# S3 File. Detailed Notation.

We run four broad sets of model specifications: (i) a dynamic panel model that defines the vector of as endogenous; (ii) institution-field and year fixed effects (Eq. 2); (iii) pooled OLS with the inclusion of two lagged logged dependent variables: and (Eq. 3) where the standard errors are clustered at the field level; and (iv) a dynamic panel model that defines the vector of as predetermined rather than as endogenous. *All funding sources are estimated in log form for the models listed below.* All the equations rely on the follow indices: *i* denotes the field, *n* denotes the institution, and *t* denotes the year. The full notation for each set of models is detailed below for each outcome – state & local, nonprofit, and industry R&D.

**Model Specification I: Primary Dynamic Panel Model (Detailed Notation of Eq. 1)**

Equations A, B, and C present detailed notation for the primary dynamic panel model for the three outcomes: state and local, nonprofit, and industry R&D, respectively. Equations A.1 - A.5, B.1 – B.5, and C.1 – C.5 clarify the estimations for each set of instruments (where the instrument is denoted by *w*) corresponding to Equations A – C, respectively. We present the functional relationships for each set in turn. For the first outcome, state and local R&D, we estimate Equations A and A.1 – A.5 as follows:

where,

and where ranges from 1 to 4 () and ranges from 2 to 4 (), thus each regressor is instrumented with multiple lags. As discussed in the manuscript, endogenous variables are lagged at least two periods as denoted by , while predetermined variables, in this case Federal R&D, are lagged at least one period as denoted by .

For the second outcome, nonprofit R&D, we estimate Equations B and B.1 – B.5 as follows:

where,

and where ranges from 1 to 4 () and ranges from 2 to 4 ().

For the third outcome, industry R&D, we estimate Equations C and C.1 – C.5 as follows:

where,

and where ranges from 1 to 4 () and ranges from 2 to 4 ().

**Model Specification II: Fixed Effects Models (Detailed Notation of Eq. 2)**

Equations D, E, and F present the detailed notation for the institution-field and year fixed effects model (Eq. 2) with the three respective outcomes: state & local, nonprofits, and industry R&D.

**Model Specification III: Pooled OLS with inclusion of lagged logged dependent variables (Detailed Notation of Eq. 3)**

Equations G, H, and I present the detailed notation for the pooled OLS model with the inclusion of two lagged logged dependent variables: and (Eq. 3) with the three respective outcomes: state & local, nonprofits, and industry R&D.

**Model Specification IV: Alternate Dynamic Panel Model (Detailed Notation of Eq. 4)**

Equations J, K, and L present detailed notation for dynamic panel model (Eq. 4) with the adjusted instrument specification for the set of non-federal regressors for the three outcomes state & local, nonprofit, and industry, respectively. Equations J.1 - J.5, K.1 – K.5, and L.1 – L.5 clarify the estimations for each set of instruments (where the instrument is denoted by *w*) for Equations J, K and L, respectively.

We estimate Equations J and J.1 – J.5 as follows:

where,

and where ranges from 1 to 4 () and ranges from 2 to 4 (), thus each regressor is instrumented with multiple lags. We estimate Equations K and K.1 – K.5 as follows:

where,

and where ranges from 1 to 4 () and ranges from 2 to 4 (). We estimate Equations L and L.1 – L.5 as follows:

where,

and where ranges from 1 to 4 () and ranges from 2 to 4 ().