Online supplemental material

Transformational party events and legislative turnover in West European democracies, 1945-2015

This Online supplemental material accompanying the paper “Transformational party events and legislative turnover in West European democracies, 1945-2015” contains additional information and estimation results aimed at complementing the analyses presented in the manuscript. Section S.1 provides details and descriptive statistics about the elections and parties covered in our study. Section S.2 describes the coding, sources, summary statistics, bivariate correlations and collinearity diagnostic checks for the variables included in the empirical analysis. Section S.3 presents additional information about the estimation of our multilevel augmented beta regression and the fractional logit models fitted to assess the robustness of our findings. Finally, Section S.4 reports additional results that had to be left out of the main text due to space constraints. The “References” section includes supplementary sources consulted for the elaboration of this Online supplemental material.
S.1 Information about the elections and parties covered in our study

Table S.1 list the elections held in each of the eight countries covered in our study between 1945 and 2015. Figures S.1 plots the number of parties in each country, while Figures S.2 and S.3 summarize the distribution of the number of elections contested by these parties and their age since foundation, respectively.

| Country   | Elections                                      |
|-----------|------------------------------------------------|
| Austria   | 1949, 1953, 1956, 1959, 1962, 1966, 1970, 1971, 1975, 1979, 1983, 1986, 1990, 1994, 1995, 1999, 2002, 2006, 2008, 2013 |
| Belgium   | 1949, 1950, 1954, 1958, 1961, 1965, 1968, 1971, 1974, 1977, 1978, 1981, 1985, 1987, 1991, 1995, 1999, 2003, 2007, 2010, 2014 |
| France    | 1946, 1951, 1956, 1958, 1962, 1967, 1968, 1973, 1978, 1981, 1986, 1988, 1993, 1997, 2002, 2007, 2012 |
| Italy     | 1948, 1952, 1956, 1958, 1960, 1964, 1968, 1970, 1973, 1976, 1979, 1982, 1985, 1988, 1991, 1994, 1998, 2002, 2006, 2010, 2014 |
| Netherlands | 1948, 1952, 1956, 1959, 1963, 1967, 1971, 1972, 1977, 1981, 1982, 1986, 1989, 1994, 1998, 2002, 2003, 2006, 2010, 2012 |
| Sweden    | 1948, 1952, 1956, 1958, 1960, 1964, 1968, 1970, 1973, 1976, 1979, 1982, 1985, 1988, 1991, 1994, 1998, 2002, 2006, 2010, 2014 |
| Switzerland | 1947, 1951, 1955, 1959, 1963, 1967, 1971, 1975, 1979, 1983, 1987, 1991, 1995, 1999, 2003, 2007, 2011, 2015 |
| UK        | 1950, 1951, 1955, 1959, 1964, 1966, 1970, 1974, 1979, 1983, 1987, 1992, 1997, 2001, 2005, 2010, 2015 |
Figure S.1: Number of sample parties, by country

Notes: The bars represent the number of parties included in our analysis, by country.
Figure S.2: Distribution of the number of elections contested by parties in each country

Notes: The box plot summarizes the distribution (mean, inter-quartile and inter-decile range) of the number of elections contested by the parties in each country over the sample period. The bold vertical lines give the average number of elections in which the parties in each country participated.
Figure S.3: Distribution of the sample parties’ age, by country

Notes: The box plot summarizes the distribution (mean, inter-quartile and inter-decile range) of the age of the parties in each country (while included in our sample, i.e., until the last election in which they took part over our sample period). The bold horizontal lines give the average age of the parties in our sample, by country.

Figure S.4, in turn, summarizes the distribution of the rate of party legislative turnover in each country between 1945 and 2015. Figure S.5 plots the distribution of seat shares captured by the parties across all the elections in which they participated during the sample period.
Figure S.4: Distribution of party legislative turnover rates, by country

Notes: The box plot summarizes the distribution (mean, inter-quartile and inter-decile range) of the rates of party legislative turnover over the sample period, by country. The bold vertical lines give the average rate of legislative turnover for the parties in each country.
Figure S.5: Distribution of seat shares captured by the sample parties across elections, by country

Notes: The box plot summarizes the distribution (mean, inter-quartile and inter-decile range) of parties’ seat shares across all the elections in which they participated between 1945 and 2015, by country. The bold horizontal lines give the average proportion of seats held by the sample parties in each country.
S.2 Coding, sources and descriptive statistics for the variables included in the empirical analysis

This section describes the coding and sources for each of the variables included in our empirical analysis. We first provide information about the dependent variable and the key explanatory variables included in our baseline model. We then describe the coding and sources for the party- and system-level controls incorporated in additional specifications aimed at testing the robustness of our benchmark results.

Additionally, Table S.2 below presents summary statistics for all the variables included in the different specifications, while Tables S.3 - S.5 report correlations and collinearity diagnostics – variance inflation factors and condition indexes (Belsley et al., 1980; Belsley, 1991; Zuur et al., 2010) – for all the independent variables (key explanatory variables and controls).

**Outcome variable**

*Party Legislative Turnover* - Proportion of first-entry and re-entering party MPs relative to the number of party seats obtained by a particular party after a given general election.\(^1\) First-entry MPs are those without prior parliamentary experience. Re-entering MPs are all those legislators who served as party MPs before, but were not seated in the beginning of the previous legislative term. Source: Data collected first hand from parliamentary registries and MPs’ biographical profiles.

**Explanatory variables of interest**

*New Leader* - 1 if the party changed its leader before a given election, and 0 otherwise. As we mentioned in the manuscript, we also interacted this variable with a dummy for the post-1989

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\(^1\) We follow Matland an Studler (2004) and ignore turnover occurring between general elections (e.g., through by-elections or replacement of list candidates).
years. Source: Data were obtained from the ParlGov dataset (Döring and Manow, 2019) and triangulated with party websites and offline archival records of individual political parties.

*New Name* - 1 if the party changed its name before a given election, and 0 otherwise. Source: Data were obtained from the ParlGov dataset (Döring and Manow, 2019) and triangulated with party websites and offline archival records of individual political parties.

