Choosing Your Pond: A Structural Model of Power Sharing

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August 7, 2020

Abstract

Although political parties are central to democratic functioning, the internal structure of party organizations is still a black box. I build a model of party formation that explains the within-party power sharing, party stability, and party-size distributions across different electoral systems. In the model, party control over government functions generates club goods. Politicians share their political rents with party leaders in exchange for accessing parties' club goods. I estimate my model for Turkey with a dataset of all listed politicians between 1995 and 2014. My model matches the high party-switching rate (28.5%) in the Turkish parliament. I find that the right-wing parties accumulate club goods more easily then they produce rents, which leads to strong party control. The counterfactual exercises suggest that the possibility of a coup d'état (granting more bargaining power to politicians) lowers (improves) the average quality of the political class.

JEL Classifications: D71, D72, J4, J410

Keywords: Clubs, Rent-Seeking, Coalitions, Political Selection, Particular Labor Markets, Matching Models

*selcencakir1@gmail.com. An online appendix with data and derivation details can be found in here. This paper is an updated version of my Ph.D. dissertation at the University of Virginia and it was previously circulated with the title "Party Formation in Parliamentary Democracies". I am deeply grateful to my advisers John McLaren, Leora Friedberg, and especially Steven Stern for guidance and support. I would also like to thank Pelin Akyol, Simon Anderson, Abdurrahman Aydemir, Hugo Benitez-Silva, Federico Cilberto, Kerem Coşar, Peter Debaere, Siddharth George Eapen, Maxim Engers, İlhan Güner, Guillermo Hausmann Guil, William Johnson, Kıvanç Karaman, Murat Kırdar, Konstantinos Matakos, Toshihiko Mukoyama, Edgar Olsen, Sheetal Sekhri, Aslı Şenkal, İnsan Tunalı, Eric Young, and seminar and conference participants at Boğaziçi, ITU, Koç, TED, TOBB ETU, Sabancı, Stony Brook, Virginia, YTU, Royal Economic Society, 1st LSE Workshop on Political Economy of Turkey, Trans-Atlantic Doctoral Conference, 2019 Istanbul Human Capital Conference, and 2020 SIOE for their helpful comments. I gratefully acknowledge the Bankard Fund for Political Economy and Bynum funds for quantitative research for financial support. All errors are mine.

1 Introduction

Political parties and party leaders are at the center of political and electoral systems. How they operate matters for which politicians are elected, how power is distributed and whether the executive power can be constrained.[1] Yet, the internal structure of party organizations is still a black box (Dal Bó and Finan 2018). Across countries, there is considerable variation in how parties operate and how much of a say parties, party leaders, and politicians have. In the closed-list electoral systems of Argentina, Israel, Italy, Spain, and Turkey, for example, parties and party leaders have a lot more clout than, say, in the more candidate-centered systems of the United States, Canada, and other countries, and politicians typically switch party affiliation a lot more frequently in such systems (Heller and Mershon 2009). In this paper, I build a model of party formation while focusing on the interaction of party leaders and politicians in a labor search framework. I then estimate my model with a new dataset for Turkey of 35,000 listed politicians and 33 parties between 1995 and 2014.

Modeling the internal structure of parties allows me to study several questions that are otherwise difficult to pursue due to data unavailability.[2] First, how does rent-seeking by party leaders affect the *quality* of party members? Second, why do politicians switch parties with some frequency in some countries but not in others? Third, why do some electoral systems produce small parties that compete in elections despite having negligible chances for having electoral success? Fourth, how do electoral institutions and the possibility of having coup d'états affect the quality of party members and the power distributions in parties?

To answer these questions, I model the political arena as a labor market in which a party has an identity of its own rather than a collection of like-minded politicians. Party leaders guard the entry points of their parties and recruit politicians with heterogeneous skills to produce political benefits. A leader, who aims to maximize her control over the party, may not recruit the most skillful politicians if they demand too much power to join the party.[3]

My structural model that builds around assumptions on i) the common and divergent characteristics of electoral systems, ii) the determinants of the *quality* of a politician, iii) the main trade-offs faced by politicians and party leaders, and iv) the underlying reasons of politicians' transitions across parties. Based on these assumptions, my model generates decision rules for how a leader recruits members and a politician chooses his party, which I

[1] Much research has emphasized the importance of executive constraints for development (Acemoğlu and Robinson 2006, 2012, Aghion et al. 2004, 2007, Besley and Mueller 2018a,b,c).

[2] For example, it is generally not possible to observe i) how much political rents are produced and how rents are distributed among politicians, ii) information on politicians who never appear in the ballot lists, and iii) the nonpecuniary benefits of pursuing a career in politics. For a comprehensive survey of the literature focusing on political selection, see Dal Bó and Finan (2018).

[3] Throughout the paper, I refer to a politician and a leader with male and female pronouns, respectively.

match to the data to estimate the structural parameters. I discuss these assumptions next.

Political benefits Across countries, joining a party provides similar types of benefits to politicians: political rents and club goods.[4] Political rents, which embody the ability to influence government institutions, are private and exclusive. Examples of rents include winning a seat in parliament or a party primary election, decisive power over the use of government budget, or employing supporters in public institutions.[5] During the process of producing political rents, party control over government functions also generates valuable club goods. Club goods, such as the non-pecuniary rewards of a party's political success or the security gained by affiliating with a strong team, are shared among party members.

Ideology A party's ideological position can be considered as a particular club good to which the politicians attach heterogeneous values. Although modeling a politician's (unobserved) ideological match with a party is straightforward, my model abstracts from it because I do not observe sufficient information to estimate a distribution for politicians' ideologies.[6] However, I estimate my model separately for the right- and left-wing parties by considering them as separate labor markets, which matches well to the data. Moreover, because ideology is a specific type of a club good, omitting it does not change this paper's qualitative results.[7]

Differences across electoral systems Although parties in all countries produce similar *types* of political benefits, the mechanisms for producing and sharing these benefits vary across systems. I model the differences across political systems along two dimensions: a rent production mechanism and politicians' bargaining power during membership negotiations.

Arguably, an electoral system's rent-accumulation process can be inferred from its party-centeredness.[8] In a party-centered system such as a closed-list proportional representation

[4] Anderson et al. (2015) and Burgess et al. (2015) provide evidence that ethnic groups produce valuable club goods for their members, which grants the elites the ability to extract rents from their members.

[5] Theoretically, political rents are defined as all financial and psychological rewards from seeking office (Caselli and Morelli 2004). Because of the difficulty of measuring rents, empirical studies tend to use specific types of political benefits as a proxy for political rents (Dal Bó and Finan 2018).

[6] A politician's ideology can be inferred in one of three ways. First, legislative histories and public speeches reveal the politicians' stances. However, such data are available only for a small subset of politicians who appeared in the media and/or participated in parliamentary activities. Second, one can think of matching politicians' demographics to voting patterns in the society. However, the name, ballot district, or gender of a politician conveys a very noisy signal of his ideology in Turkey. For example, a prominent Kurdish politician's name is Ahmet Turk, and his party can list him in any district of Turkey. His party affiliation is the main indicator of his ideology, and I efficiently use this information by considering the left- and the-right parties as separate labor markets. Third, although the party choices of politicians can be used to reveal their ideologies, it is not possible to estimate a non-degenerate ideology distribution because few politicians switch between parties with different ideologies.

[7] A good ideological match between a leader and a politician increases the match surplus and attracts the like-minded politicians to a party. However, as long as the allocation of the bargaining power between a leader and a politician is the same, how the increased surplus is shared among the agents does not change.

[8] Grofman (2005) classifies the electoral systems in their party-centeredness.

system, voters can vote only for the party as a whole. Thus, members aggregate their assets to collaboratively produce their party's rents. In a candidate-centered system, on the other hand, individual candidates organize their own campaigns to produce votes independent of their parties. In systems with medium levels of party-centeredness, rent production depends on both party- and individual-level campaigns.

The electoral rules are also informative about the extent of politicians' bargaining power during membership negotiations with leaders. For example, in candidate-centered systems where voters can show a preference for a candidate, each politician produces rents with more independence. This independence in rent production gives politicians more bargaining power in membership negotiations. Contrarily, in party-centered systems where voters can vote only for the party as a whole, a leader has monopsonistic power while recruiting politicians.

The quality of politicians A politician's quality is equal to the amount of his political assets that he uses in rent production.[9] A politician's assets are modeled as an index function of all of his characteristics that are valued by the electorate such as honesty, financial resources, and competence.[10] Although I do not observe some of the important components of a politician's political resources, structural estimation allows me to model the unobserved heterogeneity in politicians' assets.

Competition between parties Political arenas in all countries can be considered as markets for rent production, in which parties compete for gaining access to the fixed amount of political rents available in their country. Producing rents require political assets, which the politicians provide to their parties. The party competition for rents then brings about a competition for productive politicians, just like in a labor market. Party-switching by politicians resembles workers' transitions among firms, and the parties' competition over their services highlights the importance of outside options for climbing the party hierarchy.

Analyzing the parties' competition over politicians in an equilibrium framework is challenging because a party leader tends to have the dual goals of maximizing the party's electoral success while preserving her own control over the party. Because the high-quality politicians who can increase the party's popularity may demand too much power for joining the party, a leader faces a trade-off between achieving her dual objectives.

[9] As summarized by Dal Bó and Finan (2018), empirical studies typically proxy a politician's quality with his education, income, or occupation. Using Swedish register data, Besley et al. (2017) and Dal Bó et al. (2017) construct measures of a politician's quality based on the residuals they obtain from fully-saturated earnings regressions. In addition to this measure, Dal Bó et al. (2017) also use the leadership and cognitive scores as proxies for a politician's quality. Since I do not observe some important indicators of a politician's quality, I structurally model the unobserved heterogeneity in politicians' assets.

[10] See Ferraz and Finan (2008), Chang et al. (2010), Hobolt and Høyland (2011), Alt et al. (2011), Banerjee et al. (2011), Pande (2011), Winters and Weitz-Shapiro (2013), Banerjee et al. (2014), Butler and Powell (2014), Kendall et al. (2015), Bobonis et al. (2016), Fisman et al. (2016), Besley et al. (2017).

In this paper, I focus on a stationary equilibrium where the distribution of electoral power across parties is constant. In such an equilibrium, a party's rent production capacity is exogenously determined, and the party's leader seeks members who do not demand a big share of these rents. Muting the inter-party competition for rents allows me to elaborate on how a party's members form a coalition to share the party's power.

Suitability of the model to Turkey Arguably, muting the electoral competition between parties is a plausible modeling choice for a country that is polarized over non-economic issues. When the voters are divided into subgroups with vastly different policy preferences, parties that speak to different groups offer distinct policies (Matakos and Xefteris 2017). Although Turkey experienced massive changes between 2002 and 2014, the distribution of policy preferences among the voters and the parties' policy positions were stable during this period. This is mainly because the voters were polarized over non-economic issues such as secularism as opposed to Islamism and globalism as opposed to nationalism. In this environment, the major parties had little policy flexibility to convert each other's voters.[11][12]

The insights provided by this paper are also relevant for other countries where the electorate is polarized over non-economic issues. When polarization limits the competition between parties, leaders can more easily control their parties, as I explain next. So, this paper suggests a new explanation for the simultaneous rise in polarization and authoritarianism across the world (Guriev and Treisman 2019, Boxell et al. 2020, Canen et al. 2020).

Within-party competition A party is represented by a leader, who is distinguished from other politicians by having the exogenous ability to lead a party of a certain capacity to produces political benefits, i.e., rents and club goods. In a party-centered system, a leader aggregates the assets of heterogeneous politicians to produce political benefits and seeks new members through the random matching process of Cahuc et al. (2006) when there is a vacancy. So, I model the unstable party structures that are common in party-centered systems as resulting from frictions that prevent ideal matches of politicians and leaders.[13]

[11] During this period, the four largest parties of Turkey, the HDP (far-left), the CHP (center-left), the AKP (center-right), and the MHP (far-right), were highly polarized on non-economic issues (Müftüler-Baç and Keyman 2012). Although the vote shares of the parties showed some variation over time, the AKP formed a majority government for 3 consecutive terms and the vote-share ranking of the parties remained constant. As a result, the distribution of political rents across parties was highly stable.

[12] Towards the end of 2001, two groups of politicians resigned from their parties to form new parties. One of these groups formed the AKP and gained electoral success. My paper does not aim to explain the rise of the AKP and it does not model the incentives of politicians for starting a new party. Rather, it takes the stable distribution of political power among the parties in the post-2002 period as an opportunity to study how party members share their party's power, which is important for understanding how parties operate.

[13] Other possible explanations for the unstable party structures are changes in politicians' tastes and parties' votes over time. These explanations can be studied in a dynamic discrete choice framework (Berkovec and Stern 1991, Keane and Wolpin 1997, Lee 2005, Artuç et al. 2010, Aguirregabiria and Mira 2010, Kennan and Walker 2011). However, many politicians switch parties within a few weeks of being elected, which

Once brought together in pairwise matches, a leader and a politician bargain over a share of the politician's rent production in the party. A leader aims to fill her party with politicians who demand little rents. The provision of club goods allows her to find members who accept joining the party by receiving less rents than what they produce. In addition, the possibility of climbing the party hierarchy in the future creates an option-value effect, which induces a politician to forgo today's rents in expectation of becoming more powerful in the future.

Theoretical contributions My model builds on Burdett and Mortensen (1998) and Cahuc et al. (2006) and contributes to the labor search theory by incorporating team production, club goods, and capacity-constrained leaders. These features of the model generate rich party-switching patterns by politicians between parties of different sizes. Politicians differ in their value-rankings of parties because a party's value has two components that have different returns to party size. Club goods are increasing in party size, so, if they were all that mattered, the payoff from joining a party would increase in party size. This is the case if a politician has very little in private assets. On the other hand, the payoff from private rents is decreasing in party size since richer parties demand a higher tax on private assets to join. If that were all that mattered, the payoff from membership would be a decreasing function of party size. The decreasing returns to party size dominate if a politician has high private assets. If a politician has intermediate levels of private assets, the payoff is a combination of the two, and the politician may rank two parties with different sizes equally.[14]

This paper contributes to the literatures on coalition formation and politicians' career choices by studying party membership in general equilibrium, considering the outside options of the politicians, and comparing the within-party power distributions across systems.[15] To my knowledge, Desposato (2006) is the first to model the benefits of party membership as the sum of a politician's rent share and a party's club goods. In his model, a politician's rent share is approximated by his ideological match with his party. My model differs by endogenizing the rent shares of the politicians and considering dynamics, outside options, and match frictions, while abstracting from ideological match. My paper also abstracts from the leaders' strategic allocation of party resources across districts, unlike Galasso and

suggests that they may have not started politics in their most-preferred parties. For example, out of 476 completed spells of elected politicians, 33 ended within 10 weeks, and 94 ended within a year. Also, the importance of outsi de options and the general equilibrium effects render a matching model suitable to study party formation. Moreover, the 2002-2014 period of Turkey offers an excellent environment to estimate a model where the distribution of vote shares among parties is stable.

[14]The model can be applied to labor markets, in which a worker trades off compensating differentials and wages he earns in a firm engaged in team production. Similar to the compensating-differentials literature, in a Nash equilibrium, a small party pays higher rents to a politician to compensate for his disutility in lacking club goods (Rosen 1986, Sorkin 2018, Lamadon et al. 2019).

[15]Aldrich and Bianco 1992, Aldrich 1995, Eraslan 2002, Diermeier et al. 2003, 2005, Acemoğlu et al. 2008, Roemer 2009, Anderson and Meagher 2012, Anesi and Seidmann 2015, Gehlbach 2013.

Nannicini (2011), who show that Italian leaders recruit the (costly) high-valence candidates for the most contested districts. Francois et al. (2015) show how a leader allocates the power to different ethnic groups to avoid coups and revolutions in Africa. My model differs by abstracting from challenges to party leadership, while capturing the effects of the horizontal competition between parties on a leader's optimal coalition choice to some degree.

Estimation and findings I estimate the model using a dataset I constructed on the Turkish political arena from 1995-2014. During the data period, 28.5% of the members of parliament (MPs) switched their parties at least once.[16] I obtained the exact date each MP switched a party from the archives of the daily newspapers to analyze the political dynamics through the labor market of candidates.

Unlike the conventional search models which use observed wages in estimation, the estimation procedure in this paper cannot use politicians' rent shares since they are not observed. However, the high party-switching rate across parties of different sizes and (observationally unequivalent) politicians' heterogeneous valuations of the two types of political benefits in the model provide the necessary information to identify the model. The major identification challenge involves the distribution of unobserved heterogeneity, which enters the party-switching hazard rate nonseparably. I show that the results of Evdokimov (2010, 2011) can be applied for nonparametric identification of the distribution of unobserved heterogeneity.

