ONLINE APPENDIX

Politics in the Family. Nepotism and the Hiring Decisions of Italian Firms

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On-line Appendix

A1. Measurement error

Suppose that our true model is:

$$y_{iFt} = \beta_0 + \beta_1 P_{it} + u_{iFt}$$

where for simplicity we have omitted the other regressors, including the fixed effects. As said, in the data we only have an imperfect measure of family connections. In particular, we can only identify politicians carrying the same F3C and born in the same municipality as a worker, denote this by P_{Ft}. This provides an error-ridden measure of P_{it}, the actual number of politicians related to individual i. In formulas, we only observe:

$$P_{Ft} = \sum_j s_{iFj} pol_{jt}$$

where pol_{jt} is a dummy if individual j is in office in year t and s_{iFj} is a dummy equal one if individuals i and j share the same F3C and are born in the same municipality. It follows that:

$$P_{Ft} = P_{it} + \nu_{iFt}$$

where:

$$\nu_{iF} = \sum_j (s_{iFj} - d_{iFj}) pol_{jt}$$

and d_{iFj} is a dummy equal to one if individual i is a true family member of individual j. It follows that our empirical model is:

$$y_{iFt} = \beta_0 + \beta_1 P_{Ft} + v_{iFt}$$

where $v_{iFt} = u_{iFt} - \beta_1 \nu_{iFt}$.

From the above one can derive the implied bias in the estimate of β_1 in this last equation. Assuming that s_{iFj} and d_{iFj} are independent across j's, this estimate converges in probability to $k\beta_1$, where:

$$k = 1 - \frac{Cov(P, \nu)}{Var(P)} = 1 - \frac{Cov(s, s-d)}{Var(s)} = \frac{Cov(s,d)}{Var(s)}$$

Since:

$$Cov(s,d) = Pr(s=1, d=1) - Pr(s=1)Pr(d=1) =$$

$$= [Pr(d=1|s=1) - Pr(d=1|s=0)]Pr(s=0)Pr(s=1)$$

and

$$Var(s) = Pr(s = 0)Pr(s = 1)$$

it follows that:

$$k = 1 - Pr(d = 1|s = 0) - Pr(d = 0|s = 1)$$

At given $Pr(s = 1)$ and $Pr(d = 1)$, k is lower the higher is either type-1, $Pr(s = 0|d = 1)$, or type-2, $Pr(s = 1|d = 0)$, error. Since k varies between -1 and 1, estimates of the parameter converge in probability to a value between $-\beta_1$ and β_1. The intuition for this is straightforward. Type-1 and type-2 errors imply respectively that connected individuals are erroneously assigned to the control group, and unconnected individuals are assigned to the treatment group, both diluting the estimate of β_1. In the extreme case when all connected individuals are assigned to the control group and all unconnected individuals are assigned to the treatment group, the estimates of β_1 will be reverted.

The size of both errors will depend on the distribution of F3Cs in a municipality and there is a clear trade-off between the two. As type-1 error is likely to be negligible, as truly connected individuals will represent a negligible share of all those with a different F3C, a simplified expression for k is:

$$k \approx Pr(d = 1|s = 1) \tag{A1}$$

i.e., the probability that an individual with the same F3C and municipality of birth as a politician is a true family member. This probability has an empirical counterpart, $E\left(\frac{D_{Ft}}{N_{Ft}}\right)$, where N_{Ft} is the number of individuals in "family" F (i.e with a given F3C and born in a given municipality) and D_{Ft} is the total number of individuals genuinely related to politicians among them.

A2. Selection bias

One concern in relation to the estimates of model (1) arises from the structure of the data, which is made of individuals with at least one social security spell over the period. Model estimates are at risk of suffering from selection bias.

