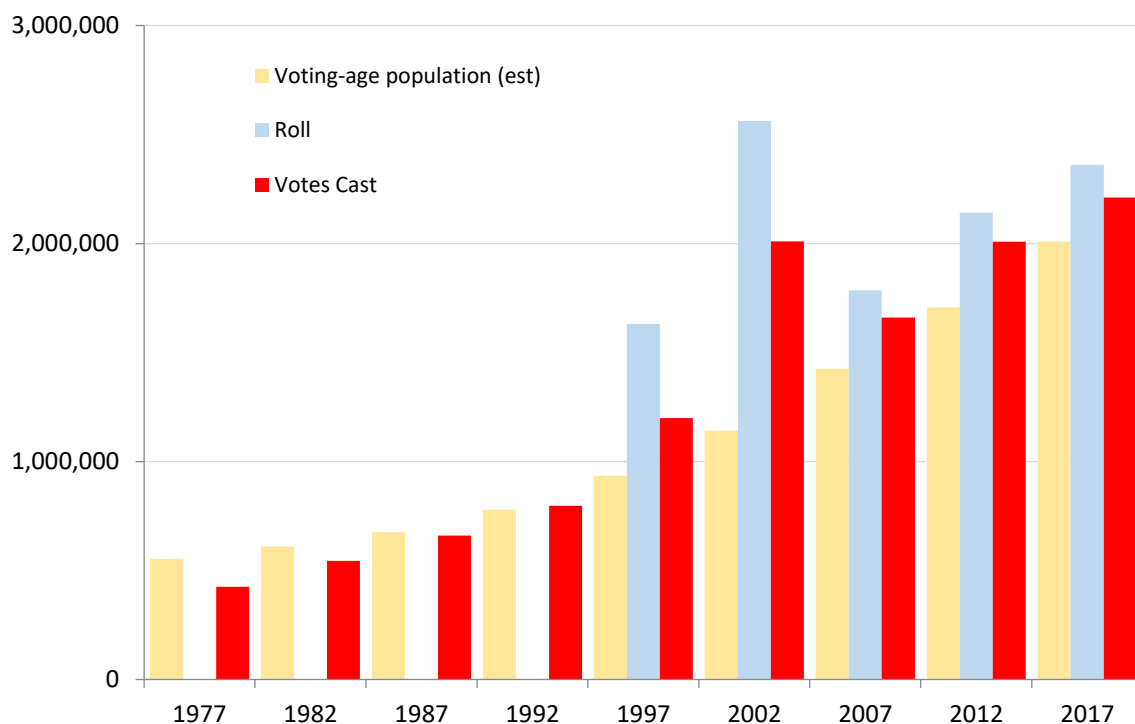


A more surprising pattern can be seen in Figure 5, which charts the same statistics for the Papua New Guinea Islands region. Here, turnout is low. In 2017, it was just 57 per cent of the voting aged population and 62 per cent of registered voters. The fact that the roll and estimated voting-aged population are similar suggests turnout is not simply artificially low due to poor roll quality or poor census data. By means of comparison, in 2014 in Solomon Islands, which neighbours Papua New Guinea, where the roll was thought to be largely accurate, and which shares some cultural similarities, turnout was nearly 90 per cent of registered voters.

**Figure 5 – Voting aged population, roll and votes cast (Islands region)**
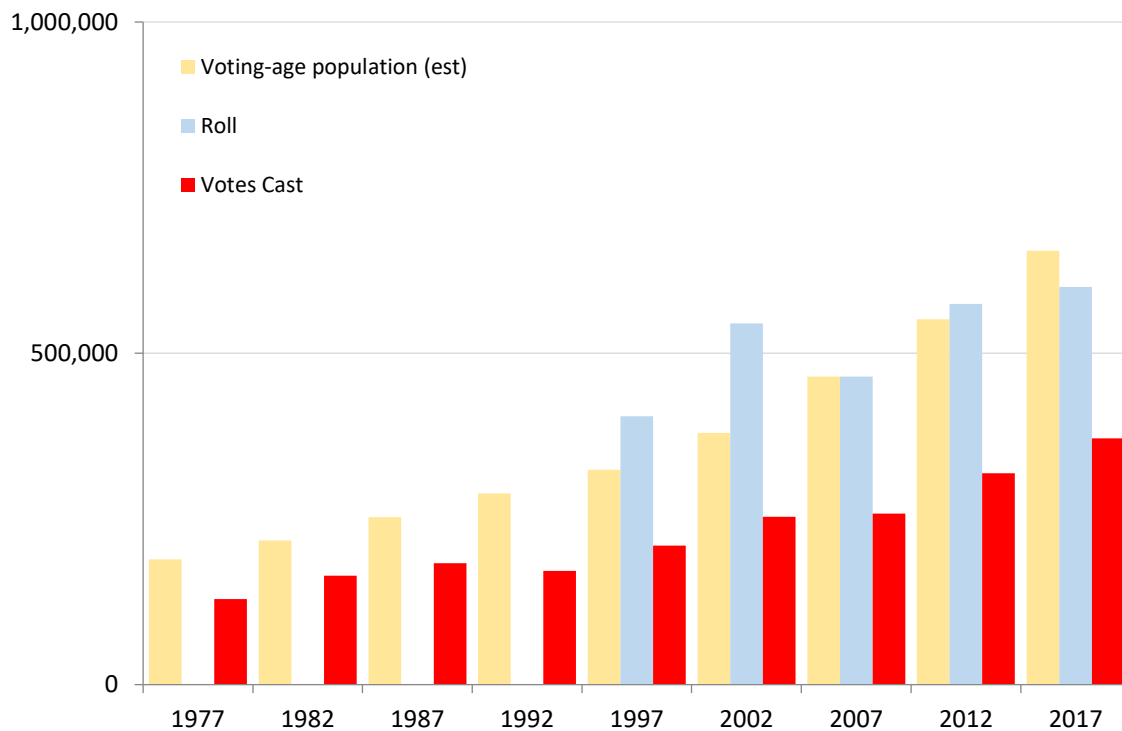


Such low turnout in the Islands defies an obvious explanation. We have heard it said that migrant plantation workers living in the Islands either return home elsewhere to vote (despite being registered in the Islands) or that they are intimidated into not voting. Both explanations might be possible, but more evidence is needed before claims can be made with any certainty. Similarly, Haley and Zubrinich (2018, p. 58) speak of delays and changes in polling schedules as potentially having disenfranchised voters "en masse" in the Islands. While this potentially explains issues in 2017, it does not offer a comprehensive explanation for a phenomenon that appears to have arisen over time.

Interestingly, low turnout is not universal in the region. In Bougainville, and East New Britain province, only 57 per cent of registered voters voted. In Manus 75 per cent of registered voters voted. Nor is low turnout limited to the Islands Region: turnout is also low in parts of Momase region.

In our own preliminary attempts to study what might be driving low turnout we ran a number of regressions in which turnout (voters per estimated voting aged population) was the dependent variable and in which regional variables, as well as a number of geographic variables (such as road access) and sociodemographic variables (such as

estimated poverty and population density) were included as independent variables. While regional differences were clear, none of the socio-demographic variables were associated with turnout, except urbanisation, which was associated, at times, with lower turnout. Differences between regions persisted even when we controlled for other variables.

## 3.3 Systematic roll manipulation

This section builds on earlier analysis by researcher Paul Flanagan who identified a concerning pattern in roll inflation prior to the 2017 election. Specifically, he found that on average the roll was more heavily inflated compared to his census-based estimates of voting aged population in electorates where the incumbent was from the prime minister's People's National Congress (PNC) party (Flanagan 2017a; Flanagan 2017b).[15,16]

Flanagan's finding is emulated the first regression model shown in Table 2.[17] As can be seen, the regression coefficient for the PNC is positive and statistically significant.[18] As the second model in the table shows, this relationship persists even when we control for the fact that roll inflation was at its highest in the Highlands, a region which might plausibly be described as a PNC support base. Matters become more complicated in the third model however. This model contains an interaction term, which captures whether roll inflation is higher in PNC held parts of the Highlands than it is elsewhere. With the inclusion of the interaction term, the coefficient for the PNC ceases to be statistically significant, while the PNC/Highlands interaction term is statistically significant

[15] Census data are inaccurate themselves, but unless there is a reason to believe census data systematically understate the population in PNC held seats, there is no reason to think Flannagan's finding would be a product of census inaccuracy.

[16] Flannagan also examined patterns in the 'cleansing' of the roll between 2012 and 2017; these are not covered in this article. (See Flanagan 2017c.)

[17] In two electorates roll inflation was such that the roll was nearly twice that anticipated on the basis of the census. Such inflation seemed implausible. It also led to high-leverage outliers in our regression models. For this reason, we excluded these two electorates (Tambul-Nebilyer and Obura-Wonenara) from our analysis. Including the two electorates led to broadly similar findings.

[18] Throughout this paper we use the term statistically significant to refer to p<0.10. Given the small sample sizes available to us, this is reasonable.

(p=0.06). This finding suggests that, on average, roll inflation in the 2017 election was at its most acute in parts of the Highlands where the incumbent was from the PNC.[19]

**Table 2 – PNC and roll inflation regression results**

|  | PNC | Highlands | Interaction |
|---|---|---|---|
| Census based estimate of roll | 0.87*** | 0.86*** | 0.89*** |
|  | (0.00) | (0.00) | (0.00) |
| PNC incumbent | 5569.90*** | 5466.61*** | 2373.92 |
|  | (0.00) | (0.01) | (0.15) |
| Highlands |  | 1110.42 | -4502.55 |
|  |  | (0.63) | (0.21) |
| PNC/Highlands interaction |  |  | 8936.07* |
|  |  |  | (0.06) |
| Constant | 6335.90** | 6465.31** | 6954.98** |
|  | (0.02) | (0.02) | (0.01) |
| Observations | 87 | 87 | 87 |
| Adjusted $R^2$ | 0.85 | 0.85 | 0.85 |

*p*-values in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

When Flannagan reported his findings, they were taken by some as suggestive that the Papua New Guinea Electoral Commission had been systematically captured in some way by the Prime Minister (who was from the Highlands) and his allies.[20] On the basis of our analysis we believe that a more nuanced interpretation is warranted. The primary reason we do not believe roll inflation provides evidence of systematic capture of the electoral commission is that it seems unlikely that, if the electoral commission had been captured, inflation would only occur in PNC held parts of the Highlands, rather than in all PNC electorates nationally.

The fact that 2017 was the first election in which roll compilation was decentralised away from the national level to provincial electoral commissions gives further cause to

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[19] If one is also willing to accept the premise that the census is accurate the value of the constant suggests roll inflation also existed, but to a lesser extent on average, in other parts of the country. It should be noted that our own findings became less clear when we transformed roll and census data using natural logs to address heteroskedasticity (p=0.13 for the combined coefficient of the PNC and the PNC/Highlands interaction term). However, our findings became much clearer when we systematically down-weighted outliers in Stata (p<0.01 for the combined coefficient of the PNC and the PNC/Highlands interaction term). When we both addressed heteroskedasticity and down-weighted outliers in the same regression model the p-value for the key term was also <0.01. Data and code available on request from the authors.

[20] Flanagan (pers. comm) has emphasised that this was not his concern, and that his primary concerns centred around the responsibility for managing the electoral roll and ensuring its integrity, as well as inadequate information provision to the independent Electoral Advisory Committee.

be sceptical of claims that the national electoral commission had systematically manipulated the roll to benefit the PNC. On the other hand, in 2017 there were very worrying allegations that, particularly in the Highlands, provincial electoral commissions were pressured to change rolls by powerful members of parliament or provincial governors (Markiewicz & Wood 2018). It seems most likely that if the roll was systematically manipulated, this is where the manipulation occurred.

It is not surprising that roll manipulation appears, on the basis of available data, to have been most apparent in parts of the Highlands, given the hard-fought nature of electoral politics in much of the region. It is more surprising that inflation appears to have been most clearly apparent in parts of the Highlands where the sitting member was from the PNC. It is plausible that PNC membership is not a cause of the inflation itself, but rather that a certain type of Highlands politician is both more likely to engage in malfeasance and join the PNC. Or observed patterns could stem from other factors not captured in our regression models, such as the allegiances of provincial governors or provincial electoral managers. However, it is also possible that while the electoral commission was not directly involved in the manipulation at source, it served as an enabler by turning a blind eye to the problems in PNC-held parts of the Highlands. To be fair to the electoral commission, even if this was the case, it may not have been a willing enabler: it was underfunded for roll-related work and under considerable political pressure from the government in the leadup to the election (Haley & Zubrinich 2018; Markiewicz & Wood 2018). Further investigation will be needed if concrete answers are to be found. Given the seriousness of the issue that has been identified, such investigation should be prioritised.

Above and beyond this specific issue, it also needs to be emphasised that the state of the electoral roll in Papua New Guinea is very poor. Considerable work will be required if it is to improve by the next election. Such work needs to be well resourced, well designed and start as soon as possible.

## 4. Election outcomes

While the conduct of the election provided cause for concern, the election results themselves were, on the surface at least, far from unusual. There were deviations from

previous trends, but candidates were still numerous and incumbent turnover high. In this section we start by looking at candidate numbers, winning candidate vote shares, and incumbent survival. We then examine the fate of women candidates, before studying the extent to which Papua New Guinea's main political parties can be said to be regionally based.