*Electoral Cartel* - 1 if a party was part of a (national-level) pre-electoral cartel or coalition before a given general election, and 0 otherwise. Following Golder (2006), an electoral cartel exists when two or more parties agree to run under a single name, with joint lists or nomination agreements. Agreements to run separately and then form a government together, though a type of party pre-electoral coalition (Golder, 2006), are not covered in our operationalization of electoral cartel. Source: Data were obtained from the ParlGov dataset (Döring and Manow, 2019), and triangulated to fit Golder’s (2006) definition.

*Merged Party* - 1 if the party emerged as a result of a merger process before a given election, and 0 otherwise. We follow here Ibenskas (2016) in conceptualizing a merger as a fusion or amalgamation of two or more independent parties into a single organization. In this process - and unlike in the case of electoral cartels - each participant gives up its own organizational identity (Ibenskas, 2016; Bolleyer et al., 2019). Sources: Data were obtained from Ibenskas (2016) and the ParlGov dataset (Döring and Manow, 2019), and triangulated with party websites and offline archival records of individual political parties.

*Divided Mother Party* - 1 for the main successor of a party that went through a division before any given election, and 0 otherwise. The divided mother party is “the most continuous with
regard to the original party before fission in organizational terms, and which normally keeps the name” of the original party (Ibenskas, 2020: 45). The coding of this variable considers only the break-up of individual parties (including parties arising from a previous merger process) as divisions; the split of (pre-)electoral coalitions or alliances is not coded as a division (and thus, parties belonging to such coalition are not coded as divided mother parties). In most cases it was clear whether a political formation was a party in itself or a coalition. In other cases, we adopted the criterion by Ibenskas (2020) and classified an organization as an individual party if it could recruit individual members without these members becoming members of the broader alliance or coalition the party belonged to. Following Bolleyer (2013), in the few instances in which the organizational continuity between the mother party and its successor after the division was not straightforward, the party founded by the largest formation arising after the division was considered the mother party. Source: Data were obtained from the ParlGov dataset (Döring and Manow, 2019) and Ibenskas (2020), and triangulated with party websites and offline archival records of individual political parties.

**Splinter Party** - 1 for parties or groups that emerged following a division experienced by a political organization before any given election, and 0 otherwise. To code this variable, we take the definition of splinter party from Ibenskas (2020), according to whom a splinter party emerges when members of an existing (mother) party defect after a division (see the previous paragraph) and set up a new formation that competes with the main successor (or rump) organization in the next electoral cycle. These defectors can be rank-and-file members of the mother party but also part of the elite (including incumbent MPs). Compared to the divided mother or “rump”, party, splinter parties take only the minority of the overall resources inside and outside public office with them (Mair, 1990: 132; Hug, 2001: 13; Zons, 2015; Ibenskas, 2020). Sources: Data were obtained from the ParlGov dataset (Döring and Manow, 2019) and
Ibenskas (2020), and triangulated with party websites and offline archival records of individual political parties.

**Party-level controls included in additional specifications**

*Policy Influence* – As we noted in the manuscript, the variable *Policy Influence* was coded as 1 for parties that occupied cabinet posts in the national government (including parties that occupied ministerial positions in government coalitions) or held at least 3% of the seats in the lower chamber before a given election, and 0 otherwise. These criteria were drawn from Ibenskas (2020), and used in Table 2 of the manuscript to split the sample and fit our baseline model to parties with (column 3) and without (column 4) potential for strong policy influence.\(^2\) The academic literature, however, has used various alternative criteria to distinguish between parties with and without the potential for strong policy influence.\(^3\) To assess the sensitivity of our findings to the operationalization of *Policy Influence*, Section S.4 of this Online supplemental material replicates the analysis using alternative measures based on Mair (1991), Rashkova and Spirova (2014), and Hobolt and Tilley (2016). As we show in Table S.7 below, the main findings reported in the manuscript remain unchanged.

*Electoral Performance* - Difference in a party’s vote share between the last two general elections. For robustness, we also estimated models using parties’ actual vote in the most recent election as a measure of *Electoral Performance*, as well as the difference between a party’s vote share and the average support for all the other contenders – as a measure of each formation’s relative electoral success vis-à-vis its competitors. The substantive findings

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\(^2\) Based on the results emerging from Table 2, an interaction between *New Name* and *Policy Influence* was included in the specifications reported in Figure 1 of the manuscript.

\(^3\) See for instance Schmidt (1996) for an overview of the different drivers of parties’ policy-making power highlighted in the literature and of the alternative measures that have been proposed to operationalize this concept.
regarding the impact of *Electoral Performance* on party legislative turnover remain the same irrespective of the particular operationalization of this variable. Sources: Caramani (2000), Döring and Manow (2019), European Journal of Political Research Political Data Yearbook (several issues), Global Elections Database (http://www.globalelectionsdatabase.com/), and Constituency Level Electoral Archive (http://www.electiondataarchive.org/).

*Party Ideology* – For the analyses reported in the main text (Section 4), we used the continuous 0 – 10 left-right scale from the ParlGov dataset (Döring and Manow, 2019), with values computed as time-invariant unweighted mean values of information from party expert surveys taken from Castles and Mair (1983), Huber and Inglehart (1995), Benoit and Laver (2006) and the CHES (2010). For robustness, Tables S.8 below replicates the analysis coding parties’ left-right positions using the *rile* variable in Volkens et al. (2019), based on the coding of parties’ programmes in the Comparative Manifesto Project. While the reliability of the manifesto data as a source of information on parties’ ideological positions has been questioned by several authors (e.g., Benoit et al., 2009; Gemenis, 2013), a comparison of the estimates Figure 1 of the main text and columns (5)-(6) of Table S.6 in this Online supplemental material vis-à-vis those in Table S.8 indicates that our main findings are not sensitive to the particular operationalization of this variable. Note that, since *Party Ideology* might be expected to be highly correlated with the indicators for *Party Family* (see next paragraph), we used hierarchical centering to improve the condition of the design matrix (Jackman, 2009). Diagnostic tests reported in Table S.5 below do not reveal collinearity problems between *Party Ideology* and the party family indicators. Source: ParlGov dataset (Döring and Manow, 2019) and Manifesto Project Dataset (Volkens et al., 2019).
Party Family – As an alternative way of operationalizing party ideology, we use indicators for the following families: Agrarian, Communist/Socialist, Green/Ecologist, Social Democracy, Liberal, Christian Democracy, Conservative and Right-wing. The reference category consists of single issue parties and those not belonging to any of these eight families. For robustness, we replicated the analyses excluding single issue parties and those not belonging to any family. The substantive findings reported in the manuscript remain unchanged. Sources: ParlGov dataset (Döring and Manow, 2019), complemented with information from Kitschelt (1989), Burchell (2002), Mudde (2007), Meguid (2008), van Spanje (2011) and van Haute (2016).