Using my data, I find that the right-wing parties accumulate club goods more easily than they produce political rents, which yield extensive party control to the leaders. I also find that politicians with better labor market options are less productive to their parties. I provide two possible explanations for interpreting these results. First, specialization in a highly-respected occupation may prevent a politician from engaging in rent-seeking. Second, party leaders may have selected the politicians with little political skills to share lesser rents. Credibly distinguishing between these two explanations require either comparing politicians to the general public, as done by Dal Bó et al. (2017, 2018) for studies on Swedish politicians, or using an exogenous variation in the amount of available rents, as in Brollo et al. (2013). Although lacking access to Turkish register data and exogenous variation in political rents prevente me from doing these exercises, my model, which suggests that the leaders select the poor-quality candidates to share lesser rents, supports the selection explanation.

[16] Altindağ and Mocan (2015) construct a similar data set and study the causes of party switching by elected politicians in Turkey. My data set differs by covering the political party choices of the universe of listed politicians during the sample period and the exact date of party switching by elected politicians. Their results are consistent with the main assumptions of this paper. First, politicians who have a narrow victory for winning a seat, which may be because of a bad initial match, are more likely to switch a party. Second, politician characteristics, which determine a politician's assets in my model, are related to their tendency for switching a party. Third, party switching by politicians increases (decreases) the local vote shares of their new (initial) parties, which implies that members provide the productive assets to their parties.

Counterfactual exercises After estimating my model for the party-centered system of Turkey, I adjust it to different systems and compare the within-party power distributions across systems. I find that, keeping politicians' bargaining power constant, members of small (big) parties earn higher rents in a party (candidate)-centered system, where their assets are more productive compared to a candidate (party)-centered system. This finding is consistent with the Duverger's law, which observes that the effective number of parties under plurality voting should be no greater than two (Morelli 2004). For example, my model suggests that, in the candidate-centered system of the United States, a politician who has the capacity to form a small party is better off if he instead joins a bigger party. This is because he produces the same amount of rents in all parties but benefits from larger club goods in bigger parties. When all politicians act this way, only 2 parties of the same size can survive in equilibrium.

My findings are also consistent with the Duverger's hypothesis, which states that there is a tendency for multipartyism in proportional representation (PR) systems (Morelli 2004). Team production in PR systems allows a politician to become more influential in smaller parties, which are in greater need for his assets. Also, the leaders with monopsonistic recruiting power can more easily exploit the members' rents in such systems. Thus, a politician who leads a small party does not prefer to join a bigger one. The majority of the literature on fragmented politics explain the Duverger observations by appealing to growing polarization or incentives to target small slices of voters (Morelli 2004, Persson and Tabellini 2005, 2016). My paper suggests a new explanation by focusing on the labor-market incentives of politicians, which can also explain the existence of multiple parties with the same ideology.

Finally, the dynamic model provides insights on how coup d'état attempts, term limits, and other institutions affect the power distributions in parties and the quality of the political class. Intuitively, these institutions affect the political dynamics either by changing the value of a party membership or altering the politicians' bargaining power. For example, the possibility of having a coup d'état reduces the value of party membership and makes a political career less attractive to high-quality politicians. On the other hand, to the extent that these institutions decrease a leader's ability of extracting rents from members, the politicians' substitutability for a leader increases. When the leaders do not seek the low-quality politicians who demand little rents, the average quality of the political class increases. This finding is consistent with the recent research that finds that the average quality of politicians tend to be higher in majoritarian systems, where a party leader has more limited ability to control her party compared to the PR systems (Merlo et al. 2010, Gagliarducci et al. 2011, Mattozzi and Merlo 2015, Galasso and Nannicini 2011, Matakos et al. 2018).

2 Data

The data set covers the universe of parties and listed politicians in Turkey between 1995 and 2014. In the sample, there are 33 parties and 35,648 politicians of whom 1,912 won a seat in parliament. I construct this dataset by digitizing the information in the Official Gazette of Turkey, which provides information on each candidate's occupation, education level, electoral district, and the ranking in his party's list about two months before an election.[17] If a politician wins a seat, a more detailed resume is published in Parliament's website.[18] Moreover, the archives of the daily newspapers provide the exact date at which a member of the parliament, henceforth MP, switches his party. About 4% of the entire sample and 28% of the MPs switched parties at least once during their political careers. The estimated party-switching rate in the entire sample is downward biased because of censoring in the data. A large majority of the politicians in the sample appeared in a party's ballot lists only once, partly because many parties participated in only one election. As the elections are party-centered, politicians who do not win seats rarely appear in the media. Therefore, it is not possible to observe their party choices late in their careers after running for office. The online appendix explains the construction of the dataset and presents the details on politician and party characteristics. In this section, I briefly summarize the data and the Turkish political system and discuss the validity of my model's main assumptions.

2.1 Institutional details

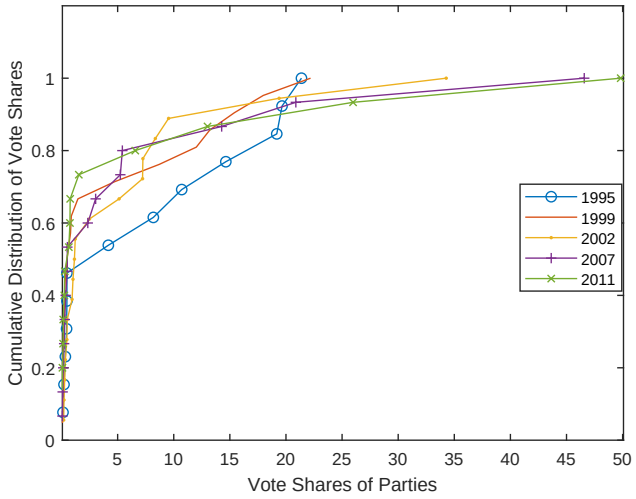
Turkey uses a closed-list proportional representation system to distribute 550 parliamentary seats to the parties. Each party lists its candidates, in order of priority, for each of the 85 electoral districts before an election. Each voter observes the ballot lists, and s/he can vote for a party as a whole rather than for individual candidates. To win a seat in parliament, a party has to gain at least 10% of the national votes. The seats are distributed to the parties that clear the electoral threshold via the d'Hondt method (Bormann and Golder 2013).

2.2 Stationary distribution of electoral power among parties

This paper focuses on the stationary equilibrium where the distribution of the electoral power across political parties is constant. The stationarity assumption holds either when no party changes over time or when the parties that dissolve get immediately replaced with similar parties. This section discusses the empirical validity of this assumption.

[17] http://www.resmigazete.gov.tr/
[18] https://www.tbmm.gov.tr/TBMM_Album.htm

Figure 1: Cumulative distribution of vote shares



During 1995-2014, 5 elections were held to distribute parliamentary seats to the parties. 33 parties competed in these elections, but only 3 participated in all 5. The number of parties that participated in a given election ranged from 13 to 21. Due to the electoral threshold, at most 5 parties gained seats in the parliament in an electoral term.

To investigate the evolution of parties, Figure 1 plots the distribution of party vote shares in each of 5 elections. We see that in contrast to the smaller parties' steady (and low) vote shares, the bigger parties' vote shares are highly volatile over time. In particular, the bigger parties' vote shares are distributed very differently before and after 2000. During the 1990s, the bigger parties' vote shares were close to each other, which resulted in a series of coalition governments. In contrast, during the 2000s, one party received a remarkably high share of votes and formed a majority government in 3 consecutive terms. Moreover, the vote-share ranking of the major parties remained constant after the 2002 election. Accordingly, although the parties' vote shares showed some variation over time, I argue that the 2002-2014 period in Turkey provides a good test bed for a model in which the distribution of electoral power among parties is constant. Because of the different outlook of Turkish politics after 2000, I estimate my model separately for the post-2000 period.[19]

2.3 Politicians' characteristics and choices

This section summarizes the data on politician's characteristics and party choices and discusses the empirical validity of model's assumptions on politician behavior. Table 1 shows

[19]Since estimation requires having data on at least 3 electoral terms, it is not possible to estimate the pre-2000 period separately.

the mean values of the observed characteristics for the entire sample as well as separately for the MPs and compares the party switchers to the whole sample. There are 35,648 politicians, and some of them entered the ballot lists multiple times. There are 1,449 party switchers in the entire sample and 540 among the MPs. Note that most of the politicians appeared on the ballot lists only once as indicated by an average number of participating in an election that is slightly above 1. The information related to the political careers of these politicians is limited to a very short duration, and it is not possible to observe whether they switched a party late in their careers after running for office. The average number of times a party switcher switches his party is 1.169 (1.364) in the entire sample (sample of MPs). Finally, the switchers are more likely to reappear in the ballot lists and win seats.

Table 1: Mean values for politician characteristics

	All	**Switchers**	**MPs**	**Switcher MPs**
College	0.50	0.70	0.91	0.88
Female	0.16	0.07	0.08	0.05
Architecture and engineering	0.09	0.15	0.18	0.17
Arts, design, entertainment, sports, and media	0.03	0.06	0.04	0.06
Bureaucracy	0.02	0.04	0.07	0.08
Business	0.33	0.32	0.18	0.21
Business and financial operations	0.06	0.05	0.05	0.05
Community	0.01	0.02	0.03	0.02
Construction	0.02	0.03	0.02	0.03
Education, training, and library	0.07	0.09	0.15	0.13
Farming	0.02	0.03	0.16	0.03
Health practitioners and technical	0.05	0.08	0.11	0.11
Legal	0.06	0.11	0.16	0.16
Life, physical, and social sciences	0.03	0.08	0.09	0.10
Management	0.03	0.05	0.04	0.05
No occupation	0.00	0.01	0.00	0.00
Office	0.01	0.00	0.00	-
Other	0.01	0.00	-	-
Production	0.09	0.05	0.01	0.01
Retired	0.06	0.01	0.01	0.00
# of party switches	0.05	1.17	0.385	1.36
# of winning a seat	0.08	0.63	1.44	1.69
# of participating in an election	1.19	2.39	2.07	2.62
N	35,648	1,449	1,912	540

Notes: Occupational categories are constructed following the 2010 Standard Occupational Classification system of the US Bureau of Labor Statistics. Fractions are rounded to the nearest hundredth.

Table 2: The observed matrix of party switches

To:	**Stay**	**New FL**	**New CL**	**New CR**	**New FR**	**New Indep.**
From:						
Old FL	8,546	125	13	13	0	25
Old CL	9,762	20	184	63	23	57
Old CR	24,076	4	51	689	76	114
Old FR	6,318	1	6	35	28	25
Old Indep.	1,261	20	33	69	19	-

Notes: The cell (x, y) presents the total number of switches from a party in category x in year t to a party in category y at year $t + 1$.

Table 2 shows the observed matrix of switches across the categories of the political spectrum (far-left *FL*, center-left *CL*, center-right *CR*, and far-right *FR*), where each politician's party choice from one year to the next is counted as a separate observation. According to the table, there are transitions between all categories of the political spectrum; however, the majority of the switches occurred between the parties with similar ideologies. The low frequency of party-switching across parties with different ideologies suggests that we can consider the right- and left-wing parties as separate labor markets.

Lastly, I focus on a stationary equilibrium where the value of a party to a politician does not depend on other politicians' choices. In the data, however, there are examples of both correlated and uncorrelated politician movements. In particular, there are 2 cases where a large number of a party's members resigned to form a new party. My model abstracts from explaining these correlated politician movements since the number of such cases is low to conduct an empirical study. However, because such movements occurred before 2002, the assumption of uncorrelated politician behavior is valid for the post-2002 period.

3 Model

This section develops a model of party formation that explains party stability, within-party power-sharing, and the effect of the leaders' power-sharing considerations on the quality of the political class. I model the political arena as a market for producing political rents, which embody the power to control government institutions. Winning a seat or employing supporters in public institutions are examples of a party's rents.

Party leaders guard the entry points of their parties. A leader has an exogenously-determined leadership capacity that determines the total amount of rents her party can

produce.[20] A leader needs to recruit politicians to produce these rents. I assume that the control/power over a party's rents is infinitely divisible among the party members. For example, winning a seat does not imply that a politician can act independently from his party during the legislative activities.

A leader maximizes her party control and she seeks politicians who demand little power to produce rents. Politicians are heterogeneous in their quality, which affects both how much rents they produce in a party and how much power they demand to serve for a party. The model shows that a leader seeks to recruit low-ability politicians who are easier to control.

The model exhibits two important features of team production that are central to party-centered democracies.[21] First, party control over government functions generates club goods that are non-exclusively provided to all members. These side-benefits of party membership allows a leader to more easily control her party. Second, because a small party is in a greater need for political assets, a politician can be more influential with his assets in small parties.[22] As a result, a more resourceful politician tends to prefer small parties, where he can be a big fish in a small pond. On the other hand, a politician with little assets prefers a large party where he benefits from the party's club goods without contributing much to the party.

3.1 The agents, production, payoffs, and matching in the political market

This section describes the types, outputs, and the utility functions of the agents in the model, all of whom live forever in a continuous-time setting.

Politicians There is a measure M of politicians of whom a fraction φ are independents and a fraction $(1-\varphi)$ have a party affiliation. The politicians are heterogeneous in their infinitesimal assets, denoted by z. The quality of a politician is measured by the amount of his political assets. The political assets of a politician include all of his resources such as network, education, valence, and financial resources that are valued by the voters.[23] Politicians' time-invariant resources are distributed $L(z)$, with density $\ell(z) > 0$ over $[0, z^{max}]$.

[20] By shutting-off the horizontal competition for rents, I elaborate on the vertical competition within a party. This assumption is arguably plausible for a country that is highly polarized over non-economic issues. This is because, in a polarized country, the parties that speak to different groups have limited ability to compete in policies to convert each other's voters.

[21] In a party-centered democracy, voters can vote only for the party as a whole rather than for individual candidates. As a result, parties produce political power as a team.

[22] Francois et al. (2015) generate a similar feature of power-sharing. In their model, members of larger ethnicities benefit less from being part of a governing coalition in Africa.

[23] During estimation, I econometrically model a politician's assets as an index function of all of his observed and unobserved characteristics and estimate how much each characteristic contributes to a politician's assets.

Parties A party has an identity of its own rather than a collection of like-minded politicians. Parties are heterogeneous in their sizes. A party's size is given by the sum of its members' resources. For example, if we knew the monetary value of each party member's political resources, the party's size would be the total monetary assets of the party. Let x denote the size of a party, distributed $x \sim \vartheta(x)$ with $\frac{d\vartheta(x)}{dx} > 0$ on $[x_{min}, x^{max}]$. Let Z_x denote the set of politicians in type-x parties.[24] Since a party's size is equal to the sum of its members' resources, the law of large numbers implies

$$x\frac{d\vartheta(x)}{dx} = \int_{z \in Z_x} z dz.$$

Party leaders A party is represented by a leader, who differs from other politicians by having the ability to lead a party. There is a continuum of leaders with a mass normalized to 1. The leaders are heterogeneous in the size of the party that they are capable of leading, denoted by $\tilde{x}$.[25] The party-leading capacities of the leaders are distributed $\tilde{x} \sim \Upsilon(\tilde{x})$.

I assume that the total assets of the politicians are sufficient for all party leaders to fill their parties up to their leading capacities. I temporarily assume and later show (in section 3.6) that it is optimal for a leader to fill her party up to her full capacity. So, the equilibrium distribution of party sizes is identical to the distribution of party leading capacities.

Production The political arena is a market for producing political rents, which embodies the ability to influence the government institutions in one's interest. In a party-centered democracy, all members of a party combine their resources to produce their party's rents. Political rents are private and exclusive. The total seats in the parliament and the government offices controlled by the party are a few examples of a party's rents. Note that one member's use of the party's rents, such as gaining a seat, becoming a governor, or employing one's supporters in the municipalities, prevents the other members from using it. However, I assume that the control over a politician's rents is infinitely divisible between the leader and the politician. For example, a member of parliament may follow the leader's preferences rather than acting independently during the legislative processes. A party of size x produces rents according to $\theta(x)$, which has diminishing returns to scale, i.e., $\theta'(\cdot) > 0$ and $\theta''(\cdot) < 0$.

During the process of producing rents, party control over government functions also generates club goods. The club goods of a party are the benefits of belonging to a team, which are provided to all members non-exclusively. While the seats of a party are its political rents, the pride or the security gained by affiliating with a strong team are the party's club goods. A party of size x produces club goods according to $\psi(x)$, with $\psi'(\cdot) > 0$ and $\psi''(\cdot) < 0$.

[24] The set Z_x consists of densities of each type of politician in a type-x party, which is derived later.