## 4.1 Candidate numbers

From independence to 2012, candidate numbers increased between all elections except 2002 and 2007, when they fell very slightly. In the 2012 general elections 3,443 candidates stood. Early expectations were that this number would rise again in 2017. However, when registrations closed, only 3,335 candidates had decided to stand, a break with the previous trend. Figure 6 shows the total number of candidates standing in the electorates with the maximum, median and minimum numbers of candidates in each general election since 1977. As Figure 6 shows, the fall in candidates was far from universal around the country. Candidate numbers in the median electorate remained unchanged between 2012 and 2017.

**Figure 6 – Minimum, maximum and median candidate numbers nationally**
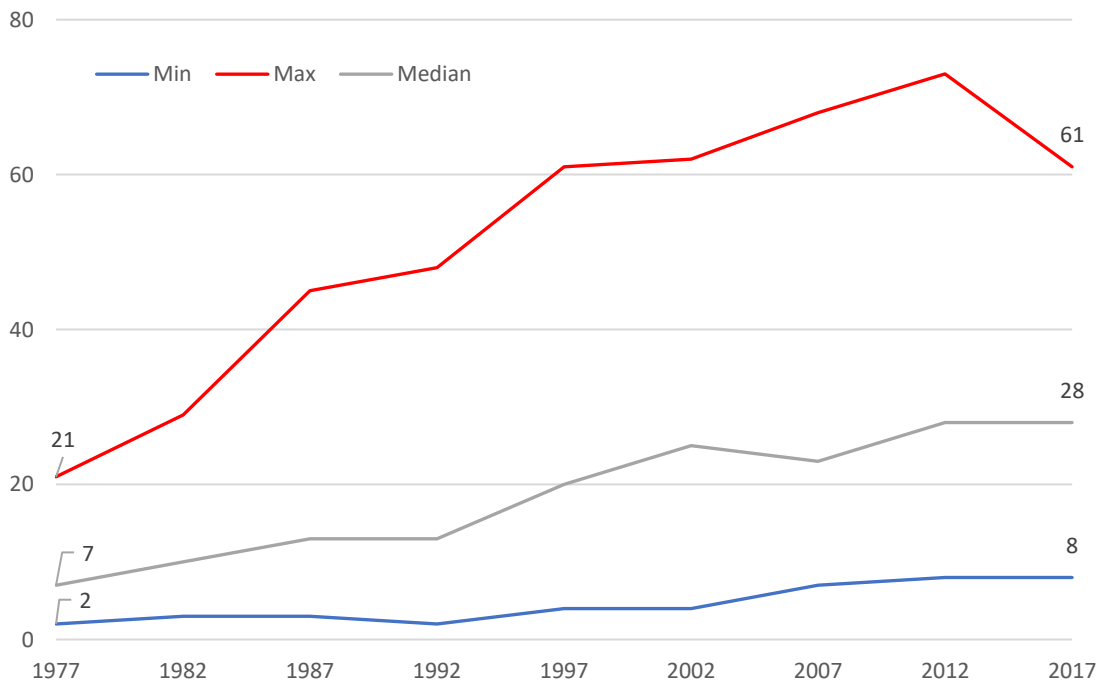
The fall in candidates in 2017 was driven first and foremost by a fall in candidates in electorates that had had large numbers of candidates in 2012. This can be seen in Figure 7, which is a scatter plot of candidate numbers in 2012 and 2017. Each point is associated with an electorate. The point's location along the x axis reflects how many candidates stood in the electorate in 2012. The point's location along the y axis reflects how many candidates stood in 2017. Points below the diagonal one to one line are associated with electorates that had fewer candidates in 2017 than in 2012. Points above had more candidates. Amongst electorates that had fewer than 45 candidates in 2012, there is a more or less equal split between electorates where candidate numbers grew and those where they fell. However, almost all the electorates that had more than 45 candidates in 2012 saw numbers fall, in some cases by a large amount.[21]

**Figure 7 – Candidate numbers by electorate 2012 and 2017**



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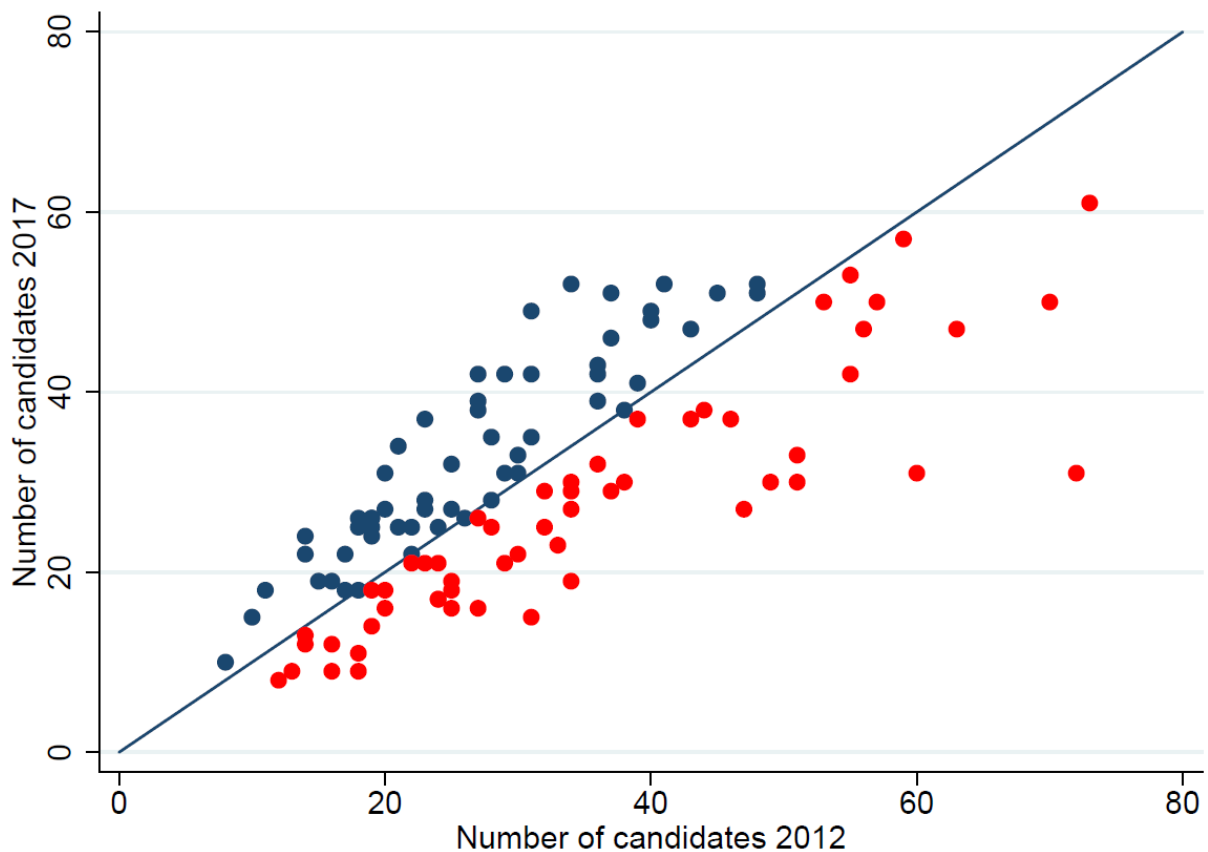
[21] Regionally, candidate numbers fell in Highlands and Southern Regions, but grew in Islands and Momase; however, these differences were not striking.

## 4.2 Winning candidate vote shares

Wood (2017) identified a negative relationship between candidate numbers and winning candidate vote share at the electorate level. Given this relationship, one would anticipate that the fall in candidate numbers in 2017 might be associated with increased winning candidate vote shares. And, on average, a small increase in winning candidate vote shares did occur in 2017. In 2012, the mean winning candidate vote share was 32 per cent after preferences. In 2017 it was 34 per cent.

Figure 8 is a scatter plot of mean winner vote share by electorate, comparing 2012 and 2017. The logic is the same as that of the previous scatter plot of candidate numbers. Points above the one to one line are associated with electorates where winner vote shares increased, points below the line are associated with electorates where winner vote shares decreased. Although it is not as striking as was the case with candidate numbers, the chart demonstrates a pattern that fits with the scatterplot of candidate numbers. Amongst electorates where the winner vote share was greater than 25 per cent in 2012, there was a fairly even balance: in some vote shares were higher in 2017, in some they were lower. However, winner vote shares rose in all electorates where winner vote shares were very low (less than 25 per cent) in 2012.

There are no obvious explanations involving regional differences for the pattern. For some reason, while in much of the country political competition was very similar in 2017 to 2012, in parts of the country where contestation was most intense, with high candidate numbers and low winner vote shares in 2012, there was a degree of consolidation in 2017: candidate numbers dropped and winners won larger shares of support. To be clear the change was hardly transformative, but it is an interesting shift nevertheless. What remains to be seen now is whether it continues in future elections.[22]

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[22] We tested to whether, more broadly there was a relationship between change in candidate numbers and change in winning candidate vote shares between 2012 and 2017. The relationship is clear the correlation coefficient was -0.59 (p<0.01). In other words, where candidate numbers fell winner vote shares went up on average; where candidate numbers rose, winner vote shares fell on average. A similar relationship is discussed in more detail in the section on incumbent survival.

**Figure 8 – Mean winner vote share by electorate 2012 and 2017**
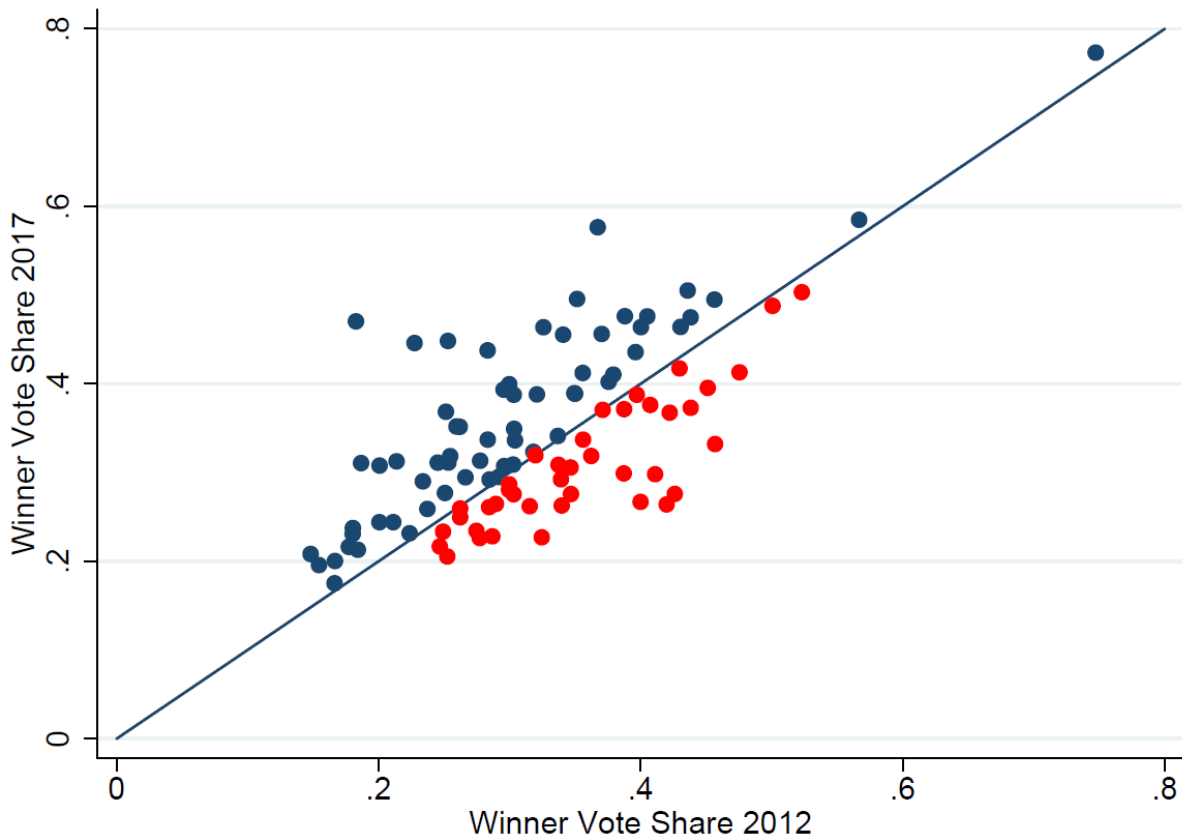


## 4.3 Incumbent turnover

Elections in Papua New Guinea are notoriously hard on incumbents. Historically, over half of those sitting MPs that contested their seats have lost them at each election. Figure 9 compares incumbent turnover rates over time. 2017 was a comparatively kind year for incumbents: 49 per cent of those who contested their seats won them back, a 5-percentage point improvement on 2012.