Party Age - Number of terms a party served in parliament since 1945 (up until the election under consideration). We decided to use the number of parliamentary terms, rather than parties’ actual age (i.e., years since its foundation), as the former measure has been sometimes suggested to be a better indicator of the level of parties’ parliamentary institutionalization. Nonetheless, using actual parties’ age does not change the findings reported in the manuscript. We started counting party legislative terms since 1945 because the end of the Second World War is commonly seen as a historical breaking point after which all West European democracies witnessed either a total renewal or a normalization of its political order, along with the emergence of a relatively new parliamentary elite.

To allow for possible nonlinearities in the relationship between Party Age and party-level turnover, we incorporated a quadratic term for this variable in the specifications reported in Figure 1 of the manuscript and Tables S.6 and S.8 of this Online supplemental material. In the presentation of these results, we follow Gelman and Pardoe (2007) and present the average marginal effect of an additional year on the rate of party-level legislative turnover – i.e., the expected change in turnover associated with a one-year increase in Party Age (reflected in both the linear and quadratic terms involving this variable), while holding all other regressors at
their observed sample values. Figure S.9 below complements this information, showing that the marginal effect of *Party Age* increases in absolute term – i.e., becomes more negative – over time. We must also note that using the logarithm of *Party Age* or simply a linear term for this variable does not alter the results about our key explanatory variables displayed in Tables 2, S.6 and S.8. Sources: Bolleyer (2013) and ParlGov dataset (Döring and Manow, 2019).

*Number of MPs* - Number of MPs (or seats) obtained by a party following a general election. Source: ParlGov dataset (Döring and Manow, 2019).

**System-level controls included in additional specifications**

*Personal Vote* – Although the Index of Particularism developed by Wallack et al. (2003) and Johnson and Wallack (2012) provides the most accurate cross-national measure of the strength of the personal vote, this data set only covers the period between 1971 and 2008. Hence, for our empirical analysis we took the *Personal Vote* variable from Gouglas et al. (2018), which covers the whole period under study and provides a more nuanced measure of the strength of personal vote than other approaches used in the literature (e.g., the distinction between proportional representation and majoritarian systems, as in Matland and Studlar, 2004). Gouglas et al. (2018) code *Personal Vote* as 1 for open-list multi-member and single-member district systems, where personal vote is strong, and 0 for closed-list systems and flexible list systems with high thresholds, where personal vote is weak. Their coding takes into consideration the relevant changes in electoral systems that took place during our sample period (e.g., France before 1958 and in 1986; Italy since 1994).

To justify their operationalization, Gouglas et al. (2018) argue that the distinction between open- and closed-list systems is the most relevant when it comes to gauging the strength of personal vote (see also Thames and Williams, 2010: 1579). In open-list systems, candidates
run more personalised campaigns because they do not benefit from the pooling of votes, and
deselection of incumbents is an electorally risky strategy for parties. The opposite holds true for closed-list systems (see Carey and Shugart, 1995: 418). Non-list single member districts are closer to open- than to closed-list systems, as candidates’ personal characteristics and popularity are more important for gaining access to a list of one, and incentives for constituency work are more marked (Wallack et al., 2003: 137-138). By contrast, flexible list systems with high thresholds behave essentially like closed-list systems in these respects.

Source: Gouglas et al. (2018), based on Pilet et al.’s (2016) Database of Electoral Systems (http://www.electoralsystemchanges.eu/Files/media/MEDIA_767/FI
LE/Codebook_Database_of_Electoral_Systems_15-02-2016.pdf).

*District Magnitude* – Continuous variable measuring the mean district magnitude in the first tier of the system. Source: Pilet et al.’s (2016) Database of Electoral Systems (http://www.electoralsystemchanges.eu/Files/media/MEDIA_767/FI
LE/Codebook_Database_of_Electoral_Systems_15-02-2016.pdf).
Table S.2: Summary statistics for the variables included in the empirical analysis

| Variable                                | Mean  | Std. Dev | Range in sample |
|-----------------------------------------|-------|----------|-----------------|
| **Outcome**                             |       |          |                 |
| Party Legislative Turnover              | 0.37  | 0.30     | 0 - 1           |
| **Explanatory variables of interest**   |       |          |                 |
| New Leader                              | 0.48  | 0.50     | 0 - 1           |
| New Name                                | 0.06  | 0.24     | 0 - 1           |
| Electoral Cartel                        | 0.09  | 0.28     | 0 - 1           |
| Merged Party                            | 0.03  | 0.17     | 0 - 1           |
| Divided Mother Party                    | 0.02  | 0.16     | 0 - 1           |
| Splinter Party                          | 0.04  | 0.21     | 0 - 1           |
| **Party-level controls included in additional models** |       |          |                 |
| Electoral Performance                   | 0.01  | 0.04     | -0.18 - 0.34    |
| Party Ideology (continuous)             | 5.16  | 2.41     | 0 - 10          |
| Party Family: Agrarian                  | 0.03  | 0.18     | 0 - 1           |
| Party Family: Communist/Socialist       | 0.10  | 0.31     | 0 - 1           |
| Party Family: Green/Ecologist           | 0.06  | 0.23     | 0 - 1           |
| Party Family: Social Democracy          | 0.20  | 0.40     | 0 - 1           |
| Party Family: Liberal                   | 0.16  | 0.36     | 0 - 1           |
| Party Family: Christian Democracy       | 0.15  | 0.36     | 0 - 1           |
| Party Family: Conservative              | 0.14  | 0.35     | 0 - 1           |
| Party Family: Right-wing                | 0.09  | 0.28     | 0 - 1           |
| Party Age                               | 6.62  | 5.10     | 1 - 21          |
| Number of MPs                           | 38.24 | 64.79    | 1 - 419         |
| Policy Influence                        | 0.35  | 0.47     | 0 - 1           |
System-level controls included in additional models

|                          |          |          |        |
|--------------------------|----------|----------|--------|
| **Personal Vote**        | 0.51     | 0.50     | 0 - 1  |
| **District Magnitude**   | 28.60    | 49.71    | 1 - 150|
Table S.3: Bivariate correlations between the independent variables (key explanatory variables and controls), and variance inflation factors (VIFs)