[25] The leadership ability is similar to the managerial ability in span-of-control models (Lucas 1978).

Independent politicians can produce rents on their own, but the accumulation of the club goods requires leadership, and hence club goods can be produced only within a party.

The flow payoffs An independent politician produces rents using his resources. The utility flow to a type-z independent politician is

$$u_0(z) = \theta(z). \tag{3.1}$$

When a type-z politician joins a type-x party, the politician's rent production is $\frac{z}{x}\theta(x)$, so that his productivity is proportional to his relative resources in the party.[26] Suppose that the politician has the control over a share $\phi \leq 1$ of his rent production in the party. Bigger values of ϕ indicate that the politician is able to act more independently in the party. Because he also benefits from the party's club goods, his utility flow is

$$u(z, \phi, x) = \phi\frac{z}{x}\theta(x) + \psi(x). \tag{3.2}$$

I temporarily assume and later show that $\frac{d}{dx}\left\{\frac{z}{x}\theta(x)\right\} < 0$ and $\frac{d^2}{dx^2}\left\{\frac{z}{x}\theta(x)\right\} > 0$.[27] This implies that a politician is more influential in smaller parties that have greater needs for his assets. Since club goods are increasing in party size, membership benefits have two components with different returns to party size. Because the first component is weighted by z, the increasing returns dominates for the more resourceful politicians, and they tend to prefer being a big fish in a small pond, as I explain in the next section.

A leader controls all the rents that are not given to the members. Thus, when a type-z politician joins a type-x party with rent share ϕ, the leader's payoff from this contract is

$$w(z, \phi, x) = (1 - \phi)\frac{z}{x}\theta(x). \tag{3.3}$$

Matching technology A party leader searches for new members when there is a vacancy through the identical, random, pairwise, time-consuming, and sequential matching process of Burdett and Mortensen (1998) and Cahuc et al. (2006) (henceforth, CPR). This process can bring a leader together with a politician who may or may not have a party affiliation.

[26] Assuming that a politician's rent production in a party is proportional to his relative resources is compatible with the idea of collective "team" bargaining (Stole and Zwiebel 1996, Rajan and Zingales 1998). In section 3.8, I find that, the maximum rents a politician can earn in a given party is linearly increasing in the politician's assets. So, if a member has twice the assets of another member, a leader is willing to pay him twice as much rents to keep him in the party. This outcome is the asymmetric Nash bargaining solution in a frictionless environment where a politician's bargaining power is equal to his relative assets in the party (Roth 2012). Thus, this specification is consistent with a subgame in which the politicians multilaterally bargain in their party.

[27] A sufficient condition to achieve this is to have $\theta(x) = x^\eta$, with $0 < \eta < 1$.

The distribution of the politicians' and the parties' types are common knowledge. Yet, a politician and a leader see each others' types, and the leader observes the politician's party membership status after matching him. Then, the leader makes a monopsonistic offer to him over a share of the politician's rent production in the party.

3.2 Stationary decision rules

This paper studies the stationary equilibrium and abstracts from the dynamics of the transition to the steady-state. The equilibrium is characterized by the following properties.

Uncorrelated politician choices: Given the exogenous, constant distribution of the party and the politician types, $\Upsilon(x)$ and $L(z)$, the flows into and outflows from a party of each politician type balance out. As a result, each party's size is constant, which yields a constant sampling distribution, $F(x)$.[28] Since the benefits of affiliating with a party depend only on a politician's type, his outside option, and the party's type, a politician's decision to join or leave a party is independent of the other politicians' behaviors.

A leader's party-control problem A party leader maximizes her share of the party rents subject to filling the party. Because she has monopsonistic recruitment power, her optimal offer to convince a politician to join the party gives the politician the value of his outside option. However, convincing a politician to join the party may not be optimal when a leader expects to fill the vacancy with a more profitable politician. This occurs, for example, if the leader expects to match with a politician who has the same amount of assets but a worse outside option after not making an acceptable offer to the politician she is currently matched. Similarly, when a party member receives an offer from an outside party, it would not be optimal to renegotiate an acceptable offer when the leader expects to fill his vacancy with another politician of the same type with a worse outside option. Thus, a leader's offer depends on both the politician's assets and his outside option.

In a stationary equilibrium, a leader's optimization problem for filling the party reduces to deciding the maximum rent share up to which she is willing to renegotiate each type of politicians' share as his outside option improves. Then, the leader offers each politician the value of his outside option as long as providing this value does not require paying more rents than the maximum she has decided to pay. Given each party's size and the upper-bound of the rent share the other party leaders are willing to pay, the maximum share a leader is willing to pay to a politician anchors the overall ranking of the party values for the politician. This is because the other components of the value of membership in a party are

[28] I temporarily assume and later show that the party-size distribution, $\Upsilon(x)$, is the same as the distribution of leaders' capacities, $\Upsilon(\tilde{x})$. The sampling distribution, $F(x)$, however, may be different from $\Upsilon(x)$.

predetermined as a function of its size (i.e., rents and the club goods).[29]

The maximum share a leader is willing to offer to a politician depends on the frictions in the labor market. In a frictionless market, a leader would make acceptable offers to only the most profitable politician types that are just sufficient to fill the party. As the friction level increases, filling the party requires making acceptable offers to less profitable types, too, due to the decreased chances of meeting the most preferred types. Given a friction level, a leader chooses these upper-bounds to attract members who are just sufficient to fill her party.

Convincing someone with a party membership to join/stay in the party If a party member receives an offer from an outside party, the two parties' leaders enter into the Bertrand competition of CPR over the membership value they offer to the politician. Accordingly, although otherwise monopsonist, a leader also has an incentive to renegotiate when the politician is poached by an outside party. The degree to which the leaders have incentives to renegotiate a politician's share in the party determines the value-ranking of the parties for that politician. Similar to CPR, this competition resembles a sequential auction game, which results in the politician joining the party that he ranks better, and he receives a membership value that is equal to the last value offered by the losing party. Both agents' types and the politician's *outside option at the time of the match* jointly determine the offer a leader makes to a politician and the politician's ranking of the party.

Formally, the value function of a party member, $V(z, \phi, \phi^{l^*}(z, x), x)$, depends on the amount of his assets, z, his rent share, ϕ, the maximum rent share his party pays to type-z politicians, $\phi^{l^*}(z, x)$, and the type of his party, x. Let (z, x') denote a type-z politician whose outside option at the time of matching with x is membership in a type-x' party. The minimum rent share that convinces a type-(z, x') politician to join/stay in a type-x party, denoted $\phi^p(z, x, x', \phi^{l^*}(z, x), \phi^{l^*}(z, x'))$, provides him the highest membership value a type-z politician can earn in a type-x' party

$$\underbrace{V(z, \phi^p(\cdot), \phi^{l^*}(z, x), x)}_{\substack{\text{minimum value that convinces} \\ \text{a type-}(z,x')\text{ politician to join } x}} = \underbrace{V(z, \phi^{l^*}(z, x'), \phi^{l^*}(z, x'), x')}_{\substack{\text{the maximum value } z \text{ can} \\ \text{receive in a type-}x'\text{ party}}} \Big\}. \tag{3.4}$$

Convincing an independent politician to join the party Let $(z, 0)$ indicate a type-z independent politician. A type-$(z, 0)$ politician's lifetime value, $V_0(z)$, is a function of his assets because he produces rents on his own. The minimum rent share that convinces a type-$(z, 0)$ politician to join a type-x party, denoted $\phi^p(z, x, 0, \phi^{l^*}(z, x), 0)$, provides the

[29] This aspect of the model distinguishes it from CPR, where a firm's outside option is zero on each match (which arises from free entry to and exit from a market with CRS technology). Thus, while a firm is willing to renegotiate a worker's wage up to the match surplus as his outside option improves in CPR, it is possible for a leader to not make an acceptable offer to a politician even in the presence of a match surplus here.

politician the value of being an independent

$$\underbrace{V(z, \phi^p(\cdot), \phi^{l^*}(z,x), x)}_{\substack{\text{minimum value that convinces} \\ \text{a type-}(z,0)\text{ politician to join } x}} = V_0(z). \tag{3.5}$$

Stationary decision rules of a leader Let c be an indicator function that is equal to 1 if a politician's outside option is membership in a type-x' party and 0 if a politician's outside option is to be an independent. Let $\phi^l(z, x, cx', \phi^{l^*}(z,x), c\phi^{l^*}(z,x'))$ denote a type-x leader's rent-share offer to a type-z politician. This offer depends on the politician's and the party's types, z and x, the politician's outside option, cx', and the maximum rent share paid by the leaders of the competing parties, $\phi^{l^*}(z,x)$ and $c\phi^{l^*}(z,x')$.[30] It solves

$$\underbrace{V(z, \phi^l(\cdot), \phi^{l^*}(z,x), x)}_{\substack{\text{Value of party } x \text{ to a type-}(z,cx') \\ \text{politician w/share } \phi^l(\cdot)}} = min\Big\{ \underbrace{V(z, \phi^p(\cdot), \phi^{l^*}(z,x), x)}_{\substack{\text{minimum value that convinces} \\ \text{a type-}(z,cx')\text{ politician to join } x}}, \underbrace{V(z, \phi^{l^*}(z,x), \phi^{l^*}(z,x), x)}_{\substack{\text{the maximum value } z \text{ can} \\ \text{receive in a type-}x\text{ party}}} \Big\}. \tag{3.6}$$

Equation 3.6 states that, when a type-x leader meets a type-(z, cx') politician, the offer she makes to the politician is just the minimum value that can convince him to join the party, $V(z, \phi^p(\cdot), \phi^{l^*}(z,x), x)$. When convincing the politician to accept the offer requires paying him a greater share than the maximum share the leader is willing to pay, $\phi^{l^*}(z,x)$, the leader instead offers $V(z, \phi^{l^*}(z,x), \phi^{l^*}(z,x), x)$, which the politician rejects.[31][32]

Formal statement of a leader's party-control problem In a stationary equilibrium, the maximum share a leader offers to each politician type takes into account her prospects of filling the party. Let $\Phi^{l^*}(\phi^{l^*}(z,x))$ denote the distribution of the upper bound of the rent shares the leaders offer to a type-z politician. A politician type's density in a party depends on this distribution as it anchors this politician type's overall value ranking of the parties by their sizes. Let $\mu_{z,x'|x}(z, x'|x, \Phi^{l^*}(\phi^{l^*}(z,x)))$ and $\mu_{z,0|x}(z, 0|x, \Phi^{l^*}(\phi^{l^*}(z,x)))$ denote the equilibrium densities of type (z, x') and $(z, 0)$ politicians in a type-x party, respectively, and $g_{z|x}(z|x, \Phi^{l^*}(\phi^{l^*}(z,x)))$ denote the density of type-z politicians in the party. The formal

[30] The only relevant characteristics of the outside offer are the outside party's size and the maximum share it pays to the politician because a party's equilibrium value for a politician is pinned down by these two objects.

[31] Note that convincing a politician to join a party may require paying him a rent share that is greater than 1, i.e. $\phi^p(\cdot) > 1$. However, I assume that a leader never pays a politician more than what he contributes to the party, i.e., $\phi^{l^*}(z,x) \leq 1, \forall z, x$.

[32] I assume that a party leader commits to not lowering rents once a politician accepts.

statement of a type-x leader's optimization problem is

$$\max_{\substack{\phi^{l^*}(z,x),\\ \phi^l(\cdot),\\ \forall z,cx'}} \int_0^{z^{max}} \int_{x_{min}}^{x^{max}} \underbrace{(1-\phi^l(z,x,x',\phi^{l^*}(z,x),\phi^{l^*}(z,x')))\frac{z}{x}\theta(x)}_{\substack{\text{payoff to a type-}x\text{ leader when a type-}(z,x')\\ \text{politician joins the party with share }\phi^l(\cdot)}} \times \underbrace{\mu_{z,x'|x}(z,x'|x,\Phi^{l^*}(\phi^{l^*}(z,x)))}_{\substack{\text{equilibrium density of type-}(z,x')\\ \text{politicians in a type-}x\text{ party}}} dx'dz$$

$$+ \int_0^{z^{max}} \underbrace{(1-\phi^l(z,x,0,\phi^{l^*}(z,x),0))\frac{z}{x}\theta(x)}_{\substack{\text{payoff to a type-}x\text{ leader when a type-}(z,0)\\ \text{politician joins the party with share }\phi^l(\cdot)}} \underbrace{\mu_{z,0|x}(z,0|x,\Phi^{l^*}(\phi^{l^*}(z,x)))}_{\substack{\text{equilibrium density of type-}(z,0)\\ \text{politicians in a type-}x\text{ party}}} dz$$

$$\text{subject to } \underbrace{x}_{\text{party size}} = \underbrace{\int_0^{z^{max}} z g_{z|x}(z|x,\Phi^{l^*}(\phi^{l^*}(z,x))dz}_{\text{equilibrium party size}}, \tag{3.7}$$

which is solved by her stationary decision rule given in equation 3.6.

Equilibrium Section 3.6 shows that, i) more resourceful politicians demand more rents to join a party, i.e., $\frac{\partial \phi^p(\cdot)}{\partial z} > 0$, ii) in all Nash equilibria, a leader is willing to negotiate a party member's rent share up to the the entire match surplus, i.e., $\phi^{l^*}(z,x) = 1, \forall z, x$, and iii) a leader wants to fill her party up to her leading capacity.

It follows from these findings that a leader seeks to fill her party with the least-resourceful (low-z) politicians. Intuitively, suppose that a leader is able to lead a party that has 1 million dollars. Instead of recruiting a handful of highly-resourceful politicians whose assets sum up to a million, the leader prefers to work with millions of politicians with very little assets, whose assets sum up to a million. That is because the resource-rich politicians demand too much control over the rents but the resource-poor politicians yield the control to the leader.

Low-, medium-, and high-types of politicians: I temporarily assume and later show that, in equilibrium, the maximum private rents a politician can earn in a party, $\phi^{l^*}(z,x)\frac{z}{x}\theta(x)$, is decreasing in party size. As a result, the benefits of party membership have two components with different returns to party size: while the rents a politician can earn in a party are decreasing, the club goods a politician accesses in a party are increasing in party size. Section 3.6 shows that this feature of the model divides the continuous types of politicians into three categories, named *low, medium*, and *high*. A politician's preference ordering of the parties by their size is increasing, U-shaped, and decreasing for the low, medium, and high types, respectively. As a result, the low (high)-type politicians switch only to the bigger (smaller) parties, while a medium-type politician may switch to either a smaller or a bigger party.

Stationary decision rules of independent politicians: Given the decision rules of the leaders, an independent medium-type politician behaves according to his own stationary

decision rule. Due to the U-shaped returns to party size, two parties with different sizes may have the same value for a medium-type politician. Let x_{a0} and x_{b0} denote the types of the smaller and the bigger parties, respectively, that make him equally well-off as being an independent. Note that these thresholds exist only when the politician's value of being an independent is greater than the lowest point of his U-shaped returns to party size. When these thresholds do not exist, the politician joins any party upon receiving an offer. When the thresholds exist, he is strictly better-off in all parties that are smaller than x_{a0} and bigger than x_{b0}, compared to being in the threshold-type parties. Therefore, the stationary decision rule of an independent medium-type politician is to join party x' if $x' \in \{[x_{min}, x_{a0}] \cup [x_{b0}, x^{max}]\}$ upon receiving an offer. Party-joining thresholds solve

$$V_0(z) = V(z, \phi^{l^*}(z, x_{a0}), \phi^{l^*}(z, x_{a0}), x_{a0}) = V(z, \phi^{l^*}(z, x_{b0}), \phi^{l^*}(z, x_{b0}), x_{b0}) \tag{3.8}$$

where $V_0(z)$ and $V(z, \phi^{l^*}(z, x), \phi^{l^*}(z, x), x)$ are the values of being an independent and being a member of a type-x party with share $\phi^{l^*}(z, x)$ for a type-z politician, respectively. Accordingly, $x_{a0}(\cdot)$ and $x_{b0}(\cdot)$ are continuously differentiable functions of z, x_{a0}, $\phi^{l^*}(z, x_{a0})$ and z, x_{b0}, $\phi^{l^*}(z, x_{b0})$, respectively. The low and the high politician types' stationary decision rules when independent are constructed similarly to that of a medium politician type. The only difference is that, since the low (high) type politicians switch only to the bigger (smaller) parties, they do not have smaller (bigger) party switching thresholds.