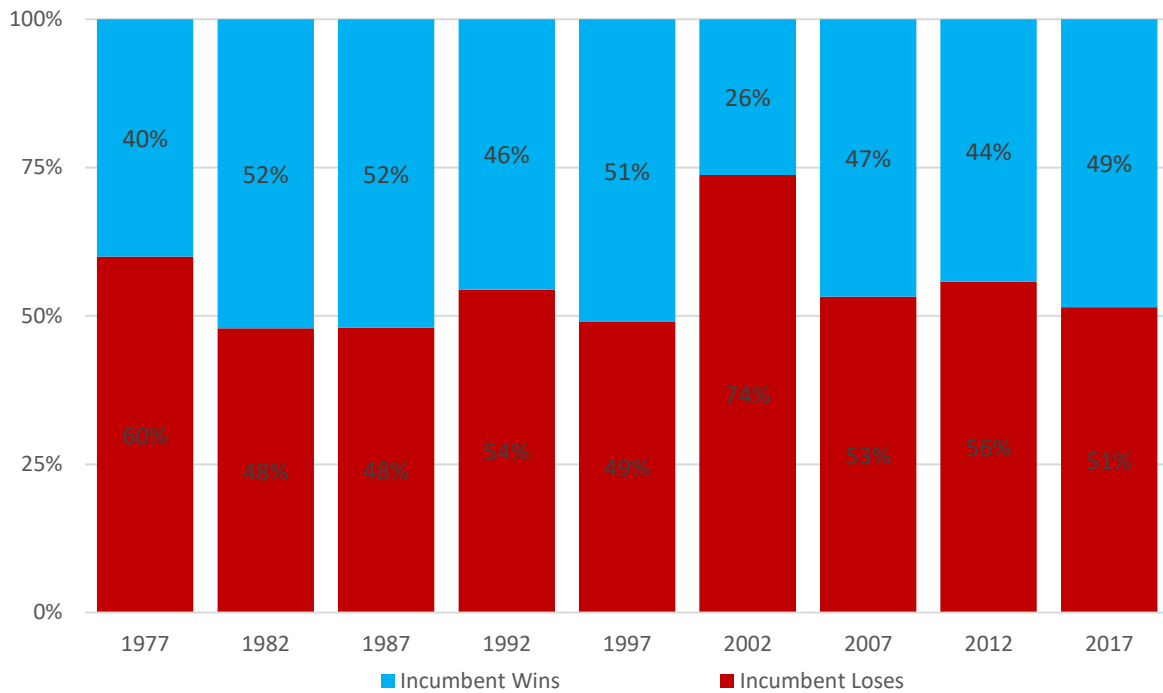**Figure 9 – Incumbent turnover and re-election over time**



Table 3 compares incumbent turnover rates between 2012 and 2017 by region. (The table shows the percentage of incumbents who lost in each region.) There was little change in incumbent turnover in Momase and Southern. Incumbent turnover increased substantially in the Islands region. However, this increase was more than offset by a major drop in incumbent turnover in the Highlands. 2017 was a good election for sitting MPs in the Highlands. (The 63 per cent turnover rate in 2012 also happens to be the mean turnover rate in the Highlands across all elections since independence.) Plausibly, this fact could be linked to electoral malfeasance in the region.

**Table 3 – Incumbent turnover by region**

| Region | 2012 | 2017 |
|--------|------|------|
| Highlands | 63% | 47% |
| Islands | 38% | 53% |
| Momase | 62% | 60% |
| Southern | 48% | 48% |

## 4.4 Predicting incumbent turnover

In the early 1980s political scientist David Hegarty discovered a relationship between the probability of an MP winning their seat back and two key variables: the number of candidates standing against them, and the size of their winning margin in the previous election (Hegarty 1982). Of the two variables, to our minds the first is the most interesting. It stands to reason that there should be some path dependency between elections, and that electorates where elections are close fought in one election may well have a higher chance of incumbent defeat in the next election. However, there is no simple reason for high candidate numbers being associated with an increased risk of incumbent turnover. Assuming additional candidates win at least some votes, more candidates may well bring reduced winner vote shares (the pattern discussed earlier) but additional candidates would seem as likely to reduce the vote shares of powerful challengers as of the incumbent. As such, additional candidates are not guaranteed in a simple arithmetic sense to increase the probability of incumbent turnover. Rather, some other feature of the local electoral landscape must be driving the relationship – at least, if a relationship between candidate numbers and incumbent turnover still exists.

The relationship that Hegarty identified (which we refer to hereafter as the "Hegarty Rule") has not been studied since Hegarty's initial analysis. Much has changed in Papua New Guinea's politics since the early 1980s (candidate numbers, in particular, have risen; also the Hegarty Rule was identified under the previous single member district plurality electoral system – it has not been tested under LPV). Moreover, Hegarty's initial identification of the pattern did not involve formal statistical testing. In Table 4 we report on the results of tests for a relationship between candidate numbers and incumbent turnover in the 2017 elections. The tests involve logistic regressions. Two models are presented. In the first candidate numbers alone are regressed on incumbent turnover. In the second model, change in candidate numbers from 2012 to 2017 and the winning margin (as a ratio of the winner's to second place getter's votes, after preferences) in the previous election are also included.[23]

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[23] Not all electorates had incumbents standing in them, which is why the n for the basic model is only 101. Some electorates lacked data on votes cast in 2012, this is why the sample size in the full model is smaller again still.

**Table 4 – Testing the Hegarty Rule**

|  | Basic model | Full model |
|---|---|---|
| Number of candidates 2017 | 0.94*** | 0.95** |
|  | (0.00) | (0.02) |
| Change in candidates 2017 - 2012 (% of 12) |  | 0.35 |
|  |  | (0.17) |
| Winner to second place ratio 2012 |  | 3.38* |
|  |  | (0.08) |
| Count R-squared | 0.66 | 0.67 |
| Observations | 101 | 95 |

Coefficients are odds ratios; *p*-values in parentheses
* *p* < 0.1, ** *p* < 0.05, *** *p* < 0.01

There is a clear relationship between candidate numbers and probability of incumbent turnover. This is true both in the basic model and in the model with additional variables. At the same time, while the sign on the coefficient in the second model for change in candidates is in the expected direction, the relationship itself is not statistically significant. There is, however, a relationship between the winning ratio in the 2012 election and an MP's probability of being reelected in 2017. The Hegarty Rule appears to continue to be true in 2017, over 30 years after it was first identified.

One other figure is worth noting in both models: the count r-squared. The count r-squared provides a useful informal gauge of the predictive power of the models. A count r-squared of one would indicate perfect predictive power. A count r-squared of 0.5 would suggest the model is no more successful in predicting whether an incumbent would be re-elected than a simple coin toss would be. The full model's count r-squared of 0.67 is considerably better than a coin toss. However, someone looking for a tool that would enable the confident prediction of election results in Papua New Guinea would still need to build on the Hegarty Rule if they wished to be able to predict with real confidence.

# 5. Women candidates

Three women were elected to parliament in 2012 in Papua New Guinea. All three contested the 2017 election. None were re-elected. No other women were elected to parliament in 2017 – there are no women currently serving in the parliament of Papua New Guinea.

This headline figure is obviously disappointing, and is sufficient on its own to illustrate the gendered nature of political competition in Papua New Guinea. However, simply counting the number of female winners is insufficient to paint a full picture of trends in women candidates' political fortunes. It could be the case that even though no women won in 2017, on average women candidates are coming closer to winning.

Unfortunately, full data on candidate gender do not exist for years prior to 2007. Table 5 shows the number of candidates for the 2007, 2012 and 2017 elections broken down by gender. Figure 10 shows male and female candidates as a share of all candidates.

As can be seen, female candidates are increasing slowly both in number and as a share of total candidates.

**Table 5 – Number of candidates by gender**

| Election | Male | Female |
|---------:|-----:|-------:|
| 2007 | 2643 | 105 |
| 2012 | 3308 | 135 |
| 2017 | 3156 | 179 |

One means of testing whether women candidates are becoming more competitive is to compare their first preference votes to that of the candidate leading after first preference votes have been counted. This can be calculated by dividing the number of votes each female candidate won by the number of votes won by the candidate that won the most first preference votes in their electorate. The result is a number that ranges between 0 and 1. If a female candidate was leading after first preferences, she would score 1. This measure is better than simply looking at the mean or median percentage of votes won by women candidates in a given year as there is considerable variation across Papua New Guinea electorates in the share of votes won by leading candidates. A female candidate that wins 10 per cent in an electorate where the leading candidate wins 15 per cent is more competitive than a candidate that wins 10 per cent of the first preference vote in an electorate where the leading candidate wins 70 per cent.
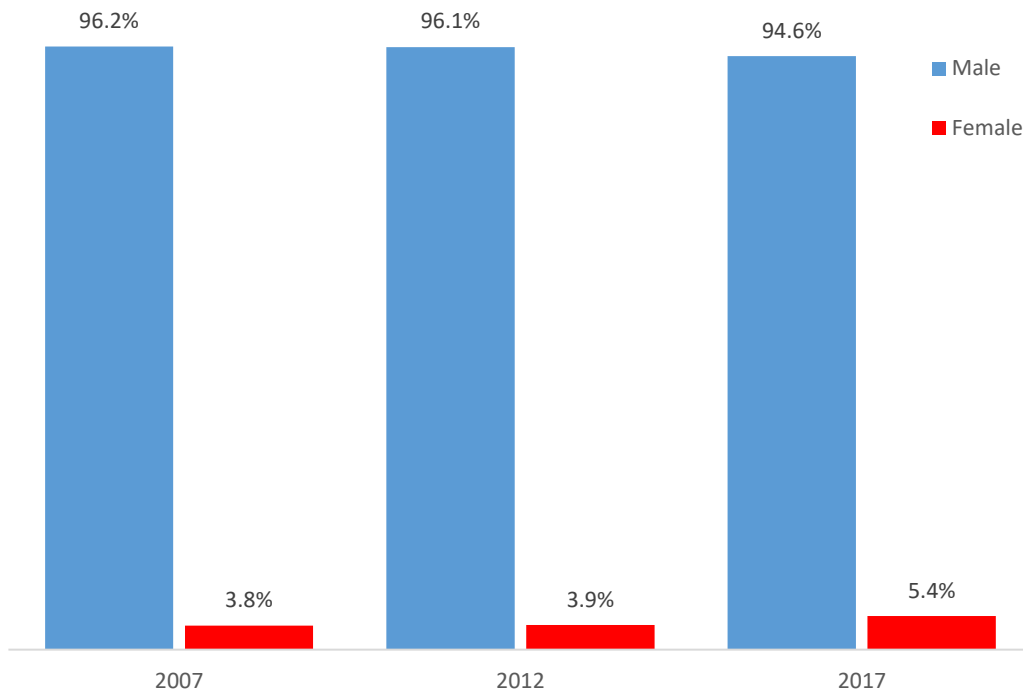
**Figure 10 – Candidate gender over time**



Table 6 is a table that compares female candidate competitiveness in 2012 and 2017 for those female candidates that we had first preference data for. [24] Interestingly, mean female candidate first preference competitiveness fell from 2012 to 2017, while the competitiveness score of the median candidate rose. Both changes were small, however.[25]

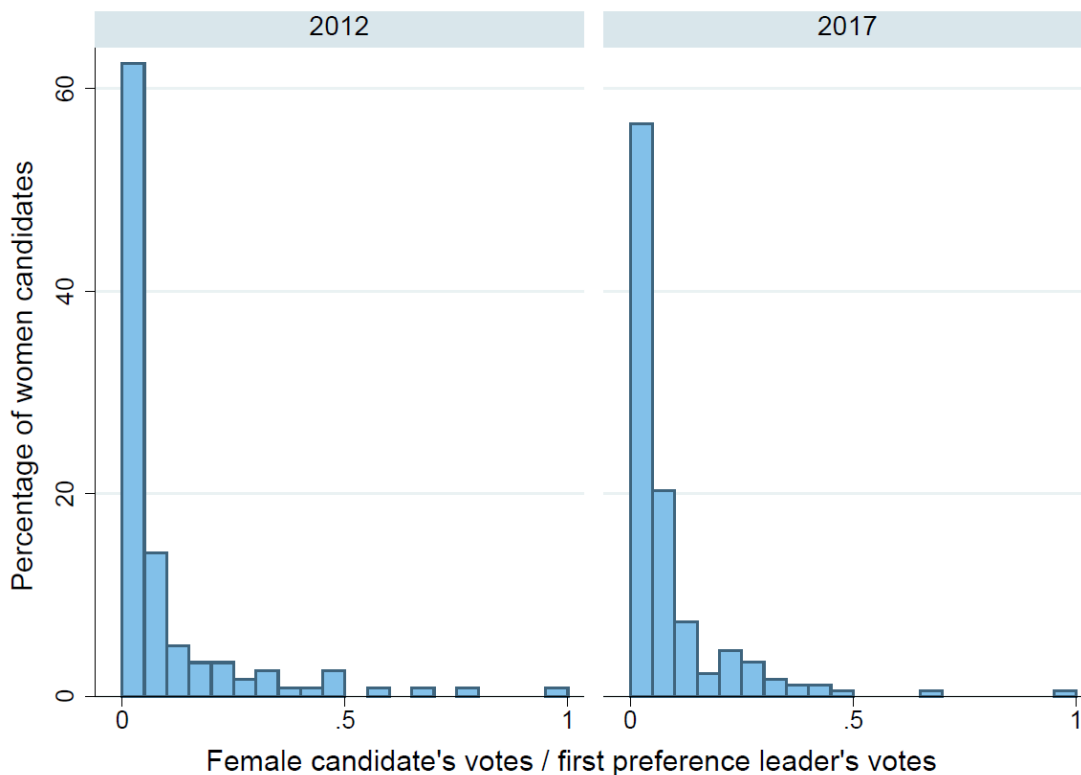**Table 6 – Female candidate first preference competitiveness**

| Year | Mean competitiveness score | Median competitiveness score |
|------|---------------------------|------------------------------|
| 2012 | 0.10 | 0.03 |
| 2017 | 0.08 | 0.04 |

[24] 2007 is excluded owing to large gaps in election results data for 2007. Owing to missing data for a small number of electorates we were still missing data for a small group of female candidates in 2012 and 2017. We have data for 120 out of 135 female candidates in 2012. We have data for 177 of 179 female candidates in 2017.