|                 | (1)  | (2)  | (3)           | (4)           | (5)           | (6)           | (7)           | (8)           | (9)           | (10)          | (11)          | (12)          | (13)          | (14)  |
|-----------------|------|------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|------|
| New Leader      | 1.00 |      |               |               |               |               |               |               |               |               |               |               |               |      |
| New Name        | 0.21 | 1.00 |               |               |               |               |               |               |               |               |               |               |               |      |
| Electoral Cartel| 0.12 | 0.07 | 1.00          |               |               |               |               |               |               |               |               |               |               | 1.02 |
| Merged Party    | 0.25 | 0.62 | 0.11          | 1.00          |               |               |               |               |               |               |               |               |               |      |
| Divided Mother Party | 0.03 | 0.22 | 0.15          | 0.31          | 1.00          |               |               |               |               |               |               |               |               | 1.01 |
| Splinter Party  | 0.64 | 0.20 | 0.38          | 0.02          | -0.20         | 1.00          |               |               |               |               |               |               |               | 1.07 |
| Electoral Performance | 0.07 | 0.15 | 0.09          | 0.44          | -0.19         | 0.29          | 1.00          |               |               |               |               |               |               | 1.12 |
| Party Ideology  | 0.02 | 0.06 | 0.10          | 0.04          | 0.09          | 0.02          | 0.05          | 1.00          |               |               |               |               |               | 1.01 |
| Party Age       | -0.13| -0.15| -0.44         | -0.41         | -0.08         | -0.80         | -0.24         | -0.07         | 1.00          |               |               |               |               | 1.37 |
| Number of MPs   | -0.02| -0.06| -0.12         | 0.04          | 0.05          | -0.28         | 0.08          | 0.00          | 0.15          | 1.00          |               |               |               | 1.12 |
| Policy Influence| 0.03 | 0.20 | -0.21         | 0.01          | -0.04         | 0.07          | 0.27          | 0.07          | 0.30          | 0.32          | 1.00          |               |               | 1.18 |
| Personal Vote   | 0.11 | 0.03 | 0.30          | 0.16          | 0.09          | 0.11          | 0.04          | -0.07         | -0.08         | -0.12         | -0.13         | 1.00          |               | 1.32 |
| District Magnitude | -0.04 | -0.17 | -0.25 | -0.05 | 0.06 | -0.06 | -0.02 | 0.03 | 0.03 | -0.07 | 0.02 | -0.55 | 1.00 | 1.29 |

Note: Columns 1-12 report pairwise (tetrachoric) correlations between the independent variables (key explanatory variables and controls) included in our analyses. The last column reports the variance inflation factor (VIF) for each covariate; **VIFs above 3 provide evidence of moderate or high collinearity between the predictors** (Zuur et al., 2010). Although - strictly speaking - VIFs are defined for linear regression models only, they provide information about potential collinearity in mixed effects and generalized linear models as well (Zuur et al., 2010). As seen in column 13, collinearity does not seem to be an issue in our analysis.
Table S.4: Condition indexes for the independent variables
(key explanatory variables and additional controls)

| Variable                  | Condition Indexes |
|---------------------------|-------------------|
| New Leader                | 1.00              |
| New Name                  | 1.41              |
| Electoral Cartel          | 1.54              |
| Merged Party              | 1.65              |
| Divided Mother Party      | 1.70              |
| Splinter Party            | 1.99              |
| Electoral Performance     | 2.13              |
| Party Ideology            | 2.24              |
| Party Age                 | 2.42              |
| Number of MPs             | 2.72              |
| Policy Influence          | 2.97              |
| Personal Vote             | 3.03              |
| District Magnitude        | 3.95              |

Note: The largest condition index (3.95) is considerably smaller than the threshold of 30 taken by Belsley et al. (1980) and Belsley (1991) as indicative of collinearity problems.
Table S.5: Condition indexes for *Party Ideology* and the *Party Family* indicators

| Variable                        | Condition Indexes |
|---------------------------------|-------------------|
| *Party Ideology* (continuous)   | 1.00              |
| *Party Family: Agrarian*        | 1.64              |
| *Party Family: Communist/Socialist* | 1.65            |
| *Party Family: Green/Ecologist* | 1.65              |
| *Party Family: Social Democracy* | 1.65              |
| *Party Family: Liberal*         | 1.65              |
| *Party Family: Christian Democracy* | 3.27          |
| *Party Family: Conservative*    | 6.54              |
| *Party Family: Right-wing*      | 15.97             |

Note: The largest condition index (15.97) is considerably smaller than the threshold of 30 taken by Belsley et al. (1980) and Belsley (1991) as indicative of collinearity problems. As in the analyses reported in the main text, the measure of *Party Ideology* is taken here from the ParlGov dataset, coded on a 0-10 left-right scale and based on party expert surveys. The results are the same if *Party Ideology* is taken from the Comparative Manifesto Project.
S.3 Additional estimation details

The MCMC sampler used for the Bayesian estimation of the augmented beta regression models presented in Section 4 of the manuscript was implemented in WinBUGS (Lunn et al., 2000) and called from R. Three parallel chains with widely dispersed starting value were run for 100,000 iterations, keeping every 20th iteration to reduce autocorrelation and discarding the first 35,000 cycles as “burn-in” (Gelman et al., 2004).

All the parameters were assigned weakly informative priors in order to let the data dominate the form of the posterior densities. Specifically, the regression parameters in $\alpha^k$ and $\beta^k$, $k \in \{0,1,\mu\}$, were assigned independent and identically distributed $N(0,1000)$ distributions, while Inverse Gamma $(0.01, 0.01)$ priors were used for the variances of the random effects $\sigma^2_s$, $s \in \{o,\tau,\varepsilon\}$. To ensure that inferences are data dependent, several alternative values were tried for the hyperparameters, yielding essentially similar results. The continuous party- and system-level controls included in the different specifications were centered to improve the condition of the design matrix (Jackman, 2009) and speed up convergence (Gelman and Hill, 2007), which was assessed based on Gelman and Rubin (1992)’s diagnostic.\(^4\) Posterior summaries – means and highest posterior density intervals - were computed from the pooled convergent samples.