Stationary decision rules of party members: Given the decision rules of the leaders, each politician with a party membership behaves according to his own decision rule. In equilibrium, a medium type-z politician in a type-x party switches his party if he gets an offer from party x' such that $x' \in \{[x_{min}, x_a) \cup (x_b, x^{max}]\}$, where $x_a(\cdot)$ and $x_b(\cdot)$ solve

$$V(z, \phi^{l^*}(z, x), \phi^{l^*}(z, x), x) = V(z, \phi^{l^*}(z, x_a), \phi^{l^*}(z, x_a), x_a) = V(z, \phi^{l^*}(z, x_b), \phi^{l^*}(z, x_b), x_b) \tag{3.9}$$

and, hence, $x_a(\cdot)$ and $x_b(\cdot)$ are continuously differentiable functions of z, x, x_a, $\phi^{l^*}(z, x)$, $\phi^{l^*}(z, x_a)$, and z, x, x_b, $\phi^{l^*}(z, x)$,$\phi^{l^*}(z, x_b)$, respectively. Similarly, upon receiving an offer, a low-type politician in a type-x party switches to party x' when $x' \in (x, x^{max}]$ and a high-type politician in party x switches to party x' when $x' \in [x_{min}, x)$.

3.3 The value functions

In this section, I present the closed forms of the value functions of the politicians and the party leaders using their stationary decision rules. To simplify presentation, let $\psi_{z,x,0}$ and $\psi_{z,x,x'}$ denote the state variables that determine the value of a type-z politician in a type-

x party whose outside option is to be an independent and a member of a type-x' party, respectively (equations 3.4 - 3.5). All agents in the model discount time at rate ρ. An independent politician receives an offer from a political party at rate λ. Given his stationary decision rule in equation 3.8, the lifetime utility of an independent type-z politician is

$$\underbrace{V_0(z)}_{\substack{\text{value of being}\\ \text{an independent}}} = \underbrace{\tau\theta(z)}_{\text{flow payoff}} + \underbrace{\frac{1}{1+\rho\tau}}_{\text{discounter}} \Big\{ \underbrace{\tau\lambda}_{\text{offer}} \Big[\underbrace{\int_{x_{min}}^{x_{a0}} V(\psi_{z,m,0}) dF(m)}_{\text{join a small party}} + \underbrace{\int_{x_{b0}(\cdot)}^{x_{max}} V(\psi_{z,m,0}) dF(m)}_{\text{join a big party}} + \underbrace{\int_{x_{a0}(\cdot)}^{x_{b0}(\cdot)} V_0(z) dF(m)}_{\text{reject offer}} \Big] + \underbrace{(1-\tau\lambda)V_0(z)}_{\text{no offer}} + o(\tau) \Big\}, \tag{3.10}$$

where $F(\cdot)$ is the sampling distribution with density $f(\cdot) > 0$ on $[x_{min}, x^{max}]$. Reading from left to right, a type-z independent politician receives value $V_0(z)$. This value consists of a flow payoff and a continuation value that he receives for an infinitesimally small period of time τ, plus a term $o(\tau)$ with the property that $\lim_{\tau\to 0} \frac{o(\tau)}{\tau} = 0$. The flow payoff is equal to the politician's own rent production. The continuation value, which he discounts at rate ρ, weights the expected value of randomly matching with a party and not matching with any party. When the politician matches with a party, he either accepts or rejects the leader's offer following his stationary decision rule in equation 3.3. When he joins a type-x' party, he receives a value of $V(z, \phi^l(\cdot), \phi^{l^*}(z, x'), x')$, which depends on the leader's offer $\phi^l(z, x', 0, \phi^{l^*}(z, x'), 0)$. When the politician either rejects an offer or does not receive any offer, he continues to receive the value of being an independent.

Substituting the leaders' stationary decision rules for independent politicians given in equation 3.5 and 3.6 into equation 3.10 and taking the limits as $\tau \to 0$, a politician's lifetime utility of being an independent in a stationary equilibrium solves as

$$V_0(z) = \frac{1+\rho}{\rho}\theta(z). \tag{3.11}$$

A party member receives offers from outside parties at rate λ. The stationary decision rules described in equation 3.9 determine the ranges of parties that induce him to switch his party. However, when he is not paid the maximum share that his party pays to the politician's type, an offer from an outside party may improve his share without inducing him to switch his party. This occurs when a type-z politician in a type-x party with share ϕ gets an offer from party x' such that $x' \in \{[x_a(\cdot), q_a(\cdot)] \cup [q_b(\cdot), x_b(\cdot)]\}$, where the threshold values

for having a share improvement in the party, $q_a(\cdot)$ and $q_b(\cdot)$, solve

$$V(z,\phi,\phi^{l^*}(z,x),x) \;=\; V(z,\phi^{l^*}(z,q_a),\phi^{l^*}(z,q_a),q_a) = V(z,\phi^{l^*}(z,q_b),\phi^{l^*}(z,q_b),q_b),$$

and, hence, $q_a(\cdot)$ and $q_b(\cdot)$ are continuously differentiable functions of x, ϕ, $\phi^{l^*}(z,x)$, q_a, $\phi^{l^*}(z,q_a)$, and x, ϕ, $\phi^{l^*}(z,x)$, q_b, $\phi^{l^*}(z,q_b)$, respectively.

When a match breaks exogenously, which occurs at rate δ, the politician becomes an independent and receives the lifetime utility associated with that state, $V_0(z)$. Given the politician's stationary decision rule and the ranges of the parties that cause a share improvement, the lifetime utility of a type-z politician in a type-x party with share ϕ is

$$\begin{aligned}
\underbrace{V(z,\phi,\phi^{l^*}(z,x),x)}_{z\text{'s value in } x \text{ w/ share } \phi} \;=\;& \tau\Big(\underbrace{\phi\frac{z}{x}\theta(x)+\psi(x)}_{\text{flow payoff}}\Big) + \underbrace{\frac{1}{1+\rho\tau}}_{\text{discounter}}\Big\{\underbrace{\tau\lambda}_{\text{offer}}\Big[\underbrace{\int_{q_a(\cdot)}^{q_b(\cdot)} V(z,\phi,\phi^{l^*}(z,x),x)dF(m)}_{z \text{ does not report the offer}} \\
&+ \underbrace{\int_{x_{min}}^{x_a(\cdot)} V(\psi_{z,m,x})dF(m) + \int_{x_b(\cdot)}^{x_{max}} V(\psi_{z,m,x})dF(m)}_{z \text{ switches to either a smaller or a bigger party}} \\
&+ \underbrace{\int_{x_a(\cdot)}^{q_{a(\cdot)}} V(\psi_{z,x,m})dF(m) + \int_{q_b(\cdot)}^{x_b(\cdot)} V(\psi_{z,x,m})dF(m)\Big]}_{z\text{'s share in party } x \text{ increases}} \\
&+ \underbrace{\tau\delta V_0(z)}_{\text{exog. break-up}} + \underbrace{(1-\tau\lambda-\tau\delta)V(z,\phi,\phi^{l^*}(z,x),x)}_{\text{no offer, no exogenous match break-up}} + o(\tau)\Big\}. \qquad (3.12)
\end{aligned}$$

Reading from left to right, a type-z politician in a type-x party with share ϕ has value $V(z,\phi,\phi^{l^*}(z,x),x)$. This value consists of a flow payoff and a continuation value that he receives for an infinitesimally small time period τ, plus a term $o(\tau)$. The flow payoff is the sum of the politician's share of party rents and the party's club goods. The continuation value weights the expected value of three mutually exclusive possibilities. If the match breaks up exogenously, he receives the value of being an independent. If the politician gets an offer from a party, which occurs at rate λ, he follows his stationary decision rules to either accept or reject the offer. Lastly, when the politician neither gets an offer nor the match breaks up exogenously, he continues to receive the value of being a member of party x with share ϕ.

Finally, a party leader's flow utility from a match is the rents that are not paid to the politician, $(1-\phi)\frac{z\theta(x)}{z}$, and her continuation value is written similarly to that of a politician. To preserve space, I do not present a leader's value function here but it is available in an earlier version of the paper.

3.4 The low, medium, and high types of politicians

In this section, I show that the continuous distribution of the politician types are divided into three categories in their rankings of the parties. Substituting the stationary decision rules of the party leaders in equation 3.1 into the lifetime utility of a type-z politician in a type-x party in equation 3.7, taking the limits, and evaluating ϕ at $\phi^{l^*}(z,x)$ shows that the maximum value a type-z politician can earn in a type-x party is[33]

$$V(z,\phi^{l^*}(z,x),\phi^{l^*}(z,x),x) \;=\; \frac{\phi^{l^*}(z,x)\frac{z}{x}\theta(x)+\psi(x)+\delta V_0(z)}{\rho+\delta} \tag{3.13}$$

with derivative,

$$\frac{dV(z,\phi^{l^*}(z,x),\phi^{l^*}(z,x),x)}{dx} = \frac{1}{\rho+\delta}\Big[z\underbrace{\frac{d}{dx}\Big\{\phi^{l^*}(z,x)\frac{\theta(x)}{x}\Big\}}_{<0}+\underbrace{\psi'(x)}_{>0}\Big]. \tag{3.14}$$

Equation 3.14 characterizes the returns to party size for a type-z politician. The maximum value the politician can earn in a type-x party, $V(z,\phi^{l^*}(z,x),\phi^{l^*}(z,x),x)$, has two components that have different returns to party size: while the upper bound of the rents a politician can earn in a party is decreasing, the club goods provided by a party are increasing in party size. This feature of the model divides the continuous distribution of the politician types into three categories in their ranking of the parties, named *low, medium*, and *high*.

The low types of politicians have very little resources. Thus, their loss in terms of the private rents is always dominated by their gains in club goods as party size increases. As a result, they rank the bigger parties better. Let $\underline{z}$ denote the threshold politician type that separates the low and medium types of politicians. For all $z \leq \underline{z}$, the second term in equation 3.14 always dominates the first term, and hence, the returns to party size are increasing on $[x_{min}, x^{max}]$. The threshold type, $\underline{z}$, receives the same marginal utility from the club goods and the private rents in the smallest party, x_{min}. All richer politicians value the private rents more, and, thus, have $\frac{dV(z,\phi^{l^*}(z,x_{min}),\phi^{l^*}(z,x_{min}),x_{min})}{dx} < 0$.[34] So, the threshold type $\underline{z}$ solves

$$\underline{z}\frac{d}{dx}\Big\{\phi^{l^*}(\underline{z},x_{min})\frac{\theta(x_{min})}{x_{min}}\Big\} = -\psi'(x_{min}). \tag{3.15}$$

Let $\bar{z}$ denote the threshold politician type that separate the medium and high types of politicians. For all $z \geq \bar{z}$, the first term in equation 3.14 dominates the second term in all

[33] These derivation steps follow CPR.

[34] Since the support of x is $[x_{min}, x^{max}]$, at x_{min} (at x^{max}), only the right (the left) derivative exists.

parties, and hence, the returns to party size are decreasing on $[x_{min}, x^{max}]$. The politicians whose assets are within the range $[\bar{z}, z^{max}]$ are very rich in resources so that their loss in private rents is never dominated by their gain in club goods as party size increases. So, the high-type politicians rank the smaller parties better. The threshold type $\bar{z}$ receives the same marginal utility from the party's club goods and the upper-bound of the private rents he can receive in the biggest party type, x^{max}. All higher politician types value the private rents more, and, therefore, have $\frac{dV(z,\phi^{l^*}(z,x^{max}),x^{max})}{dx} < 0$. Accordingly, the threshold type $\bar{z}$ solves

$$\bar{z}\frac{d}{dx}\Big\{\phi^{l^*}(\bar{z}, x^{max})\frac{\theta(x^{max})}{x^{max}}\Big\} = -\psi'(x^{max}).$$

Finally, the politicians with assets within range $(\underline{z}, \bar{z})$ have a nonmonotonic returns to party size. Note that, since $\psi'(x) > 0$ and $\psi''(x) < 0$, a sufficient condition for the medium-type politicians to have a U-shaped returns to party size is that $\frac{d}{dx}\Big(\frac{\phi^{l^*}(z,x)\theta(x)}{x}\Big) < 0$ and $\frac{d^2}{dx^2}\Big(\frac{\phi^{l^*}(z,x)\theta(x)}{x}\Big) > 0$. I temporarily assume and later show that this condition holds.

Let $x_0(z)$ denote the lowest point of a medium type-z politician's U-shaped returns to party size. The politician considers all parties that are smaller than $x_0(z)$ as "small" because over this range, the loss in private rents dominates the gain in club goods as party size increases. Similarly, he considers all x such that $x > x_0(z)$ as "big."

3.5 The share equation

This section presents the closed-form solution of a politician's rent share in a party. I derive this equation in the online appendix by following the exact same steps in CPR. Suppose that a type-(z, x') politician joins party x. His rent share, $\phi^l(z, x, x', \phi^{l^*}(z, x), \phi^{l^*}(z, x'))$, solves

$$\begin{aligned}\phi^l(\cdot) = \frac{x}{z\theta(x)}\Big\{&\phi^{l^*}(z,x')\frac{z\theta(x')}{x'} + [\psi(x') - \psi(x)] \\ &- \lambda\Big(\int_{q_b(\cdot)}^{x_b(\cdot)} \underbrace{\frac{dV(\psi_{z,x,m})}{dm}}_{>0}\bar{F}(m)dm - \int_{x_a(\cdot)}^{q_a(\cdot)} \underbrace{\frac{dV(\psi_{z,x,m})}{dm}}_{<0}F(m)dm\Big\}\Big).\end{aligned} \tag{3.16}$$

Equation 3.16 shows that, in an environment with frictions ($\lambda > 0$), the rent share which convinces a politician to stay in the party is decreasing in the rate of offer arrival. This equation differs from CPR by not allowing the politicians to have bargaining power and including the possibilities of having an outside offer from both the smaller and the bigger parties in the option value effect.

3.6 Steady-state equilibrium

This section presents the steady-state equations, which are derived in the online appendix by adjusting the steps taken in CPR for the possibility of a U-shaped returns to party size.

- *The proportion of independent politicians is*

$$\varphi_z = \frac{\delta}{\delta + \lambda[F(x_{a0}(\cdot)) + \bar{F}(x_{b0}(\cdot))]}. \tag{3.17}$$

- *The joint density of type-z politicians in type-x parties is*

$$g(z, x|\Phi^{l^*}(\phi^{l^*}(z, x)) = \frac{\delta(\delta + \lambda)}{[\delta + \lambda[F(x_a(\cdot)) + \bar{F}(x_b(\cdot))]]^2}\tilde{\ell}(z)f(x) \tag{3.18}$$

  where

$$\tilde{\ell}(z) = \frac{\ell(z)}{\delta + \lambda[F(x_{a0}(\cdot)) + \bar{F}(x_{b0}(\cdot))]} \tag{3.19}$$

  is defined to be *the effective density* of type-z politicians, as it weights the density of a politician type by its demand from the parties.

- *The joint density of type-$(z, q_b(\cdot))$ politicians and type-x parties is*

$$\mu_{z,q_b(\cdot),x}(z, q_b(\cdot), x|\Phi^{l^*}(\phi^{l^*}(z, x)) = 2\frac{\delta(\delta + \lambda)\lambda f(x)f(q_b(\cdot))\tilde{\ell}(z)}{[\delta + \lambda[\bar{F}(q_b(\cdot)) + F(q_a(\cdot))]]^3}. \tag{3.20}$$

- *The joint density of type-$(z, 0)$ politicians and type-x parties is*

$$\mu_{z,0,x}(z, 0, x|\Phi^{l^*}(\phi^{l^*}(z, x)) = \frac{\delta}{[\delta + \lambda[F(x_{a0}(z) + \bar{F}(x_{b0}(z))]]}\tilde{\ell}(z)f(x). \tag{3.21}$$

- *The within-party share distribution of type-z politicians in type-x parties is*

$$\Gamma_{\phi|z,x}(\phi|z, x, \Phi^{l^*}(\phi^{l^*}(z, x)) = \Big(\frac{\delta + \lambda[\bar{F}(x_b(\cdot)) + F(x_a(\cdot))]}{\delta + \lambda[\bar{F}(q_b(\cdot)) + F(q_a(\cdot))]}\Big)^2. \tag{3.22}$$

- *Equilibrium party size is*

$$x \;\; = \;\; \int_0^{z^{max}} zg(z, x|\Phi^{l^*}(\phi^{l^*}(z, x)))dz. \tag{3.23}$$

Equation 3.17 is slightly different from its counterpart in CPR. Because firms' outside options are taken to be zero in CPR, a firm is willing to renegotiate each worker's share of

the match surplus up to the match productivity as his outside option improves. As a result, a worker accepts any firm's offer, and hence the unemployment rate does not vary across worker types. In this paper, on the other hand, sorting by leaders results in variation in the proportion of independents across politician types.[35] Similarly, equations 3.18-3.22 differ from CPR by allowing for politicians to switch parties of different sizes.