To illustrate the source of bias (and ignoring the issue of measurement error), let us start from our model in equation (1) and let us assume that $E(v_{iFt}|\mathbf{P}_F) = 0$, where $\mathbf{P}_F = (P_{F1}, P_{F2}, ..., P_{FT})$:

$$y_{iFt} = \beta_0 + \beta_1 P_{Ft} + v_{iFt} \tag{A2}$$

Let $A_i = \{Max_{t=1,..T}(y_{iFt}) > 0\}$ define the event that determines inclusion in the sample, with the associated complementary event $B_i = \{y_{iF1} < 0, y_{iF2} <$

$0, .., y_{iFT} < 0\}$, such that $Pr(A_i = 1|\mathbf{P}_F) = 1 - Pr(B_i = 1|\mathbf{P}_F)$.

Let:

$$W_{iF} = \frac{Pr(B_i = 1|\mathbf{P}_F)}{1 - Pr(B_i = 1|\mathbf{P}_F)}$$

Given the selection rule, we only observe the empirical counterpart to:

$$E(y_{iFt}|A_i = 1, \mathbf{P}_F) = \beta_0 + \beta_1 P_{Ft} + h_{iFt}$$

where $h_{iFt} = -E(v_{iFt}|B_i = 1, \mathbf{P}_F)W_{iF}$ and we have exploited the fact that:

$$E(v_{iFt}|A_i = 1, \mathbf{P}_F) = -E(v_{iFt}|B_i = 1, \mathbf{P}_F)W_{iF}$$

which follows from the assumption that $E(v_{iFt}|\mathbf{P}_F) = 0$. Assuming independence of v_{iFt} across time within individuals, it follows:

$$h_{iFt} = -E(v_{iFt}|v_{iFt} < -\beta_0 - \beta_1 P_{Ft}, \mathbf{P}_F)\left(\frac{\Pi_s Pr(v_{iFs} < -\beta_0 - \beta_1 P_{Fs}|\mathbf{P}_F)}{1 - \Pi_s Pr(v_{iFs} < -\beta_0 - \beta_1 P_{Fs}|\mathbf{P}_F)}\right)$$

Although the sign of the bias is indeterminate in the absence of further assumptions on the distribution of u, it is easy to show that the bias tends to disappear as T grows, as $\Pi_s Pr(v_{iFs} < -\beta_0 - \beta_1 P_{Fs}|\mathbf{P}_F)$, and hence W_{iF}, are likely to become small. This is simply because the more observations there are for an individual, the less likely is that this individual will not have a positive draw of y_{iFt} in any given time period, and hence will not be included in the sample.

A3. Data Appendix

In this section we describe the municipal level and judicial district-level variables that we use in Table 5 (see also Table A.4 for descriptive statistics) and in Table 8 (see also Table A.5 for descriptive statistics).

Municipal variables:

Discretionary exp.: municipal expenditure excluding debt service and personnel per year (in 2000 euros), average between 1993 and 2004 (source: Ministry of Interior).

Income per capita: personal income as of 2005 (source: Ministry of Interior).

Firms: number of productive activities registered to the Chamber of Commerce as of 2005 (source: Ministry of Interior).

Pct. unemployment: municipal unemployment rate as of 2013 (source: Istat). Computed as a projection, based on census data, of the unemployment rate at local labor-district-level (*Sistemi Locali del Lavoro*) at the municipal level.

Pct. public sector employment: share of public sector employment as of 2001 (source: 2001 Italian General Census of Population and Housing).

Pct. college: percentage of the resident population six years old and over with a college degree or more as of 2011 (source: 2011 Italian General Census of Population and Housing).

Elderly index: ratio of resident population above sixty-five over population below fourteen years old as of 2005 (source: Ministry of Interior).

Population: resident population as of 2001 (source: 2001 Italian General Census of Population and Housing).

Region capital: dummy indicating if the municipality holds the regional government seat.

Province capital: dummy indicating if the municipality holds the provincial government seat.

CC station: dummy indicating if the municipality hosts at least one *Carabinieri* station as of 2015 (source: IPA Indice delle Pubbliche Amministrazioni).

PS station: dummy indicating if the municipality hosts at least one *Polizia di Stato* station as of 2015 (source: IPA Indice delle Pubbliche Amministrazioni).