[25] Neither change was statistically significant.

Figure 11 is a histogram of female candidate first preference competitiveness scores for 2012 and 2017. It shows why mean female candidate competitiveness fell at the same time median candidate competitiveness increased slightly: in 2017 a lower share of female candidates were strongly competitive, with a competitiveness score of greater than 0.5.

**Figure 11 – Female candidate first preference competitiveness**



Comparing the histograms provides other insights. In particular, the percentage of female candidates that were particularly uncompetitive (with competitiveness scores less than 0.05) actually fell from 2012 to 2017, while the share of candidates that were slightly more competitive (>0.05 to 0.1) rose by a similar amount.

Taken together, these points indicate that while – on the basis of first preference competitiveness at least – there were fewer particularly strong women candidates in 2017, the share of very weak female candidates also fell. As a result, the share of the median woman increased. These gains were modest, but if they persist across time, they may lead to more meaningful improvements for the typical female candidate.

In the case of after preference performance it makes more sense to look at rankings rather than vote shares as, except for those candidates that make it to the final round of second and third preference reallocations, individual candidates do not win distinct vote shares of a form that can usefully be compared across candidates.

Even examining rankings is not a simple task. A candidate that finishes fifth out of a field of five candidates, can hardly be said to have performed as well as a candidate who finished fifth out of a field of 50 candidates. To account for this, we calculated an after-preference competitiveness score for all female candidates. This was calculated as their final rank, divided by the total number of candidates in their electorate. A candidate that finished last after preferences would score one. Better performing candidates will score less than one, with lower scores being associated with finishes closer to first place.

Figure 12 is a histogram of this measure of after-preference competitiveness, broken down by year. The x axis has been reversed for visual consistency with the previous chart. (In both charts better performing candidates are to the right.) The chart shows two clear points. A smaller share of female candidates was strongly competitive (with scores close to zero) in 2017 than was the case in 2012. However, at the same time, a smaller share of female candidates was very uncompetitive. As with first preference votes, in our after-preference measure of competitiveness, while the fortunes of the strongest women waned in 2017, weaker candidates seemed to become more competitive. Table 7 shows the mean and median competitiveness scores for both years. Both are lower in 2017, signifying that women were on average more competitive (at least by this measure).[26]

**Table 7 – Female candidate after preference competitiveness**

| Year | Mean competitiveness score | Median competitiveness score |
|------|---------------------------|------------------------------|
| 2012 | 0.65 | 0.71 |
| 2017 | 0.6 | 0.63 |

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[26] Both differences are statistically significant (p<0.1).

**Figure 12 – Female candidate after preference competitiveness**
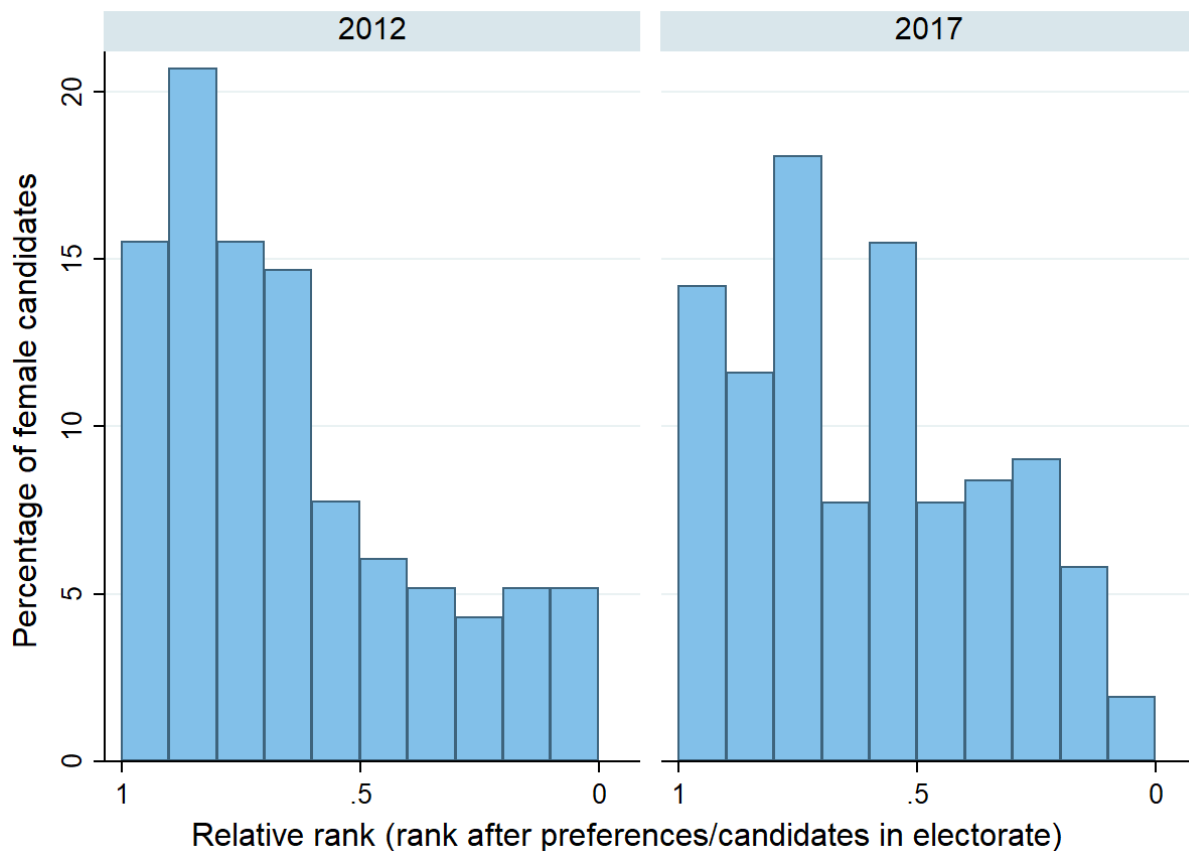


Taken together our analysis of overall female candidate competitiveness in the 2012 and 2017 elections provides suggestive evidence that, both in terms of first preference votes and in terms of after preference rankings, as a whole, female candidates became more competitive, even while the strongest female candidates tended to become less competitive. However, improvement between the two years was very modest for first preferences, and still only modest for after-preference competitiveness.

Caution should be taken when comparing only two elections. Change over two elections can hardly be seen to be a trend. Learning whether female candidates are gaining ground in a sustained way will require more data from future elections.

## 6. Party performance

Political parties are not central to elections in Papua New Guinea in the way they are in Australia. There are no clear ideological divides between parties and historically there has been little evidence people vote along party lines. Rather, the importance of parties

is that they form building blocks for parliamentary politics: governments are formed from groupings of parties. Party allegiance amongst politicians is fluid. Parties are often based around personal ties and the financial assistance party strongmen provide to candidates.

Of the 3,335 candidates who stood in the 2017 general election, 1,917 stood as independents, unaffiliated to any party. The remaining 1,418 candidates (43 per cent of all candidates) were affiliated with parties. Those candidates affiliated with parties were divided between 42 different parties. (In 2012 there were also 42 parties. In 2012, 36 per cent of candidates were affiliated with a party.) The typical party in Papua New Guinea is small (the number of candidates that the median party stood in 2017 was 32). Table 8 lists all those parties that stood candidates in more than half of Papua New Guinea's 111 open and provincial seats.

**Table 8 – Parties with candidates in more than half of seats in 2017**

| Party | Candidates |
|---|---|
| Grassroots United Front Party | 103 |
| People's National Congress Party (PNC) | 95 |
| PNG Party | 87 |
| People's Progress Party | 82 |
| Triumph Heritage Empowerment Party | 73 |
| National Alliance | 73 |
| Papua and Niugini Union Pati (PANGU) | 69 |
| PNG National Party | 56 |

Not all parties were equally electorally competitive in 2017. Figure 13 is a pie chart of those parties that won seats. Parties that won more than three seats are labelled. 21 parties won seats in total. Interestingly, none of the candidates from the Grassroots United Front Party, the party that stood the most candidates, were elected.

Independent candidates are, on average, less successful than party affiliated candidates. Nevertheless, the second largest 'group' of MPs elected in 2017 were independents. Of all the parties that stood candidates, the People's National Congress Party (PNC), the party of the Prime Minister at the time of the election, won the most seats.

**Figure 13 – Parties that won seats in 2017**
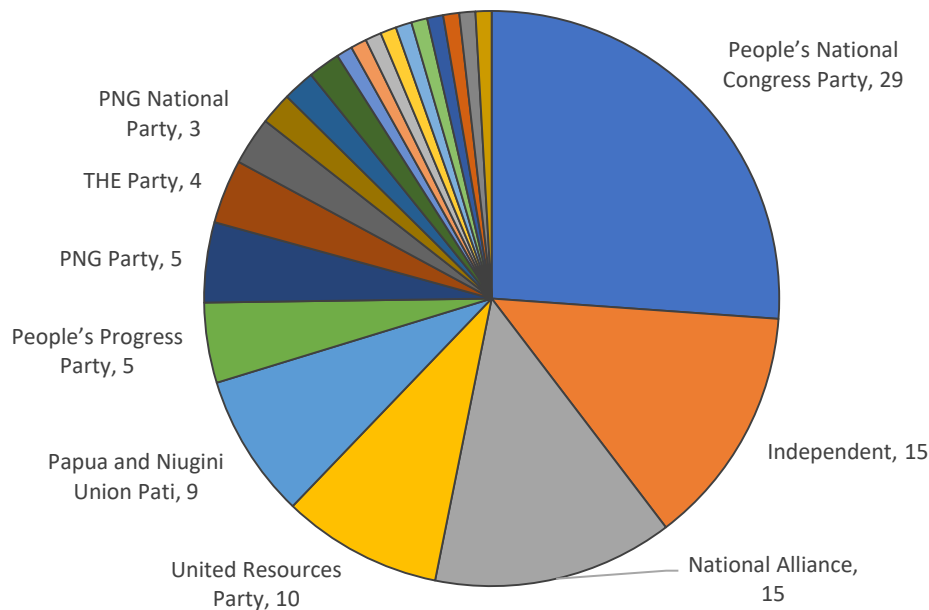


In the lead up to the 2017 elections there was some talk of parties becoming increasingly regional in orientation. In particular, the Papua and Niugini Union Pati (PANGU) was talked of as being primarily a party of the Momase region or Morobe province, while the PNC was sometimes discussed foremost as a party of the Highlands. Figure 14 is a map that shows the locations of the electorates won by major parties. Figure 15 is a map that shows the locations of the provinces won by major parties.

Importantly, the figures only focus on party locations as they were at the time of the election. Recent political realignments have substantially changed matters: most of the Morobe MPs in PANGU resigned, while a number of new MPs have shifted to join PANGU. What this will ultimately mean for the regional nature of parties is unclear. In this paper we restrict ourselves to examining party support bases at the time of the election.