I assume that an equilibrium exists and characterize the Nash equilibria of the model. Theorem 1 states that there is no Nash equilibrium in which a party leader does not negotiate a member's rent share in the party up to the match surplus.

Theorem 1. *Let $\tilde{z}(x)$ be the least profitable politician type a type-x party leader needs to hire to fill her party when $\phi^{l^*}(z,x) = 1, \forall z$. Let $\Pi(z, \phi^{l^*}(z,x), x)$ denote the profitability of type-z politicians to a type-x leader when the maximum rent share she pays to type-z politicians is $\phi^{l^*}(z,x)$. In a Nash equilibrium, $\phi^{l^*}(z,x) = 1$ for all z such that $\Pi(z, \phi^{l^*}(z,x), x) \geq \Pi(\tilde{z}(x), \phi^{l^*}(\tilde{z}(x),x), x)$, and $\phi^{l^*}(z,x) \leq \phi^{l}(z,x,0,\phi^{l^*}(z,x),0)$ for all other z.*

Proof. A party leader solves her rent-maximization problem in equation 3.2 by following the stationary decision rule in equation 3.1, i.e., she chooses $\phi^l(\cdot)$ that gives the politician the value he receives in his outside option as long as providing this value does not require paying him a greater rent share than the maximum the leader has decided to pay, $\phi^{l^*}(z,x)$. Equation 3.13 shows that the density of type-z politicians in type-x parties, $g(z,x|\Phi^{l^*}(\phi^{l^*}(z,x))$, depends on $\phi^{l^*}(z,x)$ through a type-z politician's party-switching thresholds, $x_a(\cdot)$ and $x_b(\cdot)$. However, as long as the politician values the type-x party more highly than the type-x' party, the density of type-(z,x') and type-$(z,0)$ politicians in a type-x party does not change with $\phi^{l^*}(z,x)$ (equations 3.15 and 3.16). Noting these, we can write the total profitability of type-z politicians to a type-x party leader as

$$\begin{aligned}\Pi(z,\phi^{l^*}(z,x),x) &= \frac{z\theta(x)}{x}\Big\{\int_{x_a(\cdot)}^{x_b(\cdot)}(1-\phi^l(\cdot))\mu_{z,x'|z}(z,x'|x,\Phi^{l^*}(\phi^{l^*}(z,x))dx' \\ &+ (1-\phi^l(\cdot))\mu_{z,0|}(z,0|x,\Phi^{l^*}(\phi^{l^*}(z,x))\Big\} \qquad (3.24)\end{aligned}$$

with $\frac{d\Pi(z,\phi^{l^*}(z,x),x)}{d\phi^{l^*}(z,x)} > 0$ as long as $\phi^{l^*}(z,x) \leq 1$ because we have that

$$\frac{d\mu_{z,x'|x}(z,x'|x,\Phi^{l^*}(\phi^{l^*}(z,x)))}{d\phi^{l^*}(z,x)} = 0, \frac{d\mu_{z,0|x}(z,0|x,\Phi^{l^*}(\phi^{l^*}(z,x)))}{d\phi^{l^*}(z,x)} = 0, \text{ and } \frac{d\phi^l(\cdot)}{d\phi^{l^*}(z,x)} < 0.$$

[35] The leaders' sorting of members differs from the sorting by firms in the theoretical assignment literature, as the latter arises due to supermodularities in production (Becker 1973, Burdett and Coles 1997, Shimer and Smith 2000, Eeckhout and Kircher 2010, Lise et al. 2016, Lopes de Melo 2018).

Suppose that, given all other leaders' stationary decision rules, a type-x party leader follows the rule $\phi^{l^*}(z,x)$. As the party leader seeks the most profitable politician types, she makes acceptable offers to only the most profitable politician types. Let $\tilde{z}(x)$ be the least profitable politician type that the leader has to hire to fill her party under the rule she follows. Consider a type-z politician such that $\Pi(z,\phi^{l^*}(z,x),x) > \Pi(\tilde{z}(x),\phi^{l^*}(\tilde{z}(x),x),x)$ and suppose that $\phi^{l^*}(z,x) \neq 1$. This cannot be an equilibrium, as setting $\phi^{l^*}(z,x) = 1$ would make a type-z politician even more profitable. The Nash equilibria is setting $\phi^{l^*}(z,x) = 1$, $\forall z$ such that $\Pi(z,\phi^{l^*}(z,x),x) > \Pi(\tilde{z}(x),\phi^{l^*}(\tilde{z}(x),x),x)$, and $\phi^{l^*}(z,x) \leq \phi^{p}(z,x,cx',\phi^{l^*}(z,x),c\phi^{l^*}(z,x'))$ for all other z, where $\phi^{p}(\cdot)$ is the minimum share that convinces a type-(z,cx') politician to join a type-x party and $\tilde{z}(x)$ denote the least profitable type that needs to be hired to meet the constraint in equation 3.2 after setting $\phi^{l^*}(z,x) = 1$ for all members of the party.

□

This section concludes by commenting on the comparative statics. The online appendix E shows that

1. Profits from being a leader is increasing in party size, i.e., $\frac{\partial \Pi(z,\phi^{l^*}(z,x),x)}{\partial x} > 0$. This implies that all party leaders choose to fill their parties up to their capacities, and, hence, the party-size distribution is equivalent to the distribution of leadership capacities.

2. Keeping the outside option constant, a more resourceful politician demands a bigger rent share to join a party, i.e., $\frac{\partial \phi^{l}(\cdot)}{\partial z} > 0$. This implies that the party leaders seek to recruit the least-resourceful politicians whose resources are just enough to produce the party's exogenously determined amount of political rents. Hence, we can rewrite equation 3.23 as

$$x = \int_0^{z^{*(x)}} z g(z,x|\Phi^{l^*}(\phi^{l^*}(z,x)))dz. \tag{3.25}$$

   where $z^*(x)$ is the most-resourceful politician that a type-x leader needs to recruit to fill her party. This result shows that the rent-seeking party leaders tend to select the low-ability politicians who yield the party control to them.

3. Among the parties that a type-z politician considers as big (i.e., where the benefits from club goods dominate the benefits from private rents), a politician with a given outside option demands less rents in bigger parties, i.e. $\frac{\partial \phi^{p}(\cdot)}{\partial x} < 0$. This result shows that the party-centered systems are vulnerable to strong party leaders. A strong leader

forms a large party which generates valuable club goods. Because club goods increase the value of membership, party members yield the control over their rents to the leader, just to stay in the club.

4 Identification

The identification of the model uses data on each party's vote share in each district in each of five elections as well as politician characteristics, the duration of each spell with no party affiliation, and the duration of each spell with a party affiliation.

Appendix A shows that the model is nonparametrically identified. To summarize, the transition parameters (λ, δ) are mapped to the duration of party membership as these parameters pin down the rate at which a politician leaves a party. Next, the results of Evdokimov (2010, 2011) can be used to show that a politician's time-invariant hazard of leaving a party is nonparametrically identified. The derivatives of the hazard of leaving a party with respect to the observed politician characteristics, in turn, identify the contribution of these characteristics to a politician's assets. Since a party aggregates all members' resources, the equilibrium equations in my model allows me to compute each party's total assets, which yields the sampling distribution from which the politicians draw offers, $F(x)$.

Given each party's assets, the rent production function, $\theta(\cdot)$, and the distribution of the voters' time-varying preferences for a party, $\Xi(\xi_{1t}, \xi_{2t}, ..., \xi_{Kt})$, are mapped into the vote shares via Hotz and Miller (1993) inversion of the voters' choice probabilities. Having identified the rent production function and given each agent's type, the club goods production function, $\psi(\cdot)$, is identified from the conditional likelihood of observing a party affiliation duration. Intuitively, since the richer politicians value the private rents more than the club goods, given a party's rents, the variation in the hazard of leaving the party across different politicians identifies the party's club goods. Similarly, the discount rate can be identified from the unconditional likelihood of joining a party from the pool of independents. This is because the value of being an independent is equal to the discounted value of the politician's rent production on his own, and, hence, the hazard of joining a party is determined by the discount rate when all the other relevant objects are given.

5 Estimation

There are three main challenges in estimation. First, unlike the conventional search models which use observed wages in estimation, the estimation procedure in this paper cannot use

politicians' unobserved rent shares. Second, a party's total assets is not observed. Third, some important components of a politician's assets, such as valence, are not observed and the unobserved heterogeneity enters the hazard rate nonseparably.

Fortunately, the one-to-one relationship between the voters' party-specific value functions and the vote shares allows for estimating the party sizes and the distribution of the voters' preferences for each party after assuming a functional form for the rent production function.[36][37] Having estimated the party sizes, the rich party-switching patterns generated by the model allow for undertaking the duration analysis in the framework of a finite mixture model. The remaining parameters are estimated parametrically using this formulation.

Table 3: Restrictions on primitives during estimation

Primitive		**Restriction**	**Estimated form**
$\theta(x)$	Rent production function	Fixed	$\theta(x) = log(x)$
$\psi(x)$	Club goods production function	Parameterized	$\psi(x) = x^{\eta_1}$, with $0 < \eta_1 < 1$
$\{\Xi_k(\xi_{kct})\}_{k=1}^K$	Distribution of voters' preferences	Parameterized	$\xi_{kct} \sim iidN(0, \sigma^2_{\xi_k})$
z	Politician type	Parameterized	$log(z_i) = \sum_m y_{im}\beta_m + \epsilon_i$.
$H(\epsilon)$	Distribution of unobserved het.	Parameterized	$\epsilon_i \sim iidN(0, \sigma^2_\epsilon)$
(λ, δ)	Transition parameters	Unchanged	-
$\{x_k\}_{k=1}^{33}$	Party sizes	Discretized	-
$F(x)$	The sampling distribution	Unchanged	-

5.1 Estimation procedure

The observable variables I use in estimation are $\{\{y_{im}\}_{m=1}^M, \{t_{il}, \{s_{ilk}\}_{k=1}^K, d^n_{il}, d^i_{il}, d^r_{il}\}_{l=1}^{L_i}\}_{i=1}^N$, and $\{\nu_{0ct}, \nu_{kct}\}_{k=1}^K{}_{c=1}^C{}_{t=1}^T$ where y_{im} is the mth characteristic of politician i, t_{il} is the length of politician i's lth spell, s_{ilk} is a dummy variable that is equal to 1 if the lth spell of politician i is in party k, $d^n_{il}, d^i_{il}, d^r_{il}$ are indicator variables for the uncensored, interval-censored, and right-censored observations that are equal to 1 if the lth spell of politician

[36] This procedure is similar to recovering a firm's unobserved productivity level by estimating its production function as in CPR.

[37] Throughout estimation, the rent production function is normalized to be of the form $\theta(x) = log(x)$. Evdokimov (2010, 2011) show that, when there is a complete spell for each individual, the hazard rate can be identified and estimated nonparametrically. In the absence of a complete spell for each politician, the rent production function, which is a determinant of the hazard rate, can be identified only up to a scale normalization. The rent production function connects the two parts of estimation, i.e., recovering the party sizes from the vote shares and using the estimated party sizes for estimation of the other parameters. Scaling the rent production function in the first part results in scaled estimates of party sizes. Using these scaled estimates in the second part, in turn, it is possible to scale the other parameters to obtain the exact same likelihood value as the one that was obtained before scaling.

i has the relevant type of censoring, ν_{0ct} and ν_{kct} are the shares of the voters who did not vote for any party and who voted for party k in district c at time t, respectively. Although the model is nonparametrically identified, I estimate it parametrically using the formulation that is summarized in Table 3. In what follows, I explain the estimation procedure.

5.1.1 The labor market transition parameters

The labor market transition parameters, (λ, δ), are estimated by maximizing the unconditional likelihood of the observed party-membership durations, a procedure developed by Ridder and van den Berg (2003). This likelihood function is given by

$$p(t) = \frac{1+\kappa}{\kappa}\Big(\delta \int_1^{1+\kappa} \frac{e^{-\delta a t}}{a} da\Big)^{d_n} \Big(\int_1^{1+\kappa} \frac{e^{-\delta a t}}{a^2} da\Big)^{d_r} \Big(\int_1^{1+\kappa} \frac{e^{-\delta a t_1} - e^{-\delta a t_2}}{a^2} da\Big)^{d_i}, \qquad (5.1)$$

where a is the hazard of switching a party and $\kappa = \frac{\lambda}{\delta}$. The intuition behind identification is as follows. Although the hazard rate conditional on politician type is constant, the unobserved heterogeneity makes the unconditional hazard rate a decreasing function of membership spell duration. Thus, while the slope of the membership spell duration identifies κ, δ is identified as $t \to \infty$. Equation 5.1 is derived in the online appendix by adjusting Ridder and van den Berg (2003)'s procedure for the possibility of U-shaped returns to party size.

5.1.2 Estimation of party sizes

The model defines a party's size as the sum of its members' political resources. Because I do not have data on party members that do not appear in the ballot lists, I cannot estimate a party's size by aggregating all members' estimated resources. Instead, similar to labor search models that estimate firms' productivity levels through an auxiliary production function, I estimate a simple voting model that allows me to obtain a measure of party sizes that are consistent with the parties' vote shares.

The voting model assumes that a party uses its political rents to serve the electorate through pork-barrel spending such as creating public employment, investing in infrastructure, and designing policies. In a stationary equilibrium where each party's rents are constant, the variation in vote shares can result only from voters' time-varying stationary taste shocks for parties.[38] Specifically, the value of voting for a type-x party for voter i, v_{ixt}, is equal to

[38]This assumption is arguably plausible for a country that is highly polarized on non-economic issues. For example, during the 2002-2014 period of Turkey, the voters were highly polarized over issues such as secularism as opposed to Islamism and globalism as opposed to nationalism (Müftüler-Baç and Keyman 2012) and the parties that speak to different groups had little room to compete in policies along these dimensions. In this polarized environment, the distribution of political power among the parties was highly

the sum of the party's rents, the electorate's unobserved, zero-mean, stationary preference shock for the party at time t, ξ_{xt}, and an idiosyncratic taste shock, ϵ_{ixt}

$$v_{ixt} = \theta(x) + \xi_{xt} + \epsilon_{ixt}. \tag{5.2}$$

Because explaining the horizontal competition between parties is beyond the scope of this paper, this specification only aims to link each party's size to its vote share and it does not elaborate on how a party uses its rents to maximize its electoral chances.[39] Note that although equation 5.2 assumes that all parties share all of their rents with the public, my results do not change if parties share only a fraction (that is constant across parties) of their rents with the public.[40] This is because scaling the rent production function in equation 5.2. results in scaled estimates of party sizes, which, in turn, results in scaled estimates of the structural parameters without changing their qualitative implications.

Appendix A derives the one-to-one relationship between the voters' choice specific value functions and the parties' vote shares (equation A.10),[41]

$$\underbrace{log(\nu_{kct})}_{\substack{\text{log of the vote share of party } k \\ \text{in city } c \text{ at time } t}} - \underbrace{log(\nu_{0ct})}_{\substack{\text{log of the proportion of people who} \\ \text{did not vote in city } c \text{ at time } t}} = \theta(x_k) + \xi_{kct} - \xi_{0ct}.$$

I assume that the utility a voter derives from not voting for any party is the same across different districts and constant over time, i.e., $\xi_{0ct} = \eta_0$, $\forall t$.[42] Assuming $\xi_{kct} \sim iidN(0, \sigma^2_{\xi_k})$, the probability of observing $\{\nu_{kct}, \nu_{0ct}\}_{k=1,c=1,t=1}^{K \quad C \quad T}$ is

$$\prod_{k,c,t} p(\xi_{kct}) = \prod_{k,c,t} \frac{1}{\sigma_{\xi_k}} \phi\Big(\frac{log(\nu_{kct}) - log(\nu_{0ct}) - log(x_k) + \eta_0}{\sigma_{\xi_k}}\Big) \tag{5.3}$$

where $\phi(\cdot)$ denotes the standard normal density function. The likelihood function in equation 5.3 is maximized with respect to $\{x_k, \sigma_{\xi_k}\}_{k=1}^{K}$. The estimate of the sampling distribution,

stable.

[39] My model only endogenizes how party members share the control over their parties' rents. For example, if all rents are controlled by the leader, the party leader chooses the party's policies on her own. On the other hand, if the rents are shared among the members, then some policies that are not in line with the leader's preferences may be implemented.

[40] Although studying the variation in the degree of parties' rent-sharing with the public would be interesting, I am unable to do this exercise because I do not observe the parties' rent production. The variation in my data is sufficient only to identify the parties' relative production of rents and club goods.

