Online appendix for Closing the gender gap in patenting: Evidence from a randomized control trial at the USPTO

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1 Additional background, dataset and analysis information

1.1 PSPEU examination example

The examination record of application number 14,272,542, examined in the PSPEU, helps clarify some of the art unit's objectives. On September 28, 2015, the PSPEU examiner issued a first action rejection, identifying several issues with the application.[1] At the beginning of the written correspondence, the examiner stated "Please do not hesitate to contact [examiner name omitted] at [phone number omitted] if you have any questions regarding this correspondence or replying." The next statement in the Office action requested that the inventor contact the examiner so that they could explain how to amend a form incorrectly submitted to the office (in this case, the application data sheet).[2] About two weeks later, the applicant initiated an interview, and the examiner discussed the first action rejection, providing clarification, as well as directed the applicant to a template for submitting an amendment. After another round of review, the examiner issued

[1]Examination documents are publicly available in the USPTO's Patent Center at `https://patentcenter.uspto.gov/`.

[2]More information about the application data sheet is available at `https://www.uspto.gov/sites/default/files/documents/Understanding%20the%20Application%20Data%20Sheet%20%28ADS%29.pdf`.

another rejection because of remaining issues with the amended application. Shortly after, the applicant initiated an interview where the examiner "noticed some features which appeared different from the prior art," and "spent some time drafting several claims for Applicant's consideration." After one more interview where the applicant asked about a few changes and the examiner agreed, the application was allowed.

1.2 Identifying applicant-examiner interviews and examiner's amendments

Using the transaction history data from PatEx, we obtain information on the occurrence of applicant-examiner interviews and examiner's amendments, linking these events to applications in our sample. Specifically, we record the instance of a real-time interview if any one of the transaction codes "MEXIE", "MEXET", "MEXEP", "MEXIA", "MEXAT" or "MEXAP" appear in an application's transactions history. We create two additional variables: applicant- and examiner-initiated interviews to capture separately who initiated the interview. The examiner-initiated interview variable is equal to one if any one of the transaction codes "MEXIE", "MEXET", "MEXEP" appear in the applications transactions history. The applicant-initiated interview indicator is equal to one if "MEXIA", "MEXAT" or "MEXAP" appears in the application's transaction history. For recording examiner's amendments, we use the transactions code EX.A, setting the examiner's amendment variable equal to one if EX.A occurs in an application's transactions history.

1.3 Small and micro entity sample

To explore the percentage of women and men inventors that are associated with small and micro entities, as well as the generalizability of our results beyond pro se inventors, we analyze a dataset of over eight hundred thousand utility and non-continuation patent applications filed between November 29, 2000 and December 31, 2020. These applications are identified in PatEx by limiting the population of patent applications to non-continuation (i.e., no continuations, continuations in part, or divisionals), with small and micro entities identified using the variable "small_entity_indicator" in the application data. We link these applications to PatentsView and back to PatEx to obtain patent application and inventor data similar to those included in the RCT sample.

Summary statistics for the small and micro entity applications in our sample are presented in Table A1. As with the RCT summary statistics, we include all applications where every inventor

has a gender attribution in the PatentsView data. The applications in this sample have a higher rate of allowance (55.7%), broader applications at filing, larger team sizes, and a smaller share of applications with at least 50% women inventors (14.5%) than the RCT sample.

Using this sample, we estimate the gender patenting gap using the following linear probability model:

$$patent_a = \psi \cdot Gender_a + \tau \cdot X_a + \gamma_t + \gamma_k + \epsilon_a \tag{A1}$$

where $Gender_a$ is equal to 1 if there are at least 50% women on the inventor team for application a. The vector X_a is a set of application level covariates, including team size and average inventor experience when noted, and γ_t and γ_k represent first-action year and technology center fixed effects, respectively. The coefficient of interest is ψ, which captures the correlation between women teams and successfully obtaining a patent. If $\hat{\psi}$ is negative and statistically significant, then women inventor teams are less likely to receive a patent than men inventor teams when associated with small and micro entities. The estimates are contained in Table A2.

1.4 Attorney statistics

For all non-continuation applications filed between November 29, 2000 and December 31, 2020, we identify the set of attorneys associated with the application using the "atty_registration_number" from the PatEx "attorney_agent" table. For applications with more than one attorney registration number, we fractionalize the patent application when computing attorney experience. The attorney by application statistics, contained in Tables A3 and A4, only include applications filed after September 16 2011 since micro entity filing fees were not available before the America Invents Act.