**Figure 14 – Map of electorates by winning party**
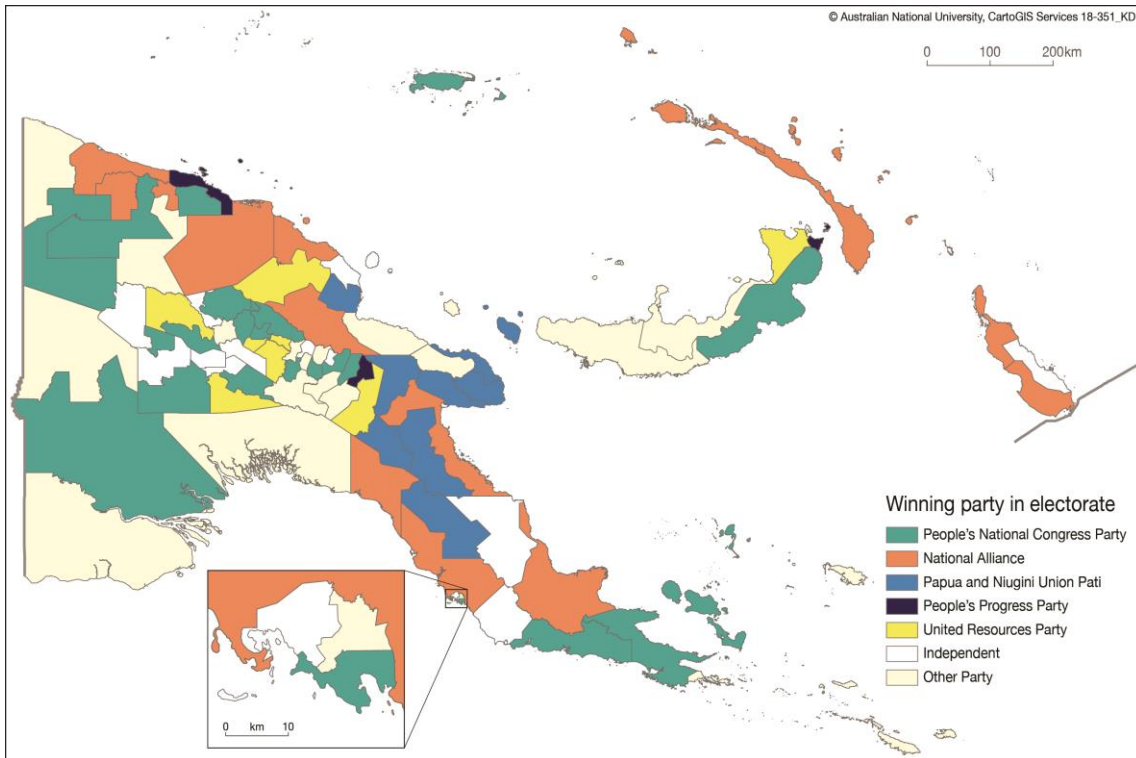


**Figure 15 – Map of provincial seats by winning party**
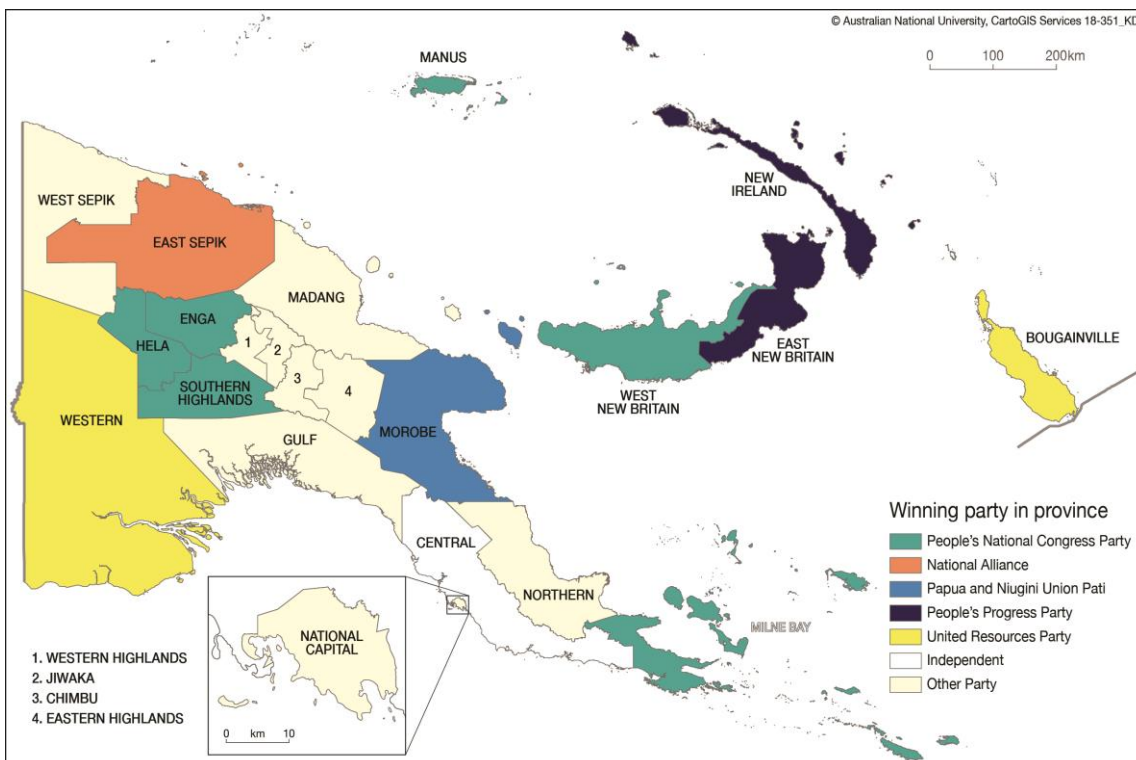
From the maps it is clear PANGU did indeed have a regional stronghold in Morobe at the time of the elections. PANGU only won two seats outside of Morobe province (and these were in neighbouring provinces). PANGU only lost three seats within Morobe province (one of these seats, the urban electorate of Lae, is difficult to see on the map). Were it not for Morobe province, and the broader region of Momase that Morobe is found within, PANGU would not have had a parliamentary presence. It seems fair, then, to describe PANGU as regionally based, at least at the time of the 2017 election.

The case of the PNC is less clear. Of the 29 seats it won in 2017, 52 per cent were in the Highlands. The PNC was more likely to win in the Highlands than elsewhere, so could be said to have had a base of sorts in the Highlands. Yet it also won seats in each of Papua New Guinea's three other regions. It was clearly not only a Highlands party. Moreover, while it won more Highlands seats than any other party, it only won 37 per cent of the seats in that region, so cannot be said to have a monopoly on Highlands politics.[27]

## 7. Limited preferential voting

After the 2002 general election, Papua New Guinea changed from a single member district plurality electoral system to a limited preferential system of voting (LPV). The 2007 general election was the first general election held using the new system. The respective costs and benefits of the change to LPV are vigorously debated (Haley 2011; Reilly 2002; Reilly 2006, p. 117; Standish 2006). In 2018, Papua New Guinea's then Prime Minister, Peter O'Neill appeared to suggest the country would move back to a single member district plurality electoral system before the next general election (Rooney 2018).

Election results data on their own cannot speak to all the debates about whether limited preferential voting has been beneficial or not. Results data cannot, for example, speak to the impact of LPV on electoral violence. However, results data can speak to some aspects of the impacts of LPV. In this section we will look at those aspects of LPV that can be informed by results analysis. In Appendix 1 we discuss other impacts of LPV (particularly

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[27] Some smaller parties only won seats in one region. However, this is because these parties only won a small number of seats full stop. The largest party to win all of its seats in one region was the Triumph Heritage Empowerment Party, which won all of the four seats it won in the Highlands.

on violence and quality of governance). Beyond the discussions in this paper, we do want to note here a particularly important gap in research on LPV – this is voters' preferences, and specifically whether voters would prefer elections to be run using LPV or a single member district plurality system. Anecdotally, LPV is popular with voters who appear to appreciate the increased choice it affords them. Systematic data are needed, however, to gather a better sense of preferences. Such data could be gathered through surveys, and would be very useful at a time when it appears Papua New Guinea is reconsidering its electoral system.

## 7.1 Has LPV led to more spoiled votes?

One obvious potential consequence of LPV was that the more complicated voting system might lead to more spoiled ballot papers (invalid votes). Figure 16 is a histogram of electorates, plotting the share of ballots that were invalid for all recent elections we have data for (2007 is excluded owing to poor data availability). The mean spoiled vote share for each election is shown with a red line. Visually, it is clear that on average the share of votes that were spoiled increased considerably after the introduction of LPV, although spoiled ballot papers do appear to have fallen somewhat in 2017.[28] Comparing 2017, the year in which LPV was used that had the lowest average share of spoilt ballot papers, with 1992, the most poorly performing single member district plurality election, shows that the share of ballot papers that was spoilt in 2017 was almost twice that of 1992. It should be noted, however, that in an absolute sense the difference is small: 2 per cent spoilt on average in 2017 versus 1 per cent spoilt on average in 1992.[29]

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[28] Given that the trend prior LPV was, if anything, towards fewer spoilt ballots, LPV is almost certainly the cause of the rise.

[29] Formally, we tested the difference by comparing 1992 and 2017 using a paired t-test in which the unit of analysis was the electorate. The difference was statistically significant (p<0.01). We also tested whether other variables predicted the extent to which ballot papers were spoilt in individual electorates. Various development indicators, including school enrolment, were not associated with the spoilt ballot paper share in 2017, although the share of ballot papers that were spoilt was notably lower in the Highlands than in the rest of the country.

**Figure 16 – Spoilt ballot papers as a share of total ballot papers**



Share of ballots that were invalid (0-1)
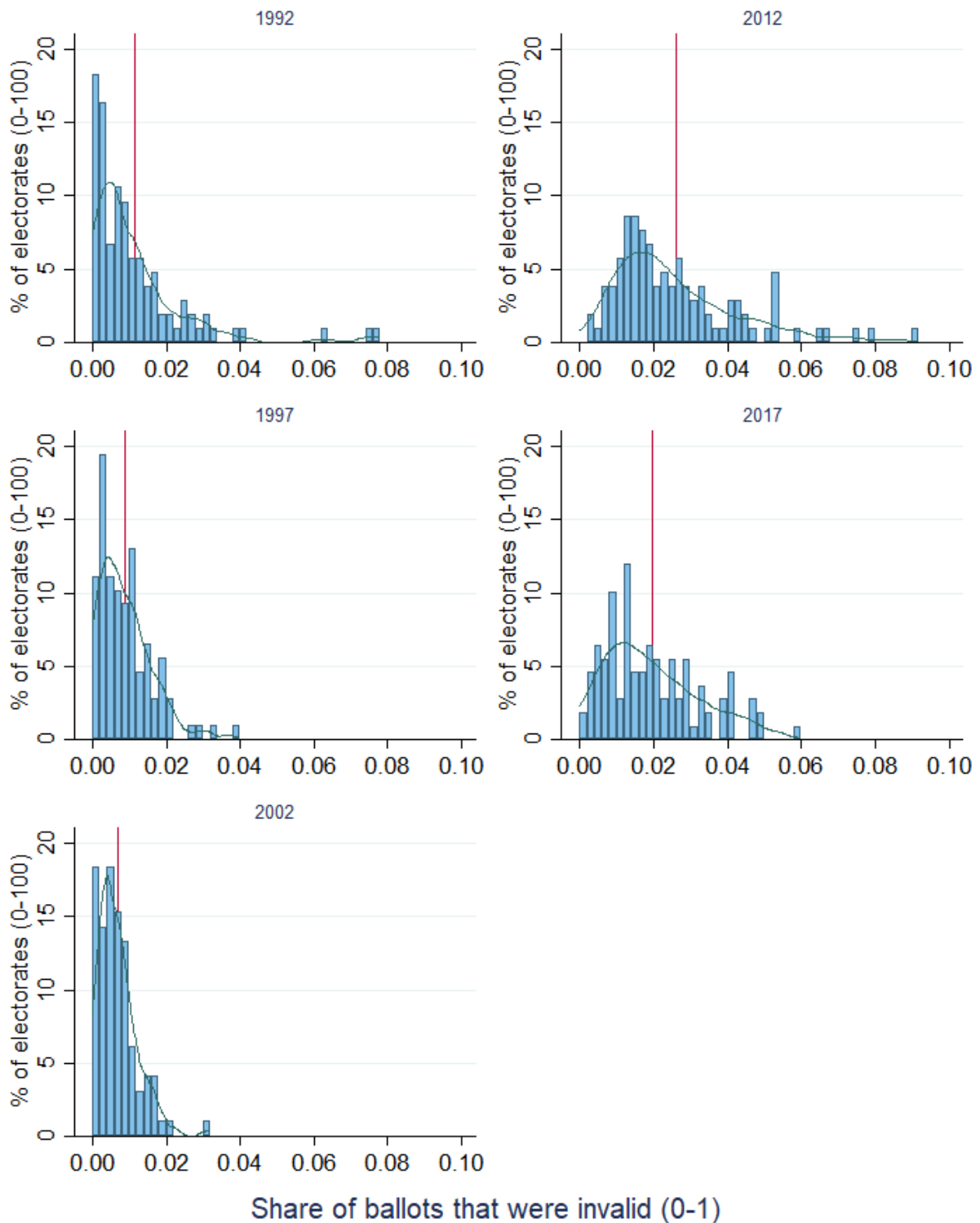
## 7.2 Does LPV increase MPs' mandates?

One argument sometimes made for LPV is that it increases the mandate of MPs who, because of second and third preference votes, are elected with larger vote shares. It is

sometimes claimed that LPV means MPs will be elected with at least 50 per cent of the support of voters from their constituencies once second and third preference votes have been taken into account. This view is mistaken, however. Winning an election under LPV simply entails winning more than 50 per cent of the votes still in play during the final round of preference reallocations. In Papua New Guinea a large share of votes are exhausted prior to the final round of reallocations.