[41] This specification follows the demand estimation models (Berry et al. 1995, Nevo 2001, Petrin 2002).

[42] This normalization is common in estimation of static games of strategic interactions, where one inverts the equilibrium choice probabilities for nonparametric identification of the choice specific value functions. See Bajari et al. (2010). To ensure positive estimates for party sizes, I set $\eta_0 = min_{k,c,t}\{log(\nu_{kct} - log(\nu_{0ct}))\}$.

$F(x)$, is the cumulative distribution of the estimated party sizes.

5.1.3 Duration analysis

The equilibrium equations in the model allow me to undertake the duration analysis in a finite mixture model framework. This is because the time-invariant hazard rate varies over the politician types in a systematic way. A politician may leave a party either through exogenous separation, which occurs at rate δ, or by receiving an offer from a party that he ranks more highly and accepting it. A low-type politician in a type-x party gives higher rank to the bigger parties, and, hence, his probability of getting an acceptable offer is $\lambda\bar{F}(x)$. Similarly, a high-type politician in a type-x party ranks the smaller parties more highly than x, and, thus, his probability of getting an acceptable offer is $\lambda F(x)$. A medium-type politician's probability of getting an acceptable offer depends on whether his current party is bigger than the lowest point of his U-shaped returns to party size, denoted $x_0(z)$. If $x > x_0(z)$, then the type-x party must be on the right side of his U-shaped returns to party size. Since his returns to party size are increasing in this region, the politician values all bigger parties more highly than x. This politician may also have a lower party switching threshold. For example, suppose that a type-x_1 party such that $x_1 < x$ provides the same value to him as he obtains in a type-x party. Then, the type-x_1 party should be on the left side of his U-shaped returns to party size. Since the smaller parties are ranked more highly in this region, the politician values all parties that are smaller than x_1 more highly than x_1 and, in turn, x. Thus, his probability of getting an acceptable offer is $\lambda[F(x_1) + \bar{F}(x)]$. Because there are 33 parties, there are only 34 possible hazard rates a party member can have. So, the members of a party can be divided into a finite number of groups, each having a different hazard rate.

Formally, suppose that the party sizes are sorted in increasing order, i.e., $x_1 < x_2 < .... < x_K$. A member of party k may have any of K+1 possible hazard rates, $a_{k1}, a_{k2}, ..., a_{kK+1}$. Let $z_{k1}, z_{k2}, ..., z_{kK}$ denote the threshold politician types that separate different hazard groups. A type-z_{kj} politician obtains the same value in parties x_k and x_j, i.e.,

$$V(z_{kj}, \phi^{l^*}(z_{kj}, x_j), \phi^{l^*}(z_{kj}, x_j), x_j) = V(z_{kj}, \phi^{l^*}(z_{kj}, x_k), \phi^{l^*}(z_{kj}, x_k), x_k),$$

which, after substituting the equilibrium value that $\phi^{l^*}(z_{kj}, x_j) = \phi^{l^*}(z_{kj}, x_k) = 1$, boils down to $z_{kj}\frac{\theta(x_j)}{x_j} + \psi(x_j) = z_{kj}\frac{\theta(x_k)}{x_k} + \psi(x_k)$. Moreover, a type-$z_{kk}$ politician's lowest point of the U-shaped returns to party size is a type-x_k party. This implies that the derivative with respect to party size of the value of membership in a type-x_k party for a type-z_{kk} politician is 0, i.e., $z_{kk}\frac{d}{dx}\left(\frac{\theta(x_k)}{x_k}\right) + \psi'(x_k) = 0$ (equation 3.9). Assuming that $\theta(x) = log(x)$ and $\psi(x) = x^{\eta_1}$, the

threshold politician types can be written as

$$z_{kj} = \begin{cases} \frac{x_k^{\eta_1} - x_j^{\eta_1}}{log(x_j)/x_j - log(x_k)/x_k} & \text{if } j \neq k \\ \frac{-\eta_1 x_k^{\eta_1 - 1}}{(1 - log(x))/x_k} & \text{if } j = k. \end{cases}$$

Next, I assume that $log(z_i) = \sum_m y_{im}\beta_m + \epsilon_i$ and $\epsilon \sim i.i.d.N(0, \sigma_\epsilon^2)$. Then, the probability that politician i's hazard rate in party k is equal to a_{kj} is equal to the probability of the event $z_{kj-1} \leq z_i \leq z_{kj}$.[43] This probability, denoted π_{ikj}, is given by

$$\begin{aligned} \pi_{ikj} &= Prob(z_{kj-1} \leq z_i \leq z_{kj}) \\ &= \Phi\Big(\frac{log(z_{kj}) - \sum_{m=1}^{M} y_{im}\beta_m}{\sigma_\epsilon}\Big) - \Phi\Big(\frac{log(z_{kj-1}) - \sum_{m=1}^{M} y_{im}\beta_m}{\sigma_\epsilon}\Big) \end{aligned}$$

where $\Phi(\cdot)$ denotes the standard normal distribution function.[44]

Conditional on having a certain hazard rate, the probability of observing a particular membership duration for a politician has the exponential form. The likelihood function for observing a given membership duration integrates out the unobserved heterogeneity in politicians' hazard rates. Formally, the likelihood contribution of politician i's lth spell is

$$\begin{aligned} L_{il}(t_{il}|x_k, \{y_{im}\}_{m=1}^{M}) &= \sum_{j,k} s_{ilk}\pi_{ikj} \\ &\times \Big[f(t_{il}|a_{kj})^{d_{il}^n} S(t_{il}|a_{kj})^{d_{il}^r} [S(t_{1il}|a_{kj}) - S(t_{2il}|a_{kj})]^{d_{il}^i}\Big]. \end{aligned} \quad (5.4)$$

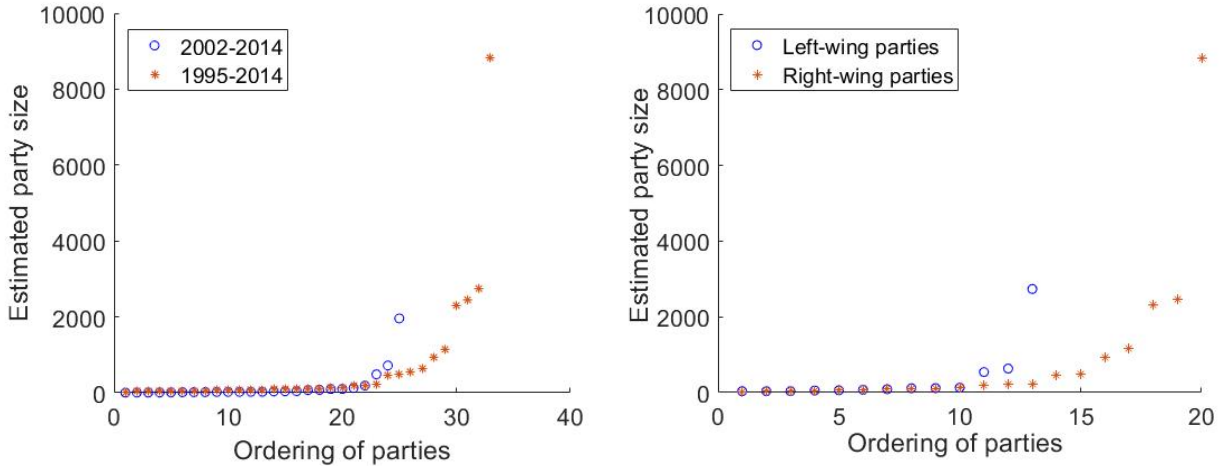
The likelihood of observing the entire data is the product of the likelihood contribution of each spell of each politician, which is maximized with respect to $\{\beta_m\}_{m=1}^{M}$, η_1, and σ_ϵ.

6 Results

Estimated party sizes Recall that a party's size is defined as its total resources that are used in producing political power. Therefore, estimated party sizes should reflect the parties' relative electoral power. Panel (a) in Figure 2 plots the maximum likelihood estimates of the party sizes for the 1995-2014 and 2002-2014 periods. The correlation between the vote shares and the estimated party sizes is 0.98. Thus, the ordering of the estimated party sizes

[43] If $j = 1$ ($j = K + 1$), then the politician is a low (high)-type, and $z_{kj-1} = z_{min}(z_{kK+1=z^{max}})$.

[44] A politician type does not exist in a party if the value of being an independent is greater than the value of party membership. During estimation, I compute the probability that someone's assets fall into a certain interval conditional on valuing party membership more highly than being an independent.



(a) All parties

(b) Left- and right-wing parties

Figure 2: Estimated Party Sizes

is highly consistent with the ordering of the parties' vote shares.

In the entire sample, there are 23 small parties whose sizes are estimated to be within the 26-213 band and 9 parties whose sizes are distributed within the 458-2,736 band. There is one outstandingly large party, with an estimated size of 8,830, which formed a majority government in 3 consecutive terms between 2002 and 2014. There are fewer medium-sized parties during 2002-2014, which indicate a decrease in political competition. Panel (b) shows that there are more medium- and large-sized parties on the right.

Labor market dynamics Table 4 shows the estimates of the labor market transition parameters for all, the right- and left-wing parties during 1995-2014 and separately for all parties during 2002-2014. In all samples, the estimated match formation rate, λ, is bigger than the rate at which a match exogenously breaks, δ. This implies that the politicians who do not have much say in their parties early in their careers can find opportunities to climb up the party hierarchy by improving their outside options.[45]

During the 1995-2014 period, on average, a politician is poached 3.05 times by outside parties before his membership ends exogenously. Compared to the right-wing parties, the left-wing parties have a higher layoff rate, which may be because of the higher dissolution frequency of the left parties. The left-wing party members are also more frequently contacted by other parties, which may be because either of the replacement of the dissolving parties with similar ones or the better ideological cohesion and the lower costs of meeting potential

[45]The average length of a party affiliation spell implied by the model, $\int_0^\infty tp(t)dt = \frac{1}{2}[\frac{1}{\delta} + \frac{1}{\delta+\lambda}]$, is about 138 weeks or 2.66 years. The mean party membership duration is estimated to be much lower than the mean employment duration estimated by CPR, reflecting the instability in party structures.

members among the left parties. In the latter case, the higher offer arrival rate of the left-wing politicians suggests that they tend to have better outside options, and, hence, more say in their parties compared to the right-wing politicians.

In comparison to the entire sample, the estimated rate of exogenous match dissolution for the 2002-2014 period is about the same but the estimated number of outside offers is almost halved. The lower match-formation rate may be because of the existence of fewer competing parties (33 vs. 25) or the increased monopsonistic power of party leaders that arise from the higher costs of part switching in a highly polarized political atmosphere.

Decreased competition and the rise of authoritarianism The 2002-2014 period of Turkey witnessed the rise of authoritarianism (Öniş 2013, Esen and Gumuscu 2016). My results suggest that the decreased competition in the political arena, as captured by increased monopsonistic power of the leaders, played a role in the concentration of political power in the hands of party leaders. Just like firms with monopsonistic power share less profits with workers, leaders share less power with politicians who have bad outside options.[46] Moreover, because a large party formed a majority government in this period, the party gained the control of the public offices, and the undemocratic practices within the party translated into the deterioration of democracy in the country.

Table 4: Maximum likelihood estimates of the labor market transition parameters

		All	Left	Right	2002-2014
Exog. layoff rate	δ	0.005 (0.000)***	0.005 (0.000)***	0.004 (0.000)***	0.005 (0.000)***
Offer arrival rate	λ	0.014 (0.002)***	0.015 (0.003)***	0.013 (0.002)***	0.007 (0.001)***
Time until layoff	κ	3.05 (0.38)***	2.88 (0.59)***	3.14 (0.49)***	1.67 (0.36)***
Time between 2 offers	$1/\lambda$	73 (8)***	69 (4.8)***	78 (11)***	133 (24)***
# offers until layoff	$1/\delta$	222 (5)***	198 (12)***	242 (5)***	221 (7.4)
$\frac{1}{N}\sum_i logL_i$		-0.68	-0.65	-0.69	-0.53
N		35,781	14,297	21,484	21,790

Notes: Estimates are per week. Standard errors are in parentheses. *,**, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Fractions are rounded to the nearest significant digit.

Estimates of club goods and politicians' quality Table 5 presents the results from estimating the likelihood function in equation 5.3. This likelihood function uses three sources of variation in data: i) party membership duration, ii) observed politician characteristics, and iii) (estimated) party sizes. Intuitively, one can think of the change in politician type

[46] See Azar et al. (2018, 2019, 2020), Manning (2020), for recent studies on monopsony in labor markets.

as providing a variation in the demand for club goods, which identifies the supply of club goods. So, the variation in the length of party membership spells of observationally different politicians in a party identify that party's club goods.

Once the club goods are identified, because the political rents are fixed, the variation in the length of party membership spells of observationally similar politicians across different parties identifies the politician types. This is because the politicians in my model have heterogenous hazard rates of leaving a party. While the high types of politicians prefer the smaller parties, the low types want to switch to the bigger parties as fast as possible. For example, if lawyers tend to leave the big parties very quickly but stay in the small parties for a long time, I would estimate that being a lawyer is a positive political asset. The online appendix D provides details on the distribution of politicians' occupations across parties of different sizes and ideologies.[47]

Throughout estimation, the parameter characterizing the club goods production, η_1, is restricted to be between 0.01 and 0.99.[48] The estimate of η_1 is 0.99, 0.68, 0.98, and 0.91 in the sample of all, left, right, and the 2002-2014 period parties, respectively.[49] Because the rent production function is assumed to have the form $\theta(x) = log(x)$, given a party's total resources, the estimated value of η_1 indicates the relative ease of the production of club goods and private rents. The estimates show that the club goods are produced more easily than rents in all samples. However, the estimated club goods parameter is not significant in the sample of the left-wing parties.

In the entire sample, out of twenty observable politician characteristics, only female, retired, other, and production have positive coefficient estimates. Among these four characteristics, only production has a statistically significant coefficient estimate. These results may seem striking, especially because having a college degree, or an occupation in business, bureaucracy, healthcare, management, engineering, education, life sciences, bureaucracy, and the legal sector all have statistically significant negative coefficient estimates.

To interpret these results, one should think of 1) which types of citizens become party members, and 2) which types of party members enter the ballot lists (hence, my dataset).

[47] One might think that having longer tenure and switching a party could be related simply for statistical reasons because if a politician is in business for longer, he might experience more parties declining. Note that because the likelihood function in equation 5.3 takes into account the right- and interval-censored party membership spells, my estimation procedure accounts for both the economic and statistical relationship between having longer tenure and switching a party. Because I focus on a stationary equilibrium and the durations are exponentially distributed, left-censoring does not change the probability distributions (Heckman and Singer 1984, Cahuc et al. 2006).

[48] The upper (lower) bound of η_1 in MATLAB's fmincon function is chosen to be 0.99 (0.01) because the likelihood function behaves badly when η_1=1 (0). In all samples, different configurations of initial parameter values converge to the same parameter estimates.

[49] The categories of other and bureaucracy are omitted due to multicollinearity.

Understanding whether the high-quality citizens are selected into politics requires comparing the party members to the general public, as done by Dal Bó et al. (2017, 2018). Because I lack access to Turkish register data, I am not able to do this exercise. However, my model suggests that the leaders with monopsonistic recruitment power select the *low-quality citizens* to share lesser rents with them.[50] Because matching frictions prevent the leaders from making offers to only the lowest-type of politicians (which is the most profitable type for a leader), the leaders end up making offers to a *distribution* of politician types with whom they can expect to fill their parties up to their leading capacities.

After a politician is recruited by a leader, his career path depends on both his skill level and his outside option. If two politicians have similar outside options, the equilibrium equations in my model imply that the higher-quality politician gets a more powerful position in the party hierarchy. This implies that, although party members are selected from the lower-quality citizens, the ballot lists tend to consist of the highest-quality party members. This rationale can explain the signs and the magnitudes of the coefficient estimates. In the population of citizens, we expect women, production workers, and retired people to have worse labor market options and face barriers into entering politics. If they can climb the party hierarchy sufficiently enough to appear in the ballot lists, we expect them to be among the most skilled party members. On the other hand, because party leaders tend to avoid rivalry, politicians with good labor market options must have low political appeal to be selected by the rent-seeking party leaders.

The last column of Table 5 presents the results for the 2002-2014 period. Note that since I use the 2002-2014 estimates of the party sizes, the unit of these estimates is different from the unit of the estimates for the entire sample. Although the 2002-2014 period was dominated by a party that formed a majority government in 3 consecutive terms, the results are qualitatively similar to those for the entire sample.