GDF station: dummy indicating if the municipality hosts at least one *Guardia di Finanza* station as of 2015 (source: IPA Indice delle Pubbliche Amministrazioni).

Court: dummy indicating if the municipality hosts a court as of 2015 (source: Ministry of Justice).

Subsidiary court: dummy indicating if the municipality hosts a subsidiary court as of 2015 (source: Ministry of Justice).

Total crimes per capita: total number of crimes reported to the judiciary authority per 1,000 individuals, average between 2004 and 2009 (source: Istat).

Crimes against public administration per capita: total number of crimes against the public administration reported to the judiciary authority per 1,000 individuals, average between 2004 and 2009 (source: Istat).

Municipal government dissolved for mafia: dummy indicating if the municipal government was ever (i.e., since 1991) dissolved due to mafia infiltration (source: Ministry of Interior).

Non-profit organizations: number of non-profit organizations (voluntary associations, social cooperatives and foundations, excluding church-based organizations) in the municipality (source: 2011 Italian General Census of Population and Housing).

Local politicians: total number of available seats in the council and in the executive, average between 1985 and 2011 (source: Ministry of Interior). The number of elected municipal officials varies discontinuously with population size, from 12 councilors and 4 executives in municipalities with less than 3,000 inhabitants, to 50-60 councilors and 14-16 executives in cities with more than 500,000 inhabitants.

Voters' turnout: percentage of voters over total registered voters in municipal elections, average between 1993 and 2010 (source: Ministry of Interior).

Judicial district-level variables:

MD vote share 1988: vote share for *Magistratura democratica* in the 1988 election of the *Comitato Direttivo Centrale* of the ANM (source: Associazione Nazionale Magistrati).

Total crimes per capita: total number of crimes reported to the judiciary authority per 1,000 individuals, average by sub-periods (1985-1991, 1992-2000 and 2001-2005) and across districts (source: Istat).

Crimes against public administration per capita: total number of crimes against the public administration reported to the judiciary authority per 1,000 individuals, average by sub-periods (1985-1991, 1992-2000 and 2001-2005) and across districts (source: Istat).

Same mayor: elected mayor is an incumbent, average by sub-periosds (1985-1991, 1992-2000 and 2001-2011) and across districts obtained using city population size as weights (source: Ministry of Interior).

Same party: elected mayor is from the incumbent mayor's party, average by sub-periods (1985-1991, 1992-2000 and 2001-2011) and across districts obtained using city population size as weights (source: Ministry of Interior).

Value added per capita: value added per capita at province level, available for 1981, 1991 and 1999, average across districts obtained using province population size as weights (source: Istituto Guglielmo Tagliacarne).

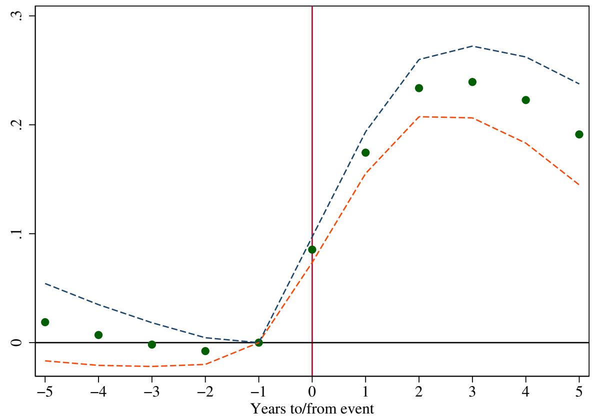

FIGURE A.1. EVENT-STUDY ANALYSIS: MONTHS OF WORK - ENTRY

Note: The figure displays the estimated change in number of months of work at different lags and leads since the time of first entry (denoted by a vertical line). All coefficients expressed relative to effect in year before entry. 95 percent confidence intervals reported. See also text for details.