The fractional logit models reported in Section S.4 of this Online supplemental material were estimated using quasi-likelihood inferential techniques implemented in R. As we mentioned in Section 3.2 of the manuscript, the fractional logit model provides an alternative method – arguably the most common approach – for handling fractional outcome variables. However, we also noted that a potential problem with the estimation of fractional logit models

\(^4\) As we noted in Section S.2, All the key explanatory variables included in our baseline and additional specifications (New Leader, New Name, Electoral Cartel, Merged Party, Divided Mother Party and Splinter Party) are dichotomous.
in our particular application is their reliance on asymptotic approximations. Kieschnick and McCullough (2003), who conducted an exhaustive evaluation of competing models for fractional outcomes, concluded that specifications based on the beta distribution were to be preferred to the fractional logit model developed by Cox (1996) and Papke and Wooldridge (1996) unless the sample size is large enough to justify the asymptotic arguments underlying the quasi-likelihood inferential approach. These asymptotic arguments are unlikely to be met in our sample, given the small number of countries (8) covered in our study. Maas and Hox (2005), for instance, show that frequentist estimation of hierarchical or multi-level models yields biased standard error estimates when the number of clusters (e.g., countries) is below 50. As we note in Section 3.2 of the manuscript, Bayesian inferential methods such as those proposed by Galvis et al. (2014) to fit the augmented beta regression model have been shown to yield accurate estimates for hierarchical models with fewer than 10 clusters (Gelman, 2006; Austin, 2010).\(^5\)

Nonetheless, a comparison of the estimates in Table 2 and Figure 1 of the manuscript vis-à-vis those presented in Table S.6 below reveals that the main findings remain unchanged, indicating that our results are not sensitive to the particular model or estimation approach adopted.

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\(^5\) The use of a Bayesian estimation approach has the additional advantage of offering further protection against (posterior) multicollinearity. As discussed by Jackman (2009: 104-105), collinearity poses a problem for the frequentist estimation of regression-like models because the parameters cannot be identified due to the high correlation between the columns of the design matrix (i.e., the predictors). In the case of Bayesian inferential methods, though, since posterior summaries for the model parameters are obtained by combining prior and sample information, inferences about these parameters can still be drawn even if the data is relatively uninformative. This “protection” is not particularly relevant in our application, though, as Tables S.3-S.5 above indicate that multicollinearity is not a concern in our data set.
S.4. Additional results

S.4.1. Additional Figures

Figures S.6 – S.8 present estimates for the party-, country- and year random effects included in our baseline augmented beta regression model (column 1 in Table 2 of the main text; see also equation (4) in Section 3.2 of the manuscript).

Figure S.6: Posterior summaries for the party random effects

Notes: The figure plots posterior means (dots) and 90% highest posterior density intervals (solid horizontal lines) for the country random effects $\omega_i$ estimated from the baseline
specification used to compute the marginal effects reported in Table 2 (column 1) of the manuscript.

Figure S.7: Posterior summaries for the country random effects

Notes: The figure plots posterior means (dots) and 90% highest posterior density intervals (solid horizontal lines) for the country random effects $\tau_j$ estimated from the baseline specification used to compute the marginal effects reported in Table 2 (column 1) of the manuscript.
Figure S.8: Posterior summaries for the year (election) random effects

Notes: The figure plots posterior means (dots) and 90% highest posterior density intervals (solid horizontal lines) for the year random effects $\varepsilon_t$ estimated from the baseline specification used to compute the marginal effects reported in Table 2 (column 1) of the manuscript.

Figure S.9, in turn, shows how the marginal effect of Party Age varies over time. As noted in Section S.2 above, Figure 1 in the main text displays the average effect of each additional year
on party-level legislative turnover following the approach in Gelman and Pardoe (2007). Figure S.9 shows that the relationship between Party Age and the proportion of new and re-entering MPs changes over time, though. In particular, the impact of each additional year becomes more negative as Party Age increases. This pattern is consistent with Pedersen (2000) and Ilonszki (2007), who argue that the process of elite renewal diminishes as parties’ stability and institutional entrenchment increase.

**Figure S.9: Marginal effect of Party Age over time**

Notes: The solid line represents the average change in legislative turnover associated with a change in Party Age, over time; the shaded area gives the 90% highest posterior density
interval. Estimates based on the specification summarized in Figure 1 (left panel) of the manuscript.

While ideology figures prominently as a determinant of legislative turnover (e.g., (Matland and Studlar, 2004; Heinson, 2014; François and Grossman, 2015), virtually all prior research has focused on its “direct” effect. To assess whether and how ideology conditions the impact of transformational party events (Harmel and Janda, 1994; Burke, 2018) on the renewal of their parliamentary delegations, we fitted an additional specification interacting the party family indicators with each of our key explanatory variables. Figure S.10 summarizes the main results from this exercise.

As seen in the figure, the positive and significant relationship between legislative turnover and New Leader found in Table 2 and Figure 1 of the main text (see also Tables S.6 - S.8 of this Online supplemental material) holds for parties across the ideological spectrum. Most of the interaction terms between the party family indicators and New Leader are significantly larger than zero; only the interactions involving agrarian and conservative parties are statistically indistinguishable from zero. A similar pattern holds for the interaction between the party family indicators and New Name: a change in name is associated with an increase in the proportion of new and re-entering in MPs for parties belonging to most of the ideological families. By contrast, and also consistent with the result in Table 2 and Figure 1 of the manuscript and Tables S.6 – S.8 below, Electoral Cartel and Merged Parties have no significant influence on MP renewal regardless of parties’ ideological affiliation.
Figure S.10: Moderating influence of party family on the relationship between our key explanatory variables and the rate of party-level legislative turnover

Note: The figure plots posterior summaries for the coefficients of the interactions between the party family indicators and our key explanatory variables (New Leader, New Name, Electoral Cartel, Merged Party, Divided Mother Party and Splinter Party) estimated from an augmented beta regression model incorporating also the other party-level controls included in the specification displayed in Figure 1 (left panel) of the main text. Circles represent point estimates (posterior means); horizontal lines give the 90% highest posterior density intervals. Fitting a fractional logit model yields similar substantive results.
On the other hand, the significant positive relationship between *Divided Mother Party* and legislative turnover and the negative association between the outcome and *Splinter Party* found after controlling for other covariates (see Figure 1 of the manuscript as well as Tables S.6 and S.8 below) seem to be entirely driven by social democratic, liberal and conservative parties.