Figure 17 is a histogram of electorates in the 2017 election based on the share of ballot papers that were exhausted in each electorate. The red line plots the mean across all electorates (the mean was 37 per cent).[30]

**Figure 17 – Histogram of exhausted votes in 2017**
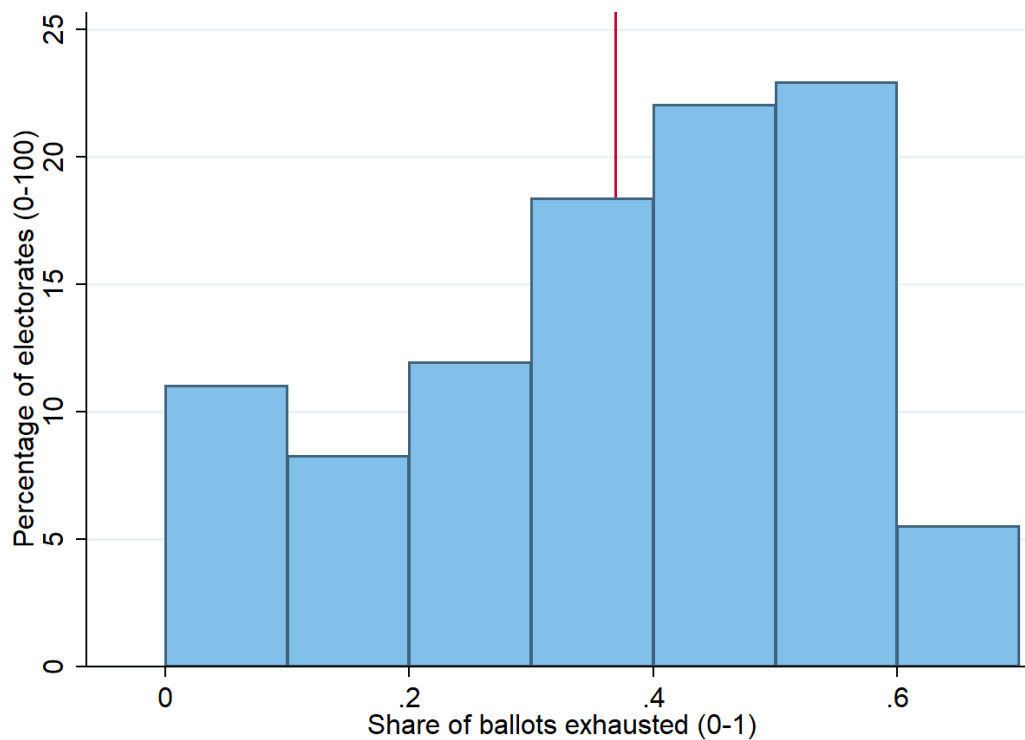


One consequence such a high share of votes being exhausted is that winning candidate vote shares after preferences are often still low when calculated as a share of total votes cast. Figure 18 shows mean winning candidate vote shares over time. Those elections

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[30] 2017 was used as it was the year in which we had full final count data for the highest number of electorates. All calculations were performed excluding invalid votes. There were six electorates in which candidates won on first preferences alone. These electorates are included in this analysis. If they are excluded, mean exhausted ballots increases to 39 per cent.

held prior to 2007 were held using a single member district plurality system, and there are no first or after preference vote shares to be plotted, there are simply winning candidate vote shares (votes over total votes cast). For all post 2007 elections winners' after-preference vote shares are plotted. As can be seen, winner vote shares increased with LPV from 20 per cent in 1997 and 2002, to an average of 33 per cent for the last three elections. However, on average they are still well short of 50 per cent of all votes cast.

**Figure 18 – Mean winner vote shares over time**
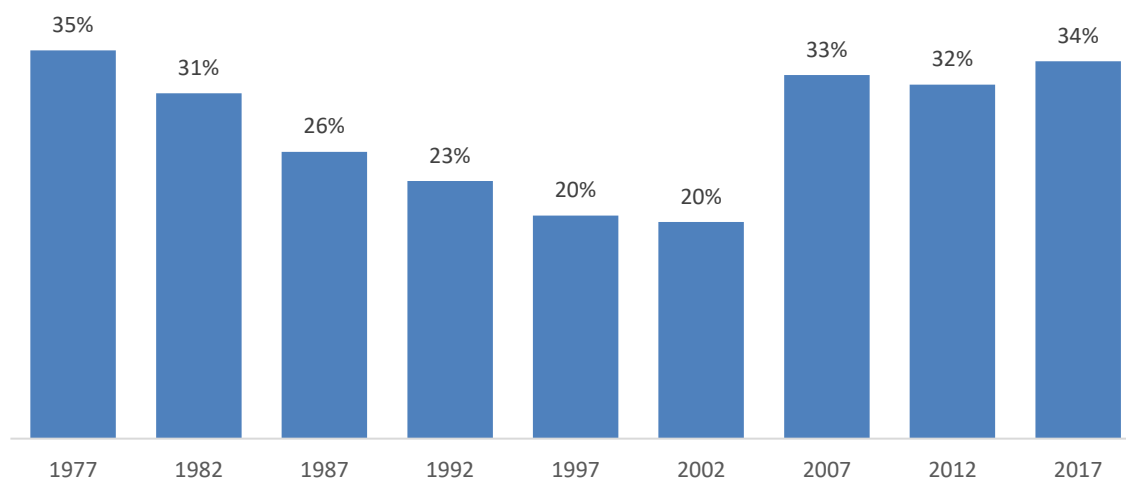


Even though few MPs are elected with majority vote shares under LPV, in circumstances where MPs feel an electoral obligation to provide some resources to everyone who voted for them, larger winner vote shares may to lead to larger shares of the electorate being assisted, at least in theory. Whether theory is being put into practice is, of course, a different question – stubbornly high incumbent turnover rates suggest much of Papua New Guinea's population still feel considerable dissatisfaction with their members of parliament.

## 7.3 Does LPV change results?

One simple question that can be asked about LPV is whether the preference reallocation process changes results much. In particular, do many candidates who are ahead after first

preferences to go on to be defeated by another candidate? If second and third preference votes do not end up changing results much, it could be argued that their presence as part of the electoral system is superfluous. Unfortunately, sufficient data do not exist to calculate how many of the candidates that were leading after first preferences went on to lose their seats in 2007. However, we have data for almost all seats in 2012 and 2017, which enables us to test whether the preference reallocation process changed many results. Figure 19 shows the share of candidates ahead after first preferences in both elections who went on to win their seats. As can be seen, in both elections nearly three quarters of first preference leaders went on to be elected. It is something of a value judgement as to whether a quarter of those candidates ahead after first preferences ultimately losing their seats amounts to a major change being brought about by second and third preference votes. However, our read of this finding is that LPV is not dramatically altering election results, at least in the typical electorate.

**Figure 19 – Share of leaders after first preference that went on to be elected**
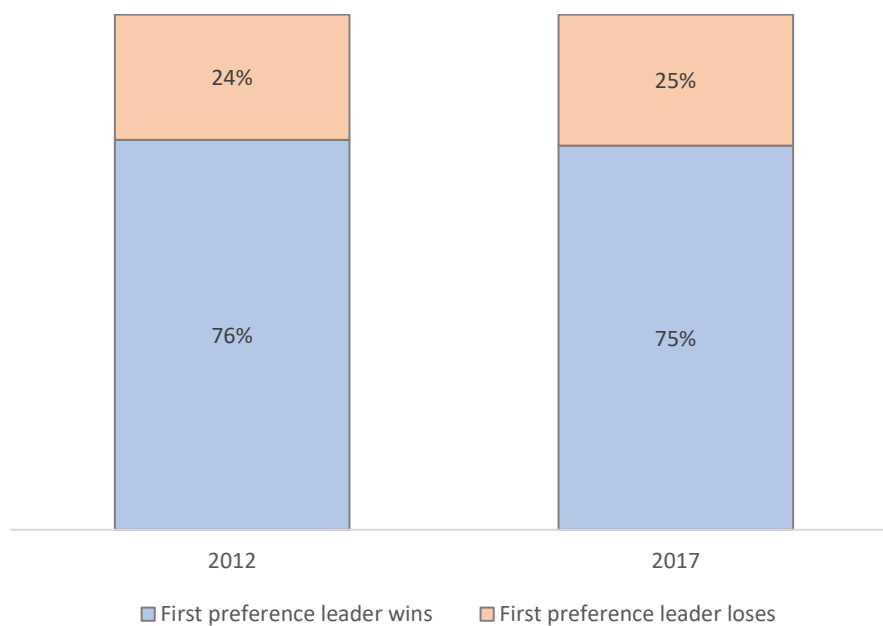


It may be possible that although only a quarter of first preference leaders are being unseated as preferences are reallocated, the change which is occurring is favouring a particular type of MP. In Appendix 2 we perform some limited tests on this possibility. We find that most of the MPs who were not ahead after first preferences were first time

winners. We did not, however, find any difference in age or education levels between the two types of winner.

## 7.4 Has LPV assisted women?

One claim sometimes made for LPV is that it assists female candidates who may be more likely to win second and third preference votes than first preferences. Clearly, given there are no women in Papua New Guinea's parliament at present, LPV has not proven to be a miraculous solution to the challenges faced by female candidates. Moreover, although two of the three women who were elected in 2012 did so by coming from behind to win as second and third preference votes were reallocated, the strongest female candidate in 2017 (Delilah Gore) was ahead after first preferences but went on to lose as second and third preferences were reallocated.

It is possible, however, that LPV is helping the average female candidate at least to some degree. We tested whether this was the case by studying the extent to which the rankings of female candidates improved, stayed the same or deteriorated as second and third preference votes were reallocated. We did this for all female candidates that we had data for in 2012 and 2017 (this totalled to 271 female candidacies across the two elections).

Figure 20 is a histogram showing how much women candidates' rankings changed as second and third preference votes were reallocated. A value of less than zero means a candidate's rankings became worse. A value above zero reflects an improvement. Zero means no change.

The key feature of this chart is simply that the rankings of more than 60 per cent of female candidates did not change as preferences were reallocated.[31] For most female candidates second and third preference votes did not have any discernible impact on their electoral fortunes. And yet a non-trivial minority (25 per cent) of female candidates did see their ranking improve by one or more places. In a small number of cases their rankings improved substantially.

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[31] This is not because most female candidates were eliminated after the first count – only a small minority were.

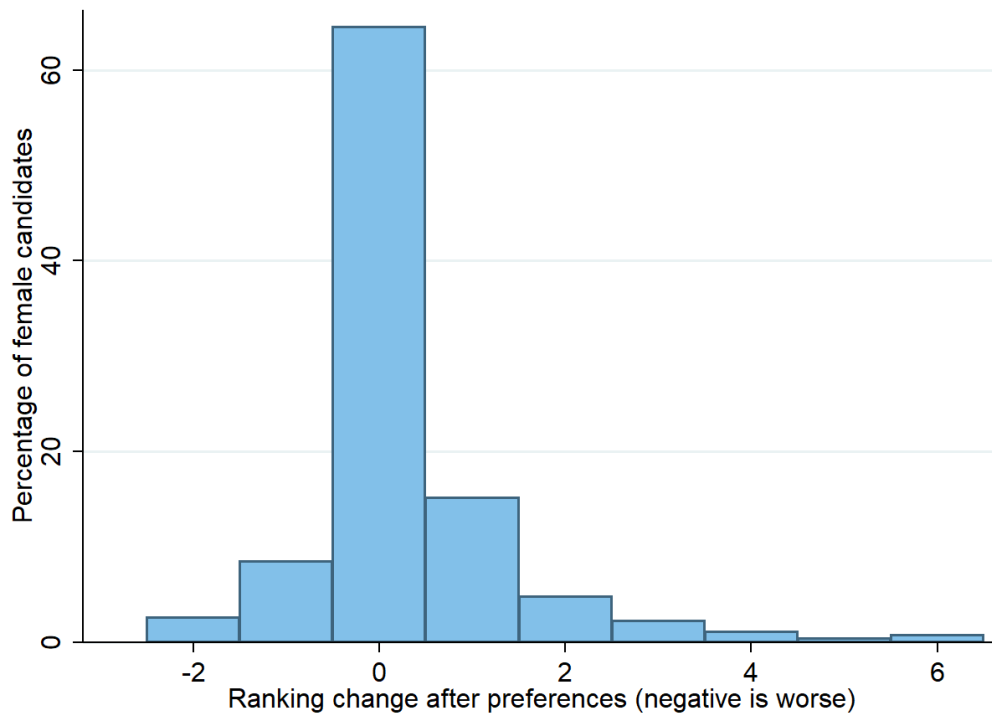**Figure 20 – Female candidate ranking changes (2012 and 2017 data combined)**



Figure 21 compares women's ranking changes with those of male candidates. The histogram shows that slightly larger share of women did not see their rankings change. However, it also shows the women were less likely than men to see their rankings fall by one or two places and more likely than men to see their rankings grow one or two places. On average female rankings increased by 0.28 (just over a quarter of one place) while male rankings fell by 0.01. The difference between the two was statistically significant (P<0.01) in a two tailed t-test.

Because other candidate attributes could plausibly be correlated with gender, Table 9 shows two regression models, the second of which has a number of control variables included. These include membership of the PNC and incumbency, two variables which are shown to be related to performance on preferences elsewhere in this paper. As can be seen, the relationship is robust to the inclusion of these controls.[32] Second and third preference ballots appear to have assisted women more than men.

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[32] The relationship is also robust to influential cases being excluded from the regression model. Results were also found when the dependent variable was ranking change/total candidates.