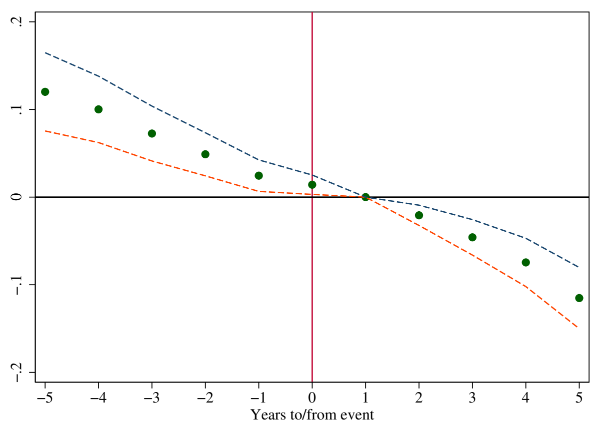

FIGURE A.2. EVENT-STUDY ANALYSIS: MONTHS OF WORK - EXIT

Note: The figure displays the estimated change in number of months of work at different lags and leads since the time of last exit (denoted by a vertical line). All coefficients expressed relative to effect in year after exit. 95 percent confidence intervals reported. See also text for details.

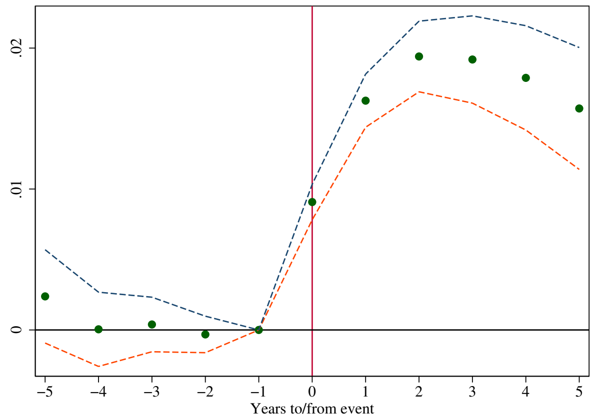

Figure A.3. Event-study analysis: Employment - entry

Note: The figure displays the estimated change in the employment probability at different lags and leads since the time of first entry (denoted by a vertical line). All coefficients expressed relative to effect in year before entry. 95 percent confidence intervals reported. See also text for details.

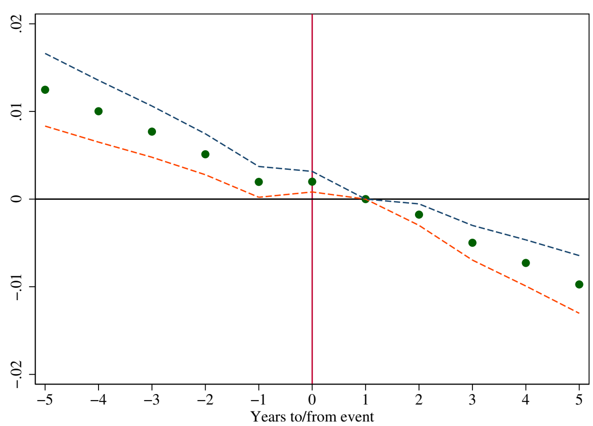

Figure A.4. Event-study analysis: Employment - exit

Note: The figure displays the estimated change in the employment probability at different lags and leads since the time of last exit (denoted by a vertical line). All coefficients expressed relative to effect in year after exit. 95 percent confidence intervals reported. See also text for details.

TABLE A.1—DESCRIPTIVE STATISTICS, WORKERS - EMPLOYMENT SPELLS

	Mean	s.d.
Months in work in the year	9.985	3.378
Yearly earnings	19,507.505	16,504.393
Number of jobs in the year	1.188	0.500
Female	0.327	0.469
Age	37.401	11.117
Area of birth: North	0.461	0.498
Area of birth: Center	0.173	0.378
Area of birth: South + Islands	0.366	0.482
Blue collar	0.639	0.480
Clerk	0.333	0.471
White collar	0.017	0.128
Manager	0.011	0.102
N. observations	9,440,711	
N. individuals	927,606	

Note: Each observation in the table is one year X individual, and the sample refers to observations with non-zero earnings. Job characteristics refer to the most highly paying job in the year. Categories of variables might not add up to one due to missing values. Yearly earnings are expressed in 2005 euros.
Source: INPS data.