We must also note that ideology not only conditions the relationship between transformative party events and legislative turnover, but also the association between other controls and our outcome variable. For instance, we estimated additional specifications interacting the party family indicators with the other party-level controls included in the left panel of Figure 1 of the manuscript. As illustrated in Figure S.11, the impact on legislative turnover of variables like *Electoral Performance* or *Number of MPs* (among others) also vary – in magnitude, significance and/or sign – across party families.
Figure S.11: Moderating influence of party family on the relationship between selected control variables and the rate of party-level legislative turnover

| Party Family        | Electoral Performance | Number of MPs |
|---------------------|-----------------------|---------------|
| Agrarian            |                       |               |
| Communist/Socialist |                       |               |
| Green/Ecologist     |                       |               |
| Social Democracy    |                       |               |
| Liberal             |                       |               |
| Christian Democracy |                       |               |
| Conservative        |                       |               |
| Right-Wing          |                       |               |

Note: The left panel of the figure plots posterior summaries for the coefficients of the interactions between the party family indicators and *Electoral Performance*; the right panel reproduces the information for the interactions between the party family indicators and *Number of MPs*. Circles represent point estimates (posterior means); horizontal lines give the 90% highest posterior density intervals. These estimates are obtained from an augmented beta regression model incorporating all the party-level controls included in the specification displayed in Figure 1 of the main text. Fitting a fractional logit model yields similar substantive results.
As we noted in our manuscript, an in-depth exploration and interpretation of these ideological differences is beyond the scope of this paper. Nonetheless, we intend to delve into the direct and indirect (moderating) influence of ideology on legislative turnover in future research.

S.4.2. Additional Tables

Table S.6 reports covariates marginal effects analogous to those presented in Table 2 and Figure 1 of the manuscript, but estimated from fractional logit – instead of from augmented beta regression – models. While the magnitudes of the marginal effects vary between the two tables due to differences in parametrizations and estimation methods, the substantive findings coincide.

**Table S.6: Marginal effects of the predictors on party-level legislative turnover estimated from fractional logit models**

| Variable                    | (1)          | (2)          | (3)          | (4)          | (5)          | (6)          |
|-----------------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| New Leader                  | 12.44***     | 7.70***      | 14.04***     | 12.17***     | 12.45***     |
|                             | (1.60)       | (2.12)       | (1.91)       | (1.50)       | (1.45)       |
| New Leader – Until 1989     |              | 10.84***     |              |              |              |
|                             |              | (2.54)       |              |              |              |
| New Leader – Post 1989      |              | 12.76***     |              |              |              |
|                             |              | (2.00)       |              |              |              |
| New Name                    | 6.72**       | 5.58*        | 6.25*        | 4.99         |              |
|                             | (3.26)       | (3.21)       | (3.51)       | (4.40)       |              |
| New Name – Policy Influence |              |              |              | 5.82*        | 5.81*        |
|                             |              |              |              | (3.07)       | (3.06)       |
| New name – No Policy Influence |          |              |              | 3.79         | 3.77         |
|                             |              |              |              | (3.55)       | (3.53)       |
| Electoral Cartel            | -1.13        | -1.30        | -0.31        | 0.19         | -1.18        |
|                             | (3.12)       | (2.94)       | (5.52)       | (3.72)       | (3.16)       |
| Merged Party                | 3.86         | 4.05         | -4.71        | 4.24         | -0.50        |
|                             | (3.70)       | (3.49)       | (6.08)       | (4.13)       | (4.00)       |
| Divided Mother Party        | 2.51         | 2.78         | 0.23         | 2.03         | 7.00*        |
|                             |              |              |              |              | 7.16*        |
|                          | Splinter Party     | Post 1989          | Policy Influence | Electoral Performance | Party Ideology | Party Age | Number of MPs | Agrarian | Communist/Socialist | Green/Ecologist | Social Democracy | Liberal | Christian Democracy | Conservative | Right-wing |
|-------------------------|--------------------|-------------------|------------------|--------------------|------------------|-----------|--------------|----------|-------------------|----------------|----------------|--------|----------------------|--------------|------------|
|                         | (4.47)             | (4.24)            | (7.15)           | (5.16)             | (3.85)           | (3.88)    |              | (4.25)   | (3.81)            | (9.92)         | (4.74)         | (3.13) | (3.13)               | (8.62)       | (3.85)     |
|                          | -2.78              | -2.95             | -0.50            | -4.49              | -8.27**         | -8.62***  |              | (3.00)   | (3.81)            | (9.92)         | (4.74)         | (3.13) | (3.13)               | (8.62)       | (3.85)     |
|                          | (4.25)             | (3.81)            | (9.92)           | (4.74)             | (3.13)           | (3.15)    |              | (3.00)   | (3.81)            | (9.92)         | (4.74)         | (3.13) | (3.13)               | (8.62)       | (3.85)     |
| Post 1989               |                    |                   |                  |                    |                  |           |              |          |                  |                |               |        |                       |              |            |
|                         |                    |                   |                  |                    |                  |           |              |          |                  |                |               |        |                       |              |            |
| Policy Influence        |                    |                   |                  |                    | -4.37***        | -5.01***   |              |          |                  |                |               |        |                       |              |            |
|                         |                    |                   |                  |                    | (1.46)          | (1.48)    |              |          |                  |                |               |        |                       |              |            |
| Electoral Performance   |                    |                   |                  |                    | 1.64***         | 1.66***    |              |          |                  |                |               |        |                       |              |            |
|                         |                    |                   |                  |                    | (0.18)          | (0.18)    |              |          |                  |                |               |        |                       |              |            |
| Party Ideology          |                    |                   |                  |                    | -0.65           | -1.62     |              |          |                  |                |               |        |                       |              |            |
|                         |                    |                   |                  |                    | (4.43)          | (4.44)    |              |          |                  |                |               |        |                       |              |            |
| Party Age               |                    |                   |                  |                    | -0.79***        | -0.72***   |              |          |                  |                |               |        |                       |              |            |
|                         |                    |                   |                  |                    | (0.23)          | (0.28)    |              |          |                  |                |               |        |                       |              |            |
| Number of MPs           |                    |                   |                  |                    | -3.70***        | -2.99**    |              |          |                  |                |               |        |                       |              |            |
|                         |                    |                   |                  |                    | (1.19)          | (1.29)    |              |          |                  |                |               |        |                       |              |            |
| Agrarian                |                    |                   |                  |                    | -2.68           | -4.27     |              |          |                  |                |               |        |                       |              |            |
|                         |                    |                   |                  |                    | (6.11)          | (6.13)    |              |          |                  |                |               |        |                       |              |            |
| Communist/Socialist     |                    |                   |                  |                    | 4.21            | 3.81      |              |          |                  |                |               |        |                       |              |            |
|                         |                    |                   |                  |                    | (6.60)          | (6.72)    |              |          |                  |                |               |        |                       |              |            |
| Green/Ecologist         |                    |                   |                  |                    | 11.36*          | 11.41*     |              |          |                  |                |               |        |                       |              |            |
|                         |                    |                   |                  |                    | (6.48)          | (6.52)    |              |          |                  |                |               |        |                       |              |            |
| Social Democracy        |                    |                   |                  |                    | -3.43           | -2.38     |              |          |                  |                |               |        |                       |              |            |
|                         |                    |                   |                  |                    | (5.67)          | (5.78)    |              |          |                  |                |               |        |                       |              |            |
| Liberal                 |                    |                   |                  |                    | -1.77           | -2.47     |              |          |                  |                |               |        |                       |              |            |
|                         |                    |                   |                  |                    | (5.68)          | (5.73)    |              |          |                  |                |               |        |                       |              |            |
| Christian Democracy     |                    |                   |                  |                    | -1.68           | -1.75     |              |          |                  |                |               |        |                       |              |            |
|                         |                    |                   |                  |                    | (5.66)          | (5.77)    |              |          |                  |                |               |        |                       |              |            |
| Conservative            |                    |                   |                  |                    | -5.21           | -6.07     |              |          |                  |                |               |        |                       |              |            |
|                         |                    |                   |                  |                    | (6.39)          | (6.42)    |              |          |                  |                |               |        |                       |              |            |
| Right-wing              |                    |                   |                  |                    | 10.76           | 9.44      |              |          |                  |                |               |        |                       |              |            |
|                         |                    |                   |                  |                    | (6.92)          | (6.98)    |              |          |                  |                |               |        |                       |              |            |
|                  |        |        |        |        |        |        |
|------------------|--------|--------|--------|--------|--------|--------|
| **Personal Vote** | -3.90  | **(1.64)** |
| **District Magnitude** | 0.04  | **(0.16)** |
| Pseudo-$R^2$      | 0.31   | 0.31   | 0.18   | 0.56   | 0.63   | 0.65   |
| Likelihood ratio test (p-value) | 0.00  | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   |
| N. Observations   | 1,359  | 1,359  | 557    | 802    | 1,359  | 1,359  |