6.1 Model fit and specification tests

In this section, I compare the frequency of party switching implied by the model to the observed frequency of party switching. The results of various specification tests are provided in Appendix B. Figure 3 plots the theoretical and empirical survival functions for the duration of a politician's party membership spell for the entire sample as well as separately for members of right- and left-wing parties. The empirical survival function is estimated by modifying the Turnbull estimator to account for the right- and interval-censored observations (Turnbull (1976), Klein and Moeschberger (2006)). The theoretical survival function is plot-

[50] Recall that a politician's quality is defined as all of his characteristics that are valued by the electorate.

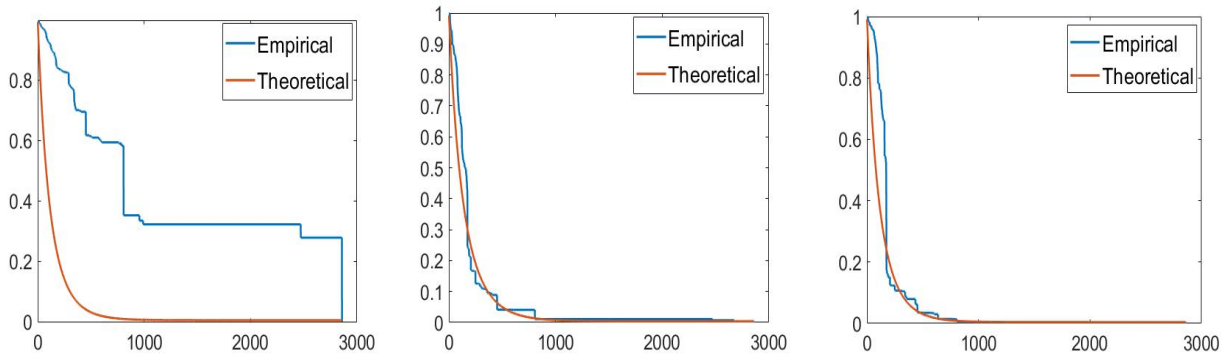
ted after substituting the estimated labor market transition parameters into the likelihood of observing a given membership duration (equation 5.1).

Table 5: Maximum likelihood estimates of the structural parameters

	Entire	Left	Right	2002-2014
Parameters				
η (club goods)	0.99*** (0.04)	0.65 (0.40)	0.98*** (0.05)	0.91*** (0.02)
σ_ϵ	2.68*** (0.25)	0.96** (0.43)	3.75*** (0.56)	0.01*** (0.04)
Characteristics				
Constant	9.98*** (0.56)	7.96** (3.36)	8.73*** (0.63)	7.18*** (0.05)
Architecture and engineering	-1.16*** (0.36)	-1.12** (0.53)	-1.77 (0.70)	-0.32 (0.18)
Arts, sports, and media	0.29 (0.39)	-0.55* (0.33)	0.36 (0.87)	0.68** (0.26)
Business	-0.14 (0.23)	-0.96** (0.45)	0.87* (0.46)	0.25** (0.11)
Business and financial operations	0.15 (0.32)	-1.76** (0.38)	0.57 (0.60)	0.25** (0.12)
College	-0.69*** (0.23)	-0.36 (0.22)	-0.64 (0.39)	-0.48* (0.08)
Community and social service	-0.07 (0.51)	-0.29 (0.37)	0.12 (0.93)	-0.37 (0.72)
Construction and extraction	-0.62 (0.46)	-1.54* (0.82)	0.53 (0.88)	0.47 (0.38)
Education, training, and library	-0.10** (0.29)	-0.60* (0.22)	-0.58* (0.41)	-0.68*** (0.12)
Farming, fishing, and forestry	0.08 (0.46)	0.21 (0.31)	-2.08* (1.09)	0.36 (0.31)
Female	0.43 (0.27)	0.04 (0.16)	1.10*** (0.55)	-0.13 (0.09)
Healthcare	-1.95*** (0.50)	-1.60** (0.76)	-2.32** (0.95)	0.18 (0.27)
Legal occupations	-1.29 *** (0.40)	-1.12** (0.53)	-2.22** (0.83)	-0.92*** (0.12)
Life, physical, and social sciences	-1.08*** (0.41)	-0.66* (0.38)	-1.83** (0.77)	-0.33* (0.19)
Management	-1.31 *** (0.44)	-1.33 (0.83)	-2.20*** (0.69)	-0.36 (0.31)
No occupation	-2.26*** (0.56)	-1.80** (0.85)	1.74 (1.22)	-0.27 (0.42)
Office	-0.59 (0.99)	-1.64* (1.94)	0.83 (1.72)	0.53 (0.41)
Production	2.12*** (0.39)	0.21 (0.20)	3.15*** (0.94)	1.14*** (0.26)
Retired	0.66 (0.56)	0.11 (0.35)	0.85 (1.00)	-0.41 (0.31)
N	35,781	14,297	21,484	21,790
$\frac{1}{N}\sum_i logL_i$	-0.663	-0.637	-0.674	-0.492

Notes: Standard errors are in parentheses. *,**, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. Fractions are rounded to the nearest significant digit.The unit is the standard deviation of voters' taste shock for not voting any party. Since different party size estimates are used, the unit of the last column is different from the units of the other three.

The figure shows that the model significantly overestimates the rate at which politicians switch their parties in the whole sample. The higher inertia in data can be due to at least two phenomena that are not accounted for in the model. First, politicians who approve their parties' ideological positions may be less interested in switching to parties that provide



(a) The entire sample (b) Members of right parties (c) Members of left parties

Figure 3: Goodness of fit: Comparison of empirical and estimated survival functions

greater political benefits. Indeed, when I consider the right- and the left wing of the political spectrum as separate labor markets, the model fit improves significantly. Still, the hazard rate of leaving a party after a short duration is overestimated in both samples, especially for the left-wing parties. Second, elected politicians and politicians who never gain access to the Parliament may have different offer arrival rates, which I do not account in my model.

7 Counterfactual exercises

Table 6: Adjusting the model to different systems

	Party-centered systems	**Candidate-centered systems**	**Medium levels of party-centeredness**
Exemplary system	Closed-list PR	Plurality voting	Open-list PR
Examples	Argentina, Israel, Italy, Turkey	Australia,Ireland, the U.K, the U.S.A.	Belgium, Finland, Netherlands, Sweden
Rent production of z in x	$\frac{z\theta(x)}{x}$	$\theta(z)$	$\alpha\theta(z) + (1-\alpha)\frac{z\theta(x)}{x}$
Politician's bargaining power	$\beta = 0$	$\beta = 1$	$\beta \in (0,1)$

Notes: See Grofman (2005) for classification of systems according to their party-centeredness.

7.1 Adjusting the model to different political systems

This section explains how I adjust the party formation model in section 3 to different systems by preserving the entire structure but altering the rent production mechanism and politicians'

bargaining power according to the rules that are summarized in Table 6.[51]

Rent production mechanism In contrast to a party-centered system, a candidate-centered democracy allows a politician to produce rents with more independence (because voters can vote for individual candidates who campaign for themselves). Thus, while all members aggregate their assets to collaboratively produce their party's rents in a party-centered system, a politician can produce rents using his own resources without the help of his party in a candidate-centered system. Formally, in a candidate-centered system, a type-z politician's rent production, $\theta(z)$, does not depend on his party affiliation status. The equilibrium rent share of a politician is derived by making this change to the model and following the same steps in sections 3.2-3.6.

Politicians' bargaining power In addition to party-centeredness, political systems also differ in the bargaining power they grant to politicians during membership negotiations. For example, in the open-list system of Sweden, party leaders select candidates and order them in priority for winning seats. However, voters can also vote for their preferred candidates, and a candidate takes priority over the party's more-highly-listed candidates if he gets sufficient preference votes. As a result, open-list systems can be considered as a market where parties produce rents as a team but the politicians have more bargaining power during the membership process. Similarly, to the extent that candidates need the approval of party authorities, a politician's bargaining power in a candidate-centered system can be limited. For example, in the candidate-centered system of the U.K., local party organizations play an influential role in the candidate recruitment processes, which limits the politicians' ability to act independently from their parties. The equilibrium rent share of a politician with bargaining power in either a candidate- or party-centered democracy is derived by allowing him to get a share $\beta \in (0, 1)$ of the match surplus (following Cahuc et al. (2006)).

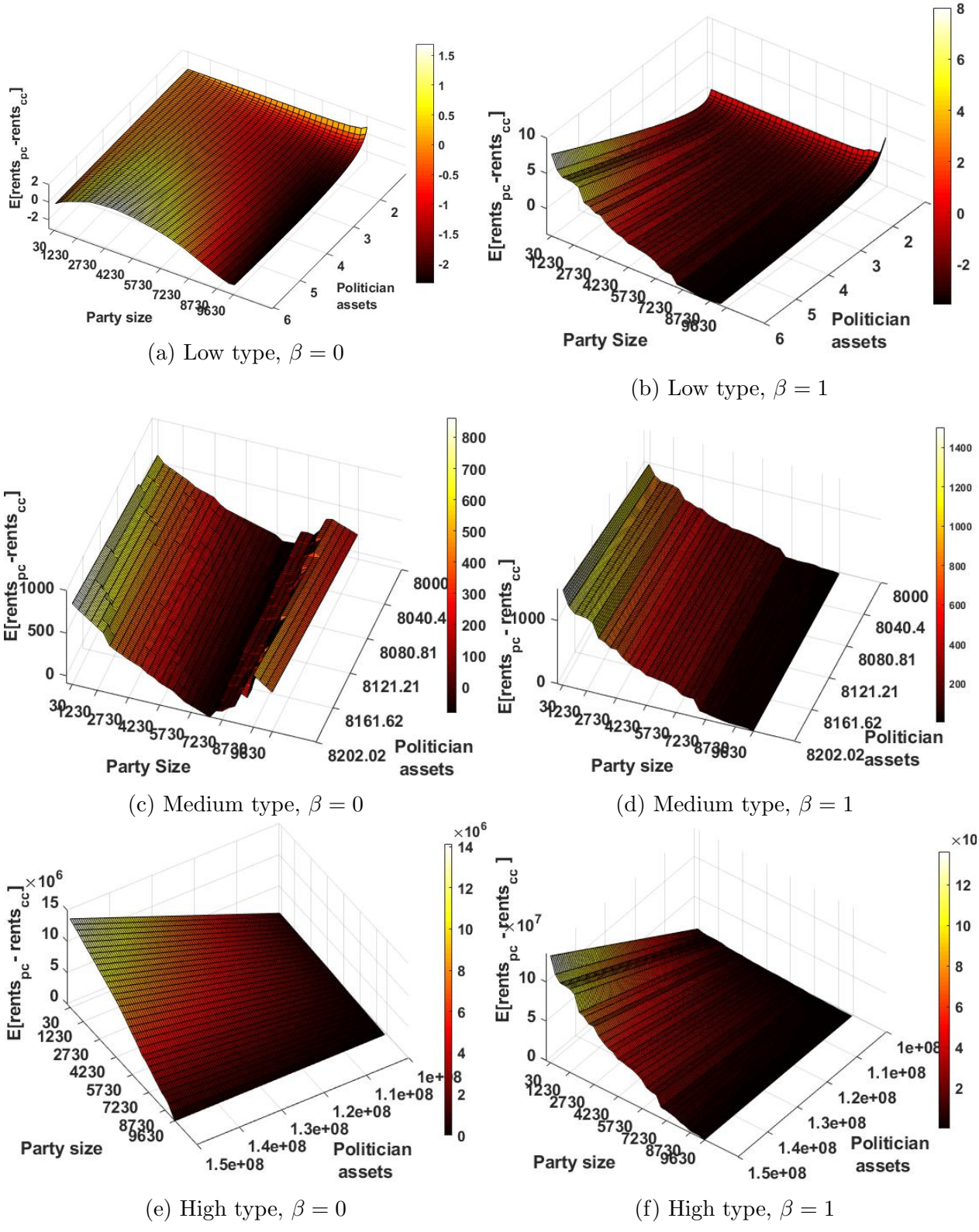
Classifying different systems In the most party-centered system, a party produces votes as an entity and a politician has no bargaining power during membership negotiations. The closed-list system of Turkey is an example of such a system. In the most candidate-centered system, on the other hand, a politician produces his own votes, and he has the entire bargaining power. This arises, for example, when he does not have to share his rents with a party leader to join her party (as in the United States). One can model all systems as a combination of these two extremes (see Table 6). Politicians have more bargaining power in systems where they can easily join a party. On the other hand, countries where politicians produce votes independently are more candidate-centered. The next section compares a politician's rents across different systems.

[51] The online appendix derives the equilibrium of these systems by following the same steps in sections 3.2-3.6.

7.2 Comparison of power distributions in parties across systems

This section compares the rents a politician earns in a party across different political systems. The difference between the rents a politician earns in a party across different systems is determined by three elements of the model. First, unlike party-centered systems where a politician's assets are more productive in smaller parties, candidate-centered systems allow a politician to produce the same amount of rents in all parties. This implies that, a politician is more productive in small (large) parties in a party (candidate)-centered system. If that were all that mattered, politicians in small (large) parties would earn more (less) rents in a party (candidate)-centered system. However, the productivity difference across the two types of systems translates into a difference in the option value of party membership. In both systems, a politician with limited bargaining power would be willing to forgo today's rents in expectation of earning higher rents in the future (which would arise from receiving lucrative outside offers). Depending on the difference in the values of the parties that would improve the politician's rents, this option value effect may be either smaller or bigger in a candidate-centered system. Third, differences in party values across the two systems translate into a difference in the value of politicians' outside options. If the parties that a politician ranks more lowly than his party are more valued in a party-centered system, then, on average, he would have better outside options and earn higher rents in that system.

Since low, medium, and high types of politicians differ in their ranking of the parties, in what follows, I analyze the difference between a politician's rents across the two political systems for each subgroup of politicians. Figure 4 shows the expected rents a politician earns in a party-centered system in excess of his rents in a candidate-centered system. Panel (a) shows that, when a low-type politician has no bargaining power, he earns more rents in smaller (bigger) parties in a party (candidate)-centered system. This is because a low-type politician ranks the parties vertically in both systems and he is more productive in smaller (bigger) parties in a party (candidate)-centered system. Moreover, the expected rent difference is hump-shaped, which reflects the differences in the expected value of a politician's outside option as well as the option value of party membership across the two systems. In medium-sized parties, there are more politicians with better outside options, compared to, say, the first party in which all low-type members' outside option is to be an independent. However, the option value of membership in a candidate-centered system is bigger in larger parties where the politician is more productive. As a result, the expected rent difference increases in party size as long as the effect of the outside option dominates the effect of the option value and decreases afterwards. When politicians have more bargaining power, since they are able to extract more out of the match surplus, the negative option value effect



(a) Low type, $\beta = 0$

(b) Low type, $\beta = 1$

(c) Medium type, $\beta = 0$

(d) Medium type, $\beta = 1$

(e) High type, $\beta = 0$

(f) High type, $\beta = 1$

Figure 4: Comparison of the rents of a politician across party-centered and candidate-centered systems

disappears. For example, when the politician is able to extract the entire match surplus, as in Panel (b), the effect of the outside option vanishes and the extra rents a politician earns in a party-centered system decreases monotonically in party size.

Because a medium-type politician's ranking of the party values differs across the two systems, the expected rent difference is not monotone in party size. Panel (c) shows that, when a politician has no bargaining power, on average, the rents he earns in a party-centered system in excess of the rents he earns in a candidate-centered system are decreasing in party size from the smallest party to his lowest-ranked party and increasing afterwards. This is because, in party-centered systems, the average value of a politician's outside option decreases in party size over the first part of his U-shaped returns to party size and increases afterwards. When the politician is able to extract the entire match surplus, as in Panel (d), the effect of the outside option disappears and the difference between the rents the politician earns across the two systems decreases monotonically.

A high-type politician prefers a party-centered system independent of his degree of bargaining power. This is because the effects of outside options, option value, and productivity all work in the same direction and make the smaller parties more attractive to him, as shown in panels (e) and (f).

7.3 Comparison of party-size distributions across different systems

The counterfactual exercises in the previous section provide a new perspective to understand the differences in party-size distributions across countries. The results suggest that there are fewer parties in more candidate-centered systems where politicians can act more independently from their parties. To see this, assume that a leader can choose to forgo her leadership privileges and become a member of another party.[52] Assume further that $z^{max} < x_{min}$, i.e., even the smallest party has more resources than the most-resourceful politician.