**Figure 21 – Male and female ranking changes (2012 and 2017 data combined)**
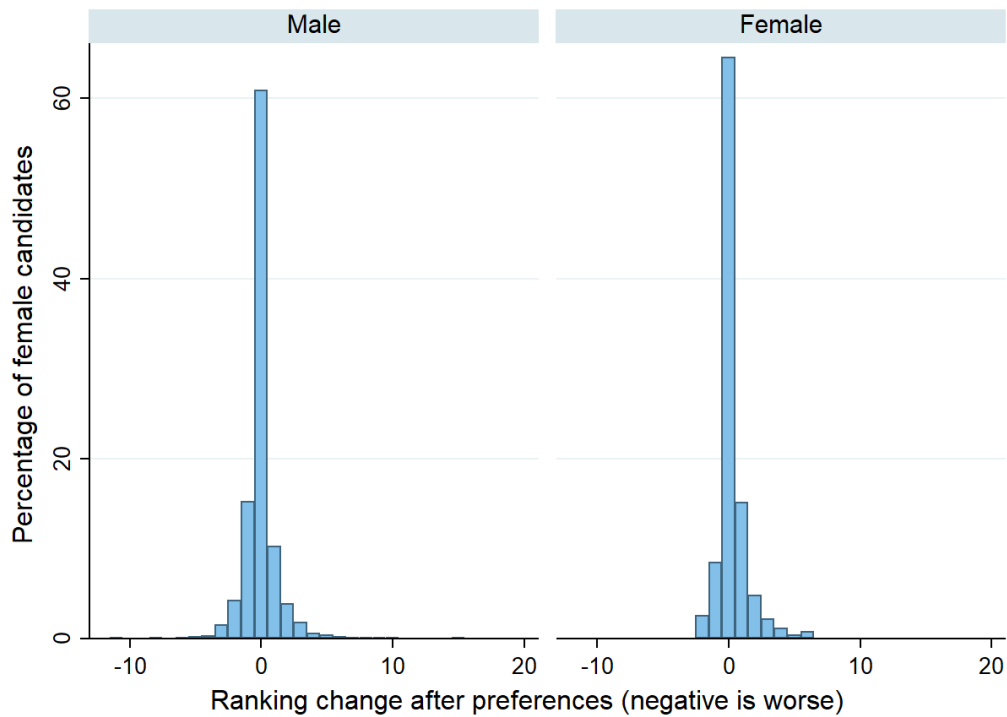


**Table 9 – Regression models of female ranking change after preferences**

|  | Basic | With controls |
|---|---|---|
| Female | 0.28*** | 0.28*** |
|  | (0.00) | (0.00) |
| Incumbent |  | -0.34*** |
|  |  | (0.00) |
| PNC |  | -0.10 |
|  |  | (0.18) |
| Islands |  | -0.00 |
|  |  | (0.97) |
| Momase |  | 0.00 |
|  |  | (0.98) |
| Southern |  | 0.01 |
|  |  | (0.90) |
| Constant | -0.01 | 0.00 |
|  | (0.61) | (0.89) |
| Observations | 6242 | 6007 |
| Adjusted $R^2$ | 0.00 | 0.00 |

*p*-values in parentheses
* p<.1, ** p<0.05, *** p<0.01

## 7.7 LPV's effects on parties

There is one area in which LPV appeared to have a notable, surprising, and potentially significant impact on election results in 2017. This is to do with the fate of different

political parties, and in particular the party of the Prime Minister at the time of the election: the PNC.

Figure 22 shows the number of seats in which the PNC candidate was in first place after first preference votes were cast in 2017. It also shows the number of seats that the PNC ultimately went on to win. After second and third preference votes were reallocated the PNC held 11 fewer seats than it had previously (more specifically, it gained two seats on preferences, but lost 13). When one considers the fact that only a quarter of seats overall changed hands as preferences were reallocated this is a notable fall.

Figure 23 shows a similar chart but this chart contains information for the PNC, the National Alliance and the United Resources Party, the three largest parties in parliament directly after the election. Although the National Alliance lost seats its loss was neither as large in absolute numbers nor as large as a share of seats held as that of the PNC. The United Resources Party gained seats as preferences were reallocated.

Figure 24 is the same as Figure 22 and looks at seat numbers for the PNC; however, it focuses on the 2012 election. As can be seen the PNC did not suffer the problem of preference losses in 2012, in fact the party actually gained one seat as preferences were reallocated.

**Figure 22 – PNC first preference leaders versus PNC winners, 2017**
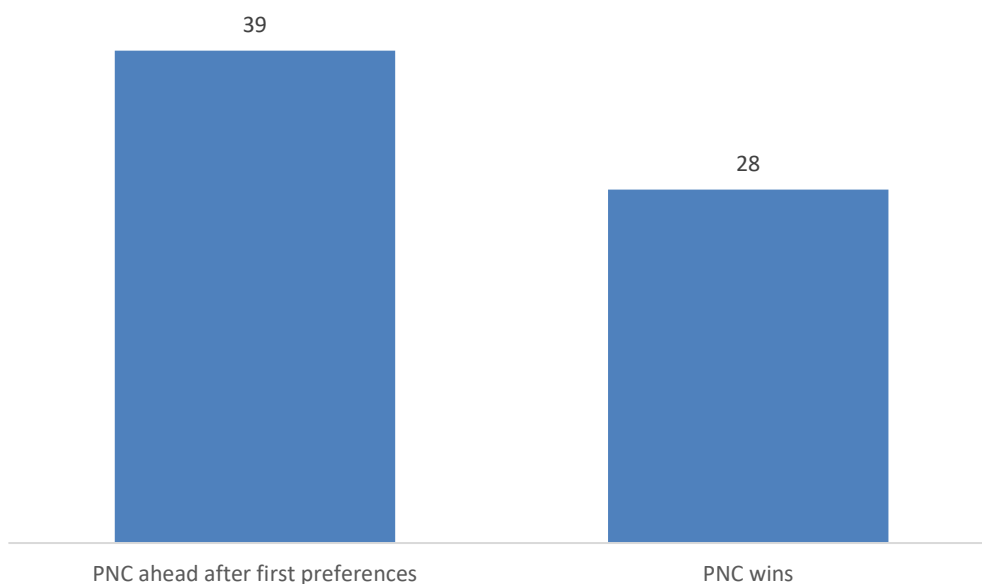
**Figure 23 – Changes on preferences 2017, the three largest parties**
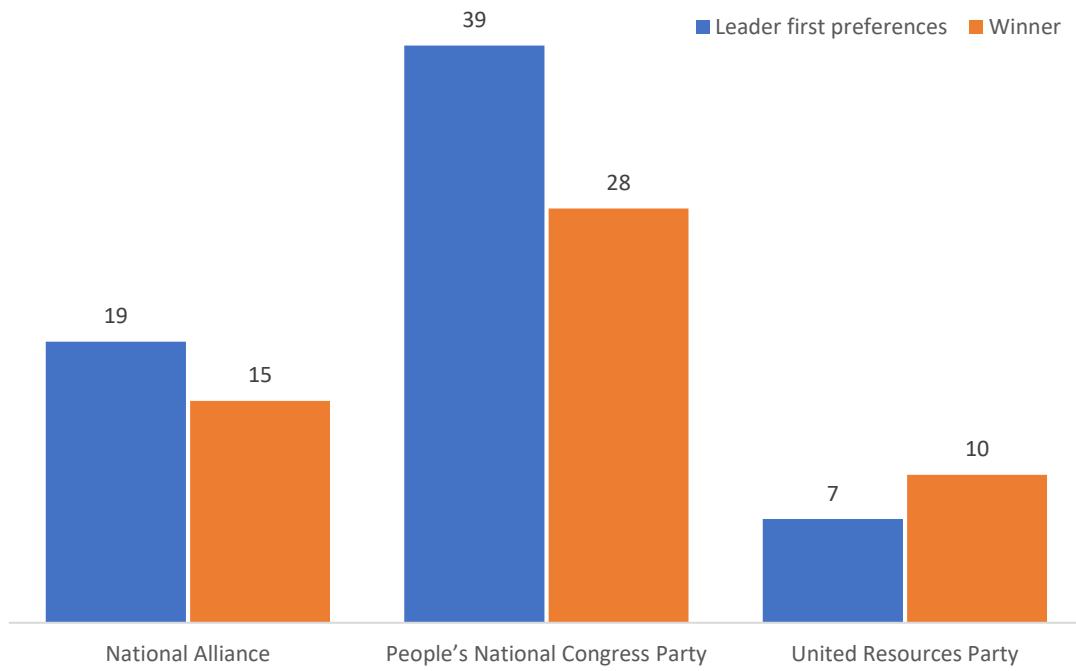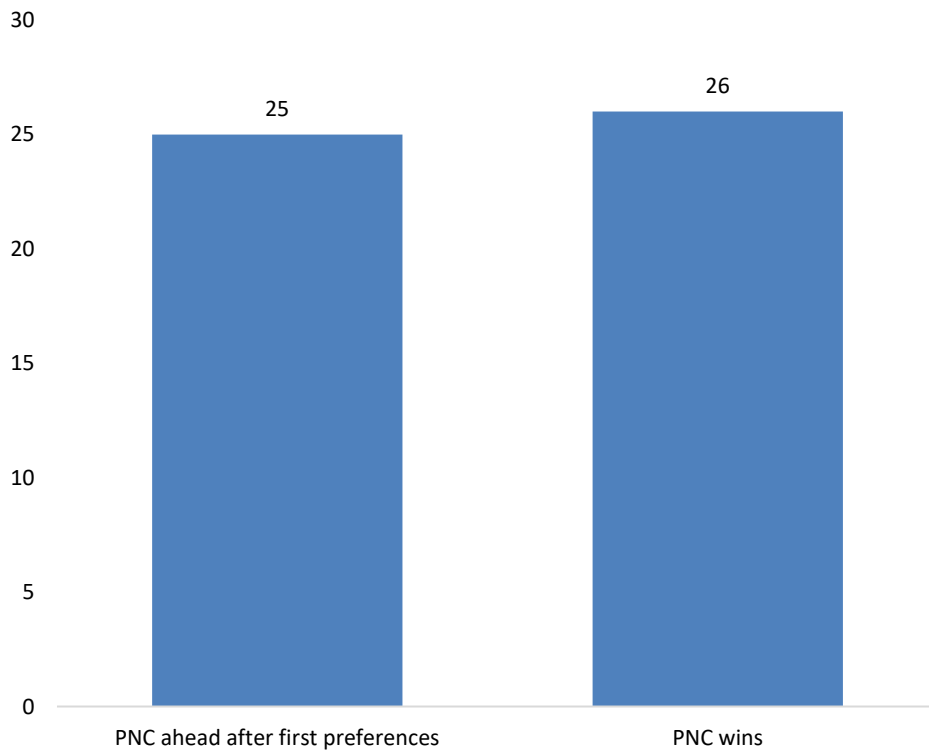


**Figure 24 – PNC first preference leaders versus PNC winners, 2012**

Such comparisons are strongly suggestive. However, before any conclusions can be made regarding the impact of second and third preference votes on candidates from the PNC, more thorough analysis is required. Specifically, the focus of comparisons should not solely be limited to candidates that were leading after first preference votes were counted. Presumably, if there was a protest vote of sorts against the PNC it would have not have been restricted to those candidates that led after first preferences. In addition, any analysis ought to control for other potential confounding variables which are related to PNC membership and an increased probability of changed electoral outcomes as second and third preference votes are reallocated.

Table 10 reports on the results of multiple regressions in which we conducted such analysis. In all models except for the final model, the dependent variable is the rise or fall in a candidate's rank during preference reallocation.

The first model reports on a simple bivariate regression that uses all candidates (that we had reliable data on in 2017) and which tests for a relationship between PNC membership and changed rankings as preferences were reallocated.

The second model reports on a similar analysis but with control variables included. These controls were whether the candidate was an incumbent (sitting MP), their gender, and the region their electorate was in. As we have shown in earlier analysis gender appears to have an impact on second and third preference performance, and findings presented in Appendix 2 also suggest a role for incumbency. Similarly, we have shown that the PNC may have had something of a Highlands base.

The third and fourth models address an analytical issue that confronted our analysis. To test whether there was a PNC effect we created a dummy PNC or not variable. However, the trouble with using such variables is that if the comparator category (candidates who were not members of the PNC) is very heterogenous, diversity amongst the comparators may mask any effect associated with the category of interest (PNC membership in this case). Unfortunately, the category of non-PNC candidates is very diverse indeed. The 3,240 candidates that stood in 2017 that were not from the PNC came from 41 different parties as well as many independents. The most successful non-PNC candidate won 85,747 first preference votes, the least successful won no votes at all.

In order to overcome the modelling challenge associated with such a diverse comparator group, in the third model we restricted our analysis only to major parties – that is only to candidates from parties that won five or more seats in the election. (In addition to the PNC there were five such parties).

Parties themselves are very diverse, however; and to further overcome the problem of comparator diversity in the fourth model we limited ourselves to strong candidates (candidates that were in the top ten after first preferences were counted) from major parties. Such restrictions involved an element of a judgement call, but restricting in this manner meant we were comparing PNC candidates with other candidates that were similarly electorally strong and which were from high-profile parties. (94 per cent of PNC candidates were situated in the top ten candidates after first preferences.)

The final model included all the restrictions found in Model 4 but used a different dependent variable. In this case the dependent variable was no longer the number of places gained or lost as second and third preference votes were reallocated but rather the number of votes gained or lost (reflected as the ratio of after preference votes divided by first preference votes won). This was included as a robustness test.