Note: The table reports point estimates and robust standard errors (in parentheses) for the marginal effect of each variable on party legislative turnover, in percentage points. Significance levels: \(*\) at 1%; \(*\) at 5%; \(*\) at 10%. As in Table 2 of the manuscript, column (1) presents our baseline estimates; column (2) explores the difference in the marginal effect of New Leader up until/after 1989; columns (3)-(4) separately fits the baseline – column (1) – model to the sub-samples of parties with and without strong potential for policy influence. The last two columns replicate the analyses summarized in Figure 1 of the main text. Column (5) adds party-level controls to the baseline specification, along with an interaction between New Name and Policy Influence to reflect the differences between parties with and without policy-making influence emerging from columns (3) and (4). Column (6) adds system-level controls to the specification in column (5).

Table S.7, in turn, examines the sensitivity of our findings to the operationalization of the Policy Influence variable. Building on Mair (1991), columns (1)-(2) code parties as having the potential for strong policy influence if they gathered at least 15% of the vote in the preceding parliamentary election, and 0 otherwise. Columns (3)-(4) use a smaller (10%) vote-share threshold, following Rashkova and Spirova (2014) and Stavenes (2019). Finally, in columns (5)-(6) we draw on Hobolt and Tilley (2016) and code Policy Influence as 0 for parties that never occupied cabinet posts in national government, and 1 if they have.
Table S.7: Marginal effects of the predictors on party-level legislative turnover using alternative operationalizations for “Policy Influence”

| Variable               | (1)  | (2)  | (3)  | (4)  | (5)  | (6)  |
|------------------------|------|------|------|------|------|------|
| New Leader             | 4.93* | 4.52* | 5.06* | 4.32* | 5.57* | 4.57* |
|                        | (1.63) | (1.17) | (1.34) | (1.26) | (1.54) | (1.14) |
| New Name               | 11.47** | 1.06 | 7.88** | 0.86 | 4.98** | 3.35 |
|                        | (4.53) | (2.21) | (3.42) | (2.36) | (2.59) | (2.82) |
| Electoral Cartel       | 2.42 | 1.29 | 2.67 | 0.35 | 1.89 | -1.24 |
|                        | (4.74) | (2.23) | (3.30) | (2.62) | (2.86) | (2.70) |
| Merged Party           | -1.55 | 1.13 | -1.31 | 1.32 | -0.55 | 0.38 |
|                        | (4.46) | (3.21) | (3.82) | (3.53) | (3.64) | (3.41) |
| Divided Mother Party   | -4.66 | 0.33 | -2.43 | 1.74 | -0.66 | 0.20 |
|                        | (4.56) | (3.34) | (3.91) | (3.69) | (5.05) | (3.20) |
| Splinter Party         | 0.95 | -1.03 | 0.06 | -3.20 | 2.16 | -2.40 |
|                        | (3.31) | (2.61) | (3.42) | (2.52) | (3.11) | (2.87) |
| Pseudo-R²              | 0.35 | 0.32 | 0.38 | 0.31 | 0.54 | 0.14 |
| Likelihood ratio test  | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| (p-value)              |       |       |       |       |       |       |
| N. Observations        | 398  | 961  | 557  | 802  | 531  | 828  |

Note: The table reports posterior means and standard errors (in parentheses) for the marginal effect of each variable on party legislative turnover, in percentage points. Columns (1)-(2) code Policy Influence as 1 for parties that gathered at least 15% of the vote in the preceding parliamentary election, and 0 otherwise; columns (3)-(4) code parties as having the potential for strong policy influence if they gathered at least 10% of the vote in the preceding parliamentary election, and 0 otherwise; columns (5)-(6) code parties as having the potential for strong policy influence if they ever occupied cabinet positions in the national government, and 0 otherwise. Estimates obtained using augmented beta regression models; the results are substantively similar when fractional logit models are fitted. Significance levels: *** at 1%; ** at 5%; * at 10%.