Table A.2—Descriptive statistics, politicians

	Mean	s.d.
Municipal	0.961	0.194
Provincial	0.024	0.154
Regional	0.008	0.090
National	0.007	0.080
Council	0.699	0.459
Executive	0.301	0.459
1 Term	0.702	0.457
2 Terms	0.209	0.407
$>$ 2 Terms	0.089	0.284
In office in 1985	0.293	0.455
Female	0.138	0.345
Age	44.389	11.267
Primary	0.099	0.299
Junior high	0.241	0.428
High school	0.411	0.492
College	0.247	0.431
Blue collar	0.159	0.366
White collar	0.338	0.473
Manager	0.080	0.271
Military/Police	0.006	0.078
Physician	0.053	0.225
Professor/Teacher	0.066	0.248
Lawyer/Judge	0.023	0.149
Other occupation	0.060	0.238
Area of birth: North	0.548	0.498
Area of birth: Center	0.137	0.344
Area of birth: South + Islands	0.316	0.465
Area of election: North	0.572	0.495
Area of election: Center	0.137	0.343
Area of election: South + Islands	0.291	0.454
Munic. of election same as birth	0.485	0.500
Province of election same as birth	0.845	0.362
Region of election same as birth	0.917	0.276
N. observations	3,714,808	
N. individuals	525,500	

Note: Each observation in the table is one year X government X individual. Data are weighted by fraction of year in office. Categories of variables might not add up to one due to missing values. Municipality of office only available for municipal politicians. Province of office only available for municipal and provincial politicians. Region of office only available for municipal, provincial and regional politicians.
Source: Ministry of Interior.

Table A.3—Descriptive statistics, matched sample

	Mean	s.d.
Months in work in the year	4.830	5.515
Employed	0.484	0.500
Yearly earnings	9,439.504	15,034.743
Total politicians	0.778	1.926
Total politician > 0	0.327	0.469
Total politicians $= 1$	0.169	0.375
Total politicians $= 2$	0.065	0.247
Total politicians > 2	0.093	0.291
Municipal politicians	0.728	1.824
Provincial politicians	0.025	0.160
Regional politicians	0.013	0.115
National politicians	0.013	0.118
Council politicians	0.565	1.440
Executive politicians	0.213	0.665
N. observations	19,011,083	
N. individuals	895,456	

Note: Each observation in the table is one year X individual. The data include both employment and non-employment spells. Workers and politicians matched on F3C and municipality of birth. See also notes to Tables A.1 and A.2.

Table A.4—Municipality characteristics

	Mean	s.d.
Discretionary exp. per politician (log)	11.540	0.926
Income per capita (log)	9.480	0.228
Firms per capita (log)	-2.622	0.328
Pct. unemployment	12.263	6.072
Pct. public sector employment	9.718	9.029
Pct. college	7.394	2.705
Elderly index	185.257	149.927
Population (log)	7.945	1.252
Region capital	0.003	0.052
Province capital	0.016	0.126
CC station	0.477	0.500
PS station	0.044	0.204
GDF station	0.063	0.244
Court	0.019	0.137
Subsidiary court	0.034	0.180
Total crimes per (1,000) capita	0.028	0.021
Corruption crimes per (1,000) capita	0.001	0.020
Municipality dissolved for Mafia	0.026	0.159
Non-profit organizations per (1,000) capita (log)	1.491	0.607
Pct. voters' turnout	79.541	8.039
Politicians per capita (log)	-4.944	1.033

Note: Number of observations: 6,245. See Section A.3 for a description of the variables and sources.

Table A.5—Judicial district characteristics

	Mean	s.d.
MD vote share 1988	0.186	0.102
Crimes against PA per (1,000) capita	0.035	0.021
Total crime per (1,000) capita	41.647	14.670
Same mayor	0.382	0.143
Same party	0.625	0.183
Value added per capita	65,297.096	56,524.209

Note: Number of observations: 78. See Section A.3 for a description of the variables and sources.