**Table 10 – Regression models testing PNC under-performance in preferences**

|  | Basic | Incumbent | Major party | Top ten | Ratio |
|---|---|---|---|---|---|
| PNC | -0.25** | -0.08 | -0.19 | -0.26** | -0.09* |
|  | (0.04) | (0.46) | (0.11) | (0.02) | (0.09) |
|  |  |  |  |  |  |
| Incumbency |  | -0.30*** | -0.34** | -0.43*** | -0.16*** |
|  |  | (0.00) | (0.01) | (0.00) | (0.00) |
| Region (vs Highlands) |  |  |  |  |  |
| Islands |  | 0.00 | -0.13 | -0.10 | -0.35*** |
|  |  | (0.96) | (0.51) | (0.65) | (0.00) |
| Momase |  | -0.00 | -0.29 | -0.26 | -0.25*** |
|  |  | (0.97) | (0.11) | (0.23) | (0.01) |
| Southern |  | -0.01 | -0.29 | -0.27 | -0.32*** |
|  |  | (0.86) | (0.10) | (0.19) | (0.00) |
|  |  |  |  |  |  |
| Female |  | 0.19** | 0.03 | 0.50 | -0.06 |
|  |  | (0.02) | (0.94) | (0.48) | (0.85) |
|  |  |  |  |  |  |
| Constant | 0.01 | 0.00 | 0.29* | 0.33 | 1.89*** |
|  | (0.75) | (0.92) | (0.07) | (0.10) | (0.00) |
| Observations | 2943 | 2943 | 382 | 275 | 275 |
| Adjusted $R^2$ | 0.00 | 0.00 | 0.02 | 0.05 | 0.09 |

*p*-values in parentheses; Huber-White standard errors used.
* p<.1, ** p<0.05, *** p<0.01

The first model shows that the relationship between PNC membership and a fall in places as preferences were reallocated continues to exist when analysis is extended from PNC candidates that were ahead on first preference votes to all PNC candidates. On average PNC candidates lost a quarter of a place as preferences were reallocated. However, the second model shows that when all candidates are considered and when control variables are added, this relationship ceases to be statistically significant. Also, although the coefficient remains negative, it is of a much smaller magnitude. At the same time incumbency, one of the controls added, has an obvious negative effect that remains statistically significant in all of the remaining models.

When our analysis is restricted to major parties in an attempt to compare like with like, the effect of PNC membership increases in magnitude and becomes very close to statistical significance with a p-value of 0.11. Once analysis is restricted to candidates that were competitive on first preferences, the PNC effect increases again and returns to statistical significance. This finding survives using ratios of votes won as an alternative dependent variable.

It appears that there is something of a PNC effect although its presence is dependent on model specifications. In other regression models not shown here, we tested whether the PNC's loss of places was driven primarily by electorates outside of the Highlands. Results were not conclusive, but provided some suggestive evidence that this was the case, although findings did not perform particularly well on robustness tests. We also substituted the PNC variable with a binary variable coded one if a candidate had been in the cabinet immediately prior to the election. This was used as an inexact proxy of "high profile politician in government". We did this as it seemed possible that protest votes were being cast against prominent government politicians rather than members of the PNC *per se*. There was some suggestion of a relationship between cabinet membership and a fall in performance on preferences, but it was weak – the variable did not perform as well as the PNC variable did.[33]

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[33] We also tried to create a dummy variable coded one if an MP was a member of the government (as opposed to the opposition) immediately prior to the election. However, such data are no longer available. In any case, it is unlikely this variable would have added value to the analysis: at the time of the 2017 election most members of parliament were part of the government.

One final word of caution is required regarding our regression analysis: the nature of the dependent variable (a variable where most candidates did not change, while a small number increased or decreased) is hard to model using simple regression models. This means our findings are not as robust as we would like. However, combined with the obvious changes shown in the charts, our findings can be taken as strongly suggestive of a PNC effect, albeit not definitive.

If the PNC effect does ultimately prove to be robust to further analysis, the fate of the PNC as preferences were reallocated in 2017 raises interesting questions. Voters in Papua New Guinea are typically thought not to choose who to vote for on the basis of national issues (Saffu 1989; Wood 2015). However, the swing against the PNC as preferences were reallocated suggests that in 2017 voters were at least willing to use their second and third preference votes to protest against the central party of an unpopular government. If this were the case, such an approach to the use of second and third preference votes might speak to the potential emergence of a form of national politics via LPV. It may be that voters consider their first preference votes too valuable to waste on national issues, but are willing to use their second and third preference votes in the name of protest or in search of national change. If voters are voting in such a manner, this could be an important phenomenon – the rise of national voting via the use of preferences. The issue requires further research.

The impacts of LPV have fallen far short of the claims made by supporters of the electoral system. However, 2017 provides some evidence that voters appear to making use of the additional electoral freedom that LPV has to offer.

## 8. Conclusion

In terms of headline results, the 2017 general election in Papua New Guinea was not unusual. The number of candidates that stood was inline with recent elections, as was the incumbent turnover rate and average winner vote share. However, 2017 election data have much to offer in affording a better understanding of electoral politics in Papua New Guinea.

The 2017 election data also provide the opportunity to look at the performance of LPV in depth. While, LPV can hardly be claimed to have been transformative, it has brought

some interesting change. In the long run, if it continues to facilitate voting on national issues and gains to female candidates, it could prove to be a useful tool. However, much is uncertain at this point, and much remains to be learnt.

With the 2017 election results now available in full, there is considerable scope to dig into what occurred in greater depth, and to learn about the nature and potential of electoral politics in Papua New Guinea.

## Appendix 1 – Other impacts of LPV

There is little evidence LPV has brought improved governance to Papua New Guinea. Figure A1 shows government effectiveness, as measured by the World Bank Governance Indicators, over time for Papua New Guinea. Government effectiveness is no longer trending sharply downwards as it was in the years prior to 2005, but this change appears to pre-date the introduction of LPV for national elections. Post-LPV there has been no clear trend of improvement. Possibly, LPV induced improvements are being masked by some other effect, although it is not immediately apparent what this effect would be.

What is more, the introduction of LPV has not brought with it a fall in MP turnover rates at elections. It seems that if voters had become more satisfied with their MPs' performance, turnover rates would have fallen.

**Figure A1 – Papua New Guinea government effectiveness**
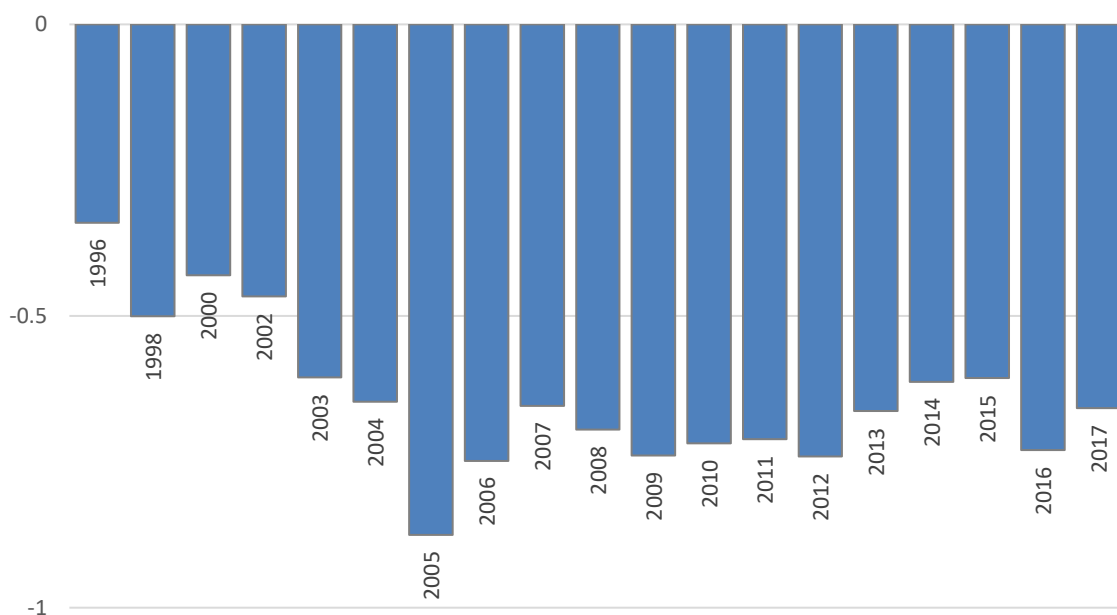


Nor has LPV brought any obvious fall in election-related violence in the Highlands (the region where the issue was most acute). Violence fell from 2002 to 2007, but it is hard to isolate LPV's contribution to the change in 2007 from other factors such as a major increase in electoral security in 2007 (Haley 2011).

Although it is generally agreed that LPV has not brought a major reduction in post-election violence, it had been thought that LPV contributed to a fall in pre-election violence in the Highlands, where it brought a more transactional and less conflictual style

of campaigning (Haley & Zubrinich 2013; Wood 2015). Reducing pre-election violence in the Highlands would, even on its own, still count as an important achievement. However, it should be noted that in their most recent report on the 2017 elections Haley and Zubrinich (2018) document cases of pre-election violence in the Highlands. LPV may have brought some reduction in pre-electoral violence but it does not appear to have prevented it altogether. A more systematic attempt at quantifying LPV's exact impact on election-related violence in Papua New Guinea would be very useful.

## Appendix 2 – Does reallocation favour a different type of candidate

For 2012 and 2017 we know which candidate was ahead after first preferences and which candidate ultimately went on to win the election. We also know how many times candidates had previously won elections. With this information we can test whether those MPs who won courtesy of a change in results after preferences were reallocated were more likely to be first term winners, or whether they were more likely to be sitting members who had been in power at least once, and possibly multiple terms. Figure A2 is comprised of two histograms. The left histogram shows the number of election winners who were in first place after first preferences and who went on to win. The x axis of the chart shows how many elections they have won (this value is inclusive of the election they had just won, so a score of one means a first-time winner). The second histogram is identical except it is limited only to those winners who were not ahead after first preferences. Both 2017 and 2012 data are combined.[34]

Commensurate with the fact that most winners were ahead after first preferences, there are more winners in first histogram than in the second. There is also a much greater range in the first histogram too. Amongst those winners who were ahead after first preferences we find many first-time winners. However, we also find many MPs who have won two or more elections. This is not the case in the second histogram – that of winners who were not ahead after first preference votes were counted. With only a small number of exceptions, these winners were first time winners.[35]

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[34] Repeating the exercise on single years of data produces broadly similar results.

[35] With differences being so visibly obvious, formally testing for their existence is barely necessary. However, for what it's worth both a t-test for differences in means and a Wilcoxon rank-sum test of differences in medians produce differences that are statistically significant with p<0.01.

**Figure A2 – Elections won, by whether winner was first preference leader or not**
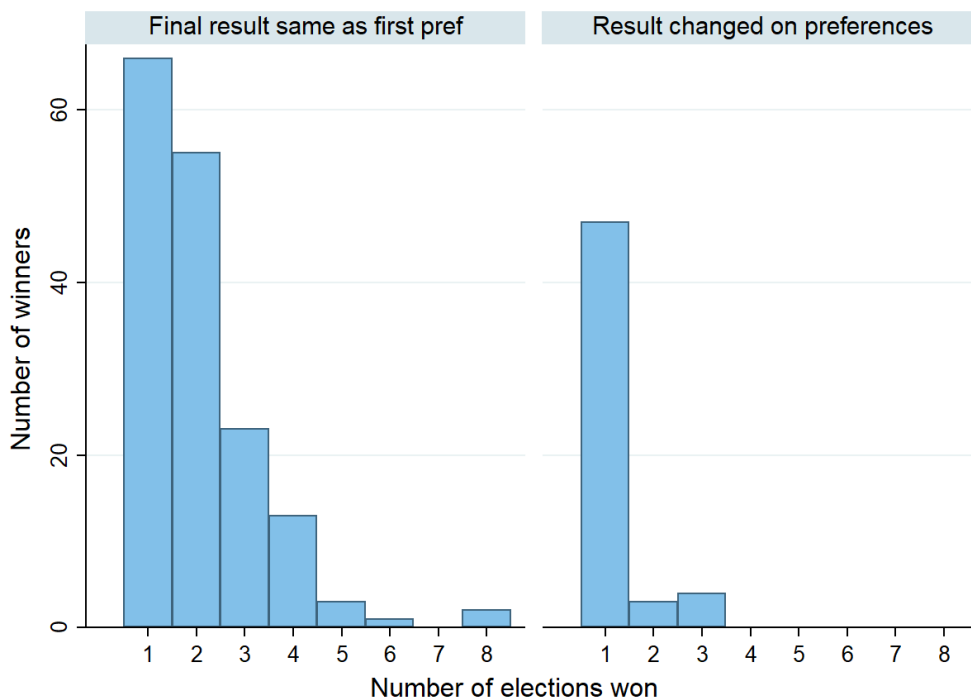


This finding would seem to suggest that LPV is affording people who might not have otherwise won, an opportunity to topple sitting MPs. Such a finding is hard to square with the fact that incumbent turnover rates in the three LPV general elections are broadly in-line with long-run averages. Nevertheless, it does appear to be the case is that second and third preference votes are affording some political newcomers a pathway to electoral success that they may not have otherwise possessed.

While we were constrained by limited data, we also tested whether the age and level of education of MPs that won but which were not leading after first preferences was any different from those winners who were ahead after first preferences. In both of these areas we found no statistically significant differences between MPs who were leading after first preferences and those who came from behind to win.

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