The main conclusions emerging from Table 2 and Figure 1 of the manuscript hold across these different specifications: (i) the marginal effect of New Leader is always positive and highly significant; (ii) New Name is systematically associated with higher turnover rates for parties.
with the potential for strong policy influence, but not for those without such influence; and (iii) the impact of all the other key explanatory variables is statistically indistinguishable from zero for both groups of parties, regardless of how Policy Influence is measured.

Finally, Table S.8 replicates that analyses in Figure 1 of the main text and Table S.6 of this Online supplemental material, but using the rile variable from the Comparative Manifesto Project (Volkens et al., 2019) - based on the coding of parties’ programmes – to operationalize Party Ideology. The estimated marginal effects for our key explanatory variables are consistent with those presented in Figure 1 and Table S.6.

Table S.8: Marginal effects using an alternative operationalization of the Party Ideology based on the Comparative Manifesto Project

| Variable                          | Augmented beta regression estimates | Fractional logit estimates |
|-----------------------------------|-------------------------------------|----------------------------|
|                                   | (1)       | (2)       | (3)       | (4)       |
| New Leader                        | 15.76**   | 15.54**   | 10.19***  | 9.85***   |
|                                   | (7.04)    | (7.03)    | (1.51)    | (1.48)    |
| New Name – Policy Influence       | 5.96***   | 5.70***   | 7.56**    | 7.63**    |
|                                   | (1.05)    | (1.03)    | (3.28)    | (3.26)    |
| New name – No Policy Influence    | 2.38      | 2.36      | 3.02      | 3.00      |
|                                   | (4.38)    | (4.45)    | (3.56)    | (3.53)    |
| Electoral Cartel                  | -2.82     | -2.73     | -3.13     | -3.41     |
|                                   | (2.98)    | (3.04)    | (4.09)    | (3.73)    |
| Merged Party                      | -1.74     | -1.65     | -7.27     | -5.97     |
|                                   | (3.19)    | (3.26)    | (6.12)    | (6.09)    |
| Divided Mother Party              | 5.13**    | 4.96*     | 6.97*     | 6.78*     |
|                                   | (2.45)    | (2.49)    | (4.08)    | (3.84)    |
| Splinter Party                    | -4.87*    | -5.11**   | -8.66**   | -6.41*    |
|                                   | (2.93)    | (2.86)    | (4.44)    | (4.07)    |

Note that ideology measures provided by the Comparative Manifesto Project do not cover all the parties included in our original data set. Hence, the number of observations in Table S.8 is lower (958) than in Tables 2 and S.6 (1,359).
|                        | Policy Influence | Electoral Performance | Party Ideology | Party Age | Number of MPs | Agrarian | Communist/Socialist | Green/Ecologist | Social Democracy | Liberal | Christian Democracy | Conservative | Right-wing | Personal Vote | District Magnitude |
|------------------------|------------------|-----------------------|----------------|----------|--------------|----------|-------------------|----------------|------------------|---------|---------------------|--------------|------------|----------------|--------------------|
|                        | -3.37*           | 5.77***               | -0.36          | -0.94   | -3.66****    | -0.95   | 1.79              | 2.39***        | -1.23            | -1.27  | -1.30               | -1.29        | 0.99       | 0.35          | 0.56               |
|                        | (1.84)           | (0.60)                | (0.65)         | (0.60)   | (0.61)       | (0.93)  | (1.91)            | (0.87)         | (0.87)           | (0.89) | (0.89)              | (0.91)       | (0.88)     | (1.23)        | (0.56)             |
|                        | -3.41*           | 5.70***               | -0.43          | -1.05*  | -3.90***     | -0.96   | 1.85              | 1.97*          | -1.28            | -1.31  | -1.25               | -1.27        | 0.76       | (1.23)       | (1.73)             |
|                        | (1.78)           | (0.61)                | (0.64)         | (1.49)   | (1.28)       | (1.04)  | (1.72)            | (0.76)         | (1.35)           | (1.36) | (1.36)              | (0.83)       | (1.39)     |              |                    |
|                        | -3.05**          | 1.59***               | -2.22          | -0.05   | -5.53***     | -1.73   | 1.63              | 1.27           | -1.42            | -1.35  | -1.48               | -1.91        | (1.39)     |              |                    |
|                        | (1.42)           | (0.19)                | (1.49)         | (0.17)   | (1.28)       | (1.36)  | (1.38)            | (1.35)         | (1.35)           | (1.36) | (1.36)              | (1.37)       | (1.39)     |              |                    |
|                        | -2.54*           | 1.59***               | -0.19          | -0.06   | -5.13***     | -1.68   | 0.57              | 1.28           | -1.38            | -1.33  | -1.46               | -1.87        | 1.30       |              |                    |
|                        | (1.53)           | (0.18)                | (1.94)         | (0.19)   | (1.44)       | (1.35)  | (1.37)            | (1.38)         | (1.37)           | (1.35) | (1.35)              | (1.37)       | (1.35)     |              |                    |
|                        |                   |                       |                |         |              |         |                  |                |                 |         |                    |              |           |              |                    |
|                        | 0.58 | 0.60 | 0.51 | 0.52 |
|------------------------|------|------|------|------|
| Pseudo-R²              |      |      |      |      |
| Likelihood ratio test  | 0.00 | 0.00 | 0.00 | 0.00 |
| (p-value)              |      |      |      |      |
| N. Observations        | 958  | 958  | 958  | 958  |

Note: The table replicates the analyses in Figure 1 of the main text and columns (5)-(6) of Table S.6, but coding Party Ideology from the (inverted) rile variable taken from the Comparative Manifesto Project (Volkens et al., 2019). Columns (1)-(2) of this table report posterior means and standard errors (in parentheses) for the marginal effects obtained using Bayesian augmented beta regression models (Galvis et al., 2014); the point estimates and robust standard errors (in parentheses) in columns (3)-(4) are obtained using fractional logit models (Cox, 1996; Papke and Wooldrige, 1996). Significance levels: *** at 1%; ** at 5%; * at 10%.
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