In a candidate-centered system where party leaders cannot extract the party members' rents, a leader who has the ability to form a small party instead prefers to join a bigger one. This is because he produces the same amount of rents in all parties but bigger parties provide more club goods. When all politicians act this way, only 2 parties of the same size can survive in equilibrium. In a party-centered system, on the other hand, a politician who has the ability to form a small party may prefer it over joining a bigger party. This is because by aggregating all members' assets, a party leader can produce greater rents than

[52]This assumes that the leaders are characterized by both their political assets (z) and their leadership capacities (x) but they can use only one of these at a time.

what she can produce on her own. Moreover, when politicians have little bargaining power, she can control the use of the majority of party's collaboratively produced rents. The exact number of parties observed in equilibrium depends on all of the primitives of the model. However, these results support the Duverger observations, which state that the candidate-centered majoritarian systems tend to have at most 2 parties, whereas there is a tendency to multipartyism in party-centered proportional representation systems.

7.4 The effects of coup d'états, term limits, party-switching costs, and other electoral institutions

In this section, I discuss how i) the possibility of a coup d'état, ii) term limits, iii) party-switching costs, and iv) electoral institutions that grant more bargaining power to politicians affect the average quality of the political class as well as the power-distributions in parties. These discussions follow from the inspection of equations 3.12, 3.16, and 3.25.

After a coup d'état, military takes over the government and incumbent politicians lose their jobs. Historically, some of the incumbent politicians were sentenced to jail in the aftermath of a successful military coup in Turkey. The existence of such a possibility decreases the continuation value of party membership. As a result, the highest-quality politicians for whom the maximum party-membership value is marginally below the value of independence do not start a political career, which lowers the average quality of the political class.

On the other hand, when the continuation value of party membership is lowered, the politician types who continue to stay in political arena demand more power for joining a party. As a result, a leader's ability to control her party diminishes after term limits, party-switching costs, and/or primaries that improve a politician's bargaining position are imposed. So, preventing the leaders from promising a bright future in exchange for today's loyalty improves the power-distributions in parties.

The institutions that limit the leaders' ability to extract rents from party members also improve the average quality of the political class. For example, section 3.6 shows that, when the leaders have the bargaining power during party-membership negotiations, they aim to recruit the low-quality politicians who are easier the control. In contrast, in electoral systems that grant the bargaining power to politicians, a leader cannot extract rents from any type of politician. When politicians' substitutability for a party leader increases, the average quality of the political class also improves.

8 Concluding Remarks

In this paper, I develop and estimate an equilibrium model of team production in a labor search environment. Team production is characteristic of many industries, including the high-tech industry, academia, the healthcare provision industry, and the political arena. The workers' career choices and the distribution of production surplus in each of these industries depend on the characteristics of the industry as well as the features of team production. In each of these industries, a smaller team produces a lower amount of output but gives its members the opportunity to be more influential by using their skills more productively. In the high-tech industry, for example, we observe skilled engineers leaving giant tech companies to establish their start-ups, where the more productive use of their skills translates into higher earnings. In academia, we frequently observe established professors moving to smaller institutions where their skills play transformative roles. Similarly, in the political arena of a parliamentary democracy, we observe politicians who switch to smaller parties and gain more say in party politics due to the smaller parties' greater needs for their political assets.

The effects of the distribution of production surplus in political arena extend beyond the agents in the political arena. This is because the political arena is a market for producing political power, and policy choices of a country depend on how power is distributed. Party-centered systems that yield monopsonistic recruiting power to the leaders are especially vulnerable to strong party leaders. Moreover, I find evidence that party control over government functions in these systems generates valuable club goods, which increases the value of party membership. In this environment, politicians may relegate the use of their political power to party authorities when membership is more valuable than acting independently. This implies that the political power, and, in turn, the determination of all social and economic policies, may be left to a few strong party leaders instead of a broader set of representatives. This result is especially important for understanding how liberal democracies can be vulnerable to power concentration.

The dynamic analysis of the interactions between politicians and party leaders provides an estimable framework to think about how to design electoral institutions to prevent the concentration of political power and improve the quality of the political class. My results suggest that term limits, party-switching costs, and other career-constraints decrease a politician's expected future gains from politics and cause him to demand more say in party politics. Limiting a leader's ability to control her party by granting more bargaining power to politicians improve the average quality of the political class.

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Appendix A Identification

This section shows that the model is nonparametrically identified. Throughout the section, I focus on equilibrium where the maximum rent share a leader pays to a politician, $\phi^{l^*}(z,x)$, is 1. As a result, the arguments of the party-switching threshold functions, $x_a(\cdot)$ and $x_b(\cdot)$, defined in equation 3.6, reduce to the types of a politician and his party, z and x. Similarly, the arguments of the functions defining the thresholds for joining a party from the pool of independent politicians, $x_{a0}(\cdot)$ and x_{b0}, defined in equation 3.5, are the politician's type, z.

A.1 The hazard function and the agents' types

The distribution of the politicians' types is recovered from the hazard of leaving a party, which, in turn, is nonparametrically identified. Suppose that we observe M characteristics of politician i's private assets, $\{y_{im}\}_{m=1}^{M}$. There is also an unobserved component of politician i's assets, ϵ_i, distributed $H(\cdot)$ with $h(\epsilon) > 0$ on $(-\infty, \infty)$. Politician i's assets are equal to

$$z_i \quad = \quad exp(\sum_{m=1}^{M} y_{im}\beta_m + \epsilon_i). \tag{A.1}$$

Accordingly, identification of the distribution of politicians' types is equivalent to identification of the contribution of the observed characteristics to a politician's assets and the distribution of the unobserved heterogeneity, which are shown in the next subsections.

A.1.1 Application of Evdokimov (2011)

This section discusses the applicability of Evdokimov (2011) for the identification of the hazard function and the distribution of the unobserved heterogeneity. Let $y_i = [y_{i1}\ y_{i2}\ \ldots\ y_{iM}]$ be the vector of politician i's observable characteristics. Denote a politician's type as

$$log(z_i) = \bar{z}(y_i, \beta) + \epsilon_i. \tag{A.2}$$

Since all party transition processes are Poisson, all corresponding durations are exponentially distributed conditional on a politician's and his party's types. The stationary decision rules in equation 3.6 imply that the hazard of a type-z politician leaving a type-x party is

$$a(y, x, \epsilon) \quad = \quad \delta[1 + \kappa[F(x_a(\bar{z}(y_i, \beta), \epsilon_i, x)) + \bar{F}(x_b(\bar{z}(y_i, \beta), \epsilon_i, x)]] \tag{A.3}$$

with corresponding survivor function

$$S(t|\tilde{z},x)=\int_0^\infty e^{-\int_0^t a(y,x,\epsilon)ds}h(\epsilon)d\epsilon. \tag{A.4}$$

The left-hand side of equation A.4 is identified from data given x. The hazard function $a(y,x,\epsilon)$ and the conditional distribution of the unobserved heterogeneity, $h(\epsilon|y,x)$, on the right-hand side are also identified by theorem 5 in Evdokimov (2011). This theorem shows the sufficient conditions for the identification of the transformation models of the form

$$\Lambda_j(t_j,y,x_j)=m(y_j,x_j,\epsilon)+u_j. \tag{A.5}$$

The hazard function in equation A.3 is a special case of the models defined by equation A.5, where $F(u_j|y,x_j)=1-exp(-e^u)$, $exp(\Lambda_j(t_j))$ is the integrated baseline hazard of spell j of length t_j, and $a(y,x_j,\epsilon)=exp(-m(y,x_j,\epsilon))$.

The types of models that Evdokimov considers are more general than the model in equation A.3, and, in general, the required conditions for identification include a random sample of two spells for each individual. In particular, for time-variant hazard models, two spells for a subsample with time-invariant covariates are required for identification of the time-varying component of the hazard function in a fashion similar to Honore (1993). Identification of the time-invariant component of the hazard function, on the other hand, requires a subsample with time-variant covariates, the necessity of which stems from the need for a scale normalization for the unrestricted distribution of the unobserved heterogeneity. With time-variant covariates and two spells for each individual, it is possible to normalize the value of the time-invariant component of the hazard function for a specific covariate in a given spell. Then, the value of the hazard function for all possible covariates in the other spell can be identified up to this normalization. Since he requires two spells for each individual, he chooses the covariate to impose a normalization on as one that each individual can obtain in their second spell independent of what their covariates were in their first spell. Note that, two spells for each individual is not a requirement for applying Evdokimov's theorem to a time-invariant hazard function, as one only needs to normalize the value of the hazard function for a specific covariate. In this paper, the politicians' types are constant over time, but their party affiliations may change. Accordingly, Evdokimov's result applies after normalizing the value of the hazard function for an arbitrarily chosen party type.

A.1.2 The types of the agents

Having identified the structural hazard function conditional on the agents' observed characteristis, the contribution of the observables to a politician's private assets can be identified from the derivatives of equation A.4 with respect to β_m for $m = 1, 2, ..., M$. Then, the types of the parties are also identified using the equilibrium density of each politician type in a party which was derived in equations 3.17. Formally,

$$x = \int_0^{z^{max}} z g(z|x, \Phi^{l^*}(\phi^{l^*}(z,x))dz) = \int_0^{z^{max}} z \frac{\delta(\delta+\lambda)}{\Big[\delta + \lambda[F(x_a(z,x)) + \bar{F}(x_b(z,x))\Big]^2} \tilde{\ell}(z) dz \quad (A.6)$$

where the denominator is the square of the hazard of leaving a type-x party for a type-z politician, which is nonparametrically identified. Moreover, the effective distribution of politician types, $\tilde{L}(z)$, is the convolution of the distributions of $\sum_m y_m \beta_m$ and ϵ. Since the distribution of $\sum_m y_m \beta_m$ is identified from the data and $h(\epsilon|y, x)$ is derived nonparametrically, $\tilde{\ell}(z)$ can be derived by straightforward algebra.

A.2 Rent production function

This section discusses the identification of the rent production function and the voters' time-varying preferences for political parties using the vote shares. To do this, I deviate from the model in section 3 in two ways. First, although the assumption of constant party rents is preserved, I deviate from stationarity by assuming that the voters have unobserved preferences for each party that is common among the voters but varies over time.[53] Second, although the model assumes the existence of a continuum of parties, in the empirical section, I assume that there are $k \in \{1, 2, ..., K\}$ parties participating in an election.

In section 3.3, the value of voting for party k for voter i in district c, v_{ikct}, is given by

$$v_{ikct} = \theta(x_k) + \xi_{kct} + \epsilon_{ikct} \quad (A.7)$$

where ξ_{kct} is the electorate's unobserved preference for party k in district c at time t and ϵ_{ikct} is an idiosyncratic taste shock. When ϵ_{ikct} is generated from an extreme value distribution as in the logit model (Anderson, de Palma, and Thisse 1992, Berry, Levinsohn, and Pakes

[53] Recall that the political rents were defined as the ability to influence the government institutions. I assume that the change in the vote share of a party does not influence how a team with certain assets can affect the decision makers in the government institutions. Time-varying preferences are included into the model solely for explaining the variation in the vote shares over time. Accordingly, I assume that the non-stationarity in voter preferences does not affect the equilibrium conditions derived in section 3.

1995), the vote share of party k in district c at time t is

$$\nu_{kct} = \frac{exp(\theta(x_k) + \xi_{kct})}{\sum_{k=0}^{K} exp(\theta(x_k) + \xi_{kct})} \tag{A.8}$$

where $k = 0$ is the outside option, i.e., not voting for any party. Let voter i's value of not voting be $v_{i0ct} = \xi_{0ct} + \epsilon_{i0ct}$. Then the probability of not voting for any party is

$$\nu_{0ct} = \frac{exp(\xi_{0ct})}{\sum_{k=0}^{K} exp(\theta(x_k) + \xi_{kct})}. \tag{A.9}$$

The inversion theorem in Hotz and Miller (1993) implies that the vote shares, ν_{kct}, have a one-to-one relationship to the choice specific value functions, $\theta(x_k) + \xi_{kct}$. To see this, one can take the logs of each sides in equations A.8 and A.9 to obtain

$$log(\nu_{kct}) - log(\nu_{0ct}) = \theta(x_k) + \xi_{kct} - \xi_{0ct}. \tag{A.10}$$

We can identify the rent production function and the distribution of the voters' preferences for a party from equation A.10 conditional on having identified $x_k, \forall k$.

A.3 Club goods production function

Given the types of politicians and parties, the conditional likelihood of the observed membership durations contains the necessary information to identify both the rent and club goods production functions. To see this, consider the probability of observing a membership duration of t for a type-z politician in a type-x party,

$$p(t|z,x) \;=\; \delta[1 + \kappa[\bar{F}(x_b(z,x)) + F(x_a(z,x))]]e^{-\delta[1+\kappa[\bar{F}(x_b(z,x))+F(x_a(z,x))]]t}. \tag{A.11}$$

The hazard out of a party, and, in turn, a politician's transition across parties contains information about the parties' rents and club goods only if the politician is a medium type. This is because, the hazard rate of leaving a type-x party increases in politician type on $(\underline{z}, z_0(x))$ and decreases on $(z_0(x), \bar{z})$, as $z_0(x)$ is the politician type who considers a type-x party as the worst. So, the derivative of the likelihood of a membership duration with respect to politician type should be decreasing on $(\underline{z}, z_0(x))$ and increasing on $(z_0(x), \bar{z})$. Then, the variation in the hazard of leaving a party across politician types identifies the club goods production function. Intuitively, one can think of the change in politician type as providing a variation in the demand for club goods, which identifies the supply of club goods. Moreover,

given a politician type, the variation in the hazard of leaving a party across different parties identifies the overall ranking of party values, and, hence, enables one to identify the rent production function given club goods production function.

A.4 Discount rate

Having identified the primitive functions and the other parameters, the discount rate can be identified from a politician's spell of being an independent. Recall that, the lifetime utility of being an independent for a type-z politician is $V_0(z) = \frac{1+\rho}{\rho}\theta(z)$ (equation 3.6), and he accepts the membership offers of the parties that provide a lifetime utility that is at least as much as that of being an independent. Suppose that the politician accepts the offer of a type-x party when $x \in [x_{min}, x_a(z)] \cup [x_b(z), x^{max}]$, where the thresholds $x_a(z)$ and $x_b(z)$ are the types of two parties that provide the same lifetime utility to the politician as that of being an independent. Accordingly, these threshold party types solve

$$\begin{aligned} & V_0(z) = V(z,1,1,x_a(z)) = V(z,1,1,x_b(z)) \\ & \implies (1+\rho)\theta(z) = \frac{z\theta(x_a(z))}{x_a(z)} + \psi(x_a(z)) = \frac{z\theta(x_b(z))}{x_b(z)} + \psi(x_b(z)). \end{aligned} \tag{A.12}$$

An independent type-z politician joins a party at rate $\lambda[F(x_a(z)) + \bar{F}(x_b(z))]$. So, the conditional probability of observing a spell of being an independent of length t_0 is

$$p(t_0|z) = \lambda[F(x_a(z)) + \bar{F}(x_b(z))]e^{-\lambda[F(x_a(z))+\bar{F}(x_b(z))]t_0}. \tag{A.13}$$

The derivatives of equation A.13 with respect to t_0 and z provide two equations that identify the hazard of joining a party for different types of politicians. Identifying the hazard of joining a party, in turn, identifies the discount rate because having identified z, $\theta(x)$, and $\psi(x)$, equation A.12 depends only on ρ.

Appendix B Specification Tests

This section presents the results of two specification tests. First, I conduct a Wald test for the hypothesis that the contribution of all observed characteristics of a politician to his political assets is zero. This test yields a p-value less than 10^{-5}. Thus, the coefficient estimates of the politician characteristics are jointly significantly different from zero.

Second, I conduct a Wald test for the hypothesis that a party that forms a majority government cannot produce additional club goods. To do this, I reestimate the model by

allowing the party that formed a majority government during 2002-2014 to have additional club goods production.[54] Formally, if a type-z politician joins the governing party x_M with share ϕ, then the politician's payoff from this membership is given by

$$u(z, \phi, x_M) = \frac{z\phi\theta(x_M)}{x_M} + \psi(x_M) + x_M^{\alpha}, \tag{B.1}$$

where x_M^{α} is the club goods that arise from party control over government functions. Testing $H_0 : \alpha = 0$ yields a p-value of 0.74. Thus, I fail to reject that party control over government functions do not generate additional club goods. Note that some of these additional club goods may be associated with winning seats in parliament. If this is true, then other parties that win seats in parliament should also be allowed to produce additional club goods. However, I cannot test this hypothesis because the model is identified only when at least 3 electoral terms are used in the estimation sample and there are no three consecutive terms in which the same subset of parties won seats in parliament.

[54]Note that, in the new estimation sample, I only included the last three electoral terms in my dataset, during which a party formed a majority government consecutively. Nevertheless, the restricted model's estimates are fairly similar for the 1995-2014 and 2002-2014 terms.