1.5 Identifying pro se applications

This subsection provides additional details on identifying pro se applications. The PSPEU used an algorithm on internal USPTO PALM data to identify these applications. Although the query used internal data (the PALM database), after publication of the application all of the fields necessary to execute the query would be publicly available, and therefore obtainable from the Patent Examination Research Dataset (Graham et al. 2019). PALM is used to create PatEx, and therefore the fields should be identical between the internal and public data.

The first criterion of the PSPEU query was that the application be in status 20 or 30 indicating that the application was either in pre-examination, or docketed and awaiting examination. Status 20 is "Application Dispatched from Preexam, Not Yet Docketed" and status 30 is "Docketed New Case - Ready for Examination." This requirement ensured that the applications pulled for the Pilot had yet to be examined. The second criterion excluded applications with an associated attorney by removing applications with transactions codes N570 and N572 (indicating power of attorney communications). Finally, the query excluded reexamination, provisional, PCT, reissue, continuation, continuation-in-part, divisional and requests for continued examination. Provisionals, international designs, PCT, re-examinations and reissues were excluded by keeping application series less than 35. In PatEx, the application type field can be used to exclude these applications. Finally, continuations and continuations in part were excluded using the continuity data in PALM. This data is also publicly available in PatEx.

To identify all pro se applications filed between 2000 and 2020, used to compute each examiner‘s pre-RCT pro se grant rate (i.e., pro se applications beyond those selected for the RCT), we used a modified version of the pro se query. First, we removed the status 20 and 30 limitation from the original query to find all applications regardless of current docketing status. Second, we did not remove RCE and PCT applications, since these applications are generally pseudo-randomly assigned (Righi et al. 2019) and therefore provide information about each examiner‘s granting tendency. We still excluded continuations, continuations-in-part, divisionals and reexaminations since these applications are generally not randomly assigned (de Grazia et al. 2021).

Recall that the PSPEU manually reviewed the applications selected for the RCT to ensure an attorney was not present. To broaden the sample to all pro se applications, we could not feasibly manually review each application. For this reason, we added several additional criterion to the original approach. First, we added additional image file wrapper codes that indicate a power of attorney correspondence, including "PA.." and "PA.LIST". Second, we excluded all applications with an attorney/agent listed in the PatEx dataset. Finally, we removed applications with acronyms, names, etc. that indicated likely law firm or company correspondence names; for example, "law", "llc", "llp", "p.a".

The resulting dataset includes all pro se utility applications in the PatEx dataset that were not continuations, continuations in part, reexaminations or reissues (i.e. new applications). Table A24

estimates equation A1 to identify the gender gap for this broader sample of pro se applications, while Columns (1)-(3) in Table A25 uses a similar equation to estimate the gender gap in examiner's amendment for this sample.

1.6 Office action data

We used two first Office action characteristics in our analysis: (1) page length and (2) whether the word "encourage" was used. We obtained the number of pages in the first Office action from Image File Wrapper (IFW) meta data. While we used an internal version of this dataset, it is publicly available in the 2022 release of PatEx.[3] From the IFW data, we extracted the first action for each application in our sample as the first instance of the document codes "CTNF", "NOA", "CTEQ" and "CTFR." The length of the first Office action is the number of pages in this first document.

The first step for the encouragement indicator is to obtain the Office action text. This data is available from the USPTO's Office Action Text Retrieval API (Office Action Text Retrieval API 2022).[4] The first Office action identifying information, including the "obsolete document identifier" needed to download the text from the API, was obtained from IFW. Next, we identified the use of the word "encourage" in all first Office actions for applications in our sample. 33.51 percent of the first Office actions issued to treated applications used "encourage," while only 9.28 percent of first actions in the control did. To analyze the significance of "encourage" in Office actions, we randomly sampled 5 office actions that used the word "encourage" from both the treatment and the control groups. The sentences containing "encourage" are provided below, and show that (1) the word "encourage" is often used by examiners to request that the applicant do something, and (2), encourage is often associated with requesting that the applicant initiate an interview. For example, two of the five randomly sampled office actions in the treatment stated "if applicant does not receive a courtesy call from the examiner within one calendar month, then applicant is invited, and encouraged, to contact the examiner to expedite prosecution."

To explore the relationship between using the word "encourage" in Office actions and subsequent initiation of interviews by the applicant, we estimate a model with interviews as the dependent variable (separately for all interviews, examiner initiated and applicant initiated), and

[3] Available at `https://www.uspto.gov/sites/default/files/documents/oce-patex-technical-addendum-2022.pdf`

[4] Available at `https://developer.uspto.gov/api-catalog/uspto-office-action-text-retrieval-api`

whether "encourage" was used in the Office action as an independent variable, along with TC by RCT round fixed effects. The results are contained in Table A5 and show that "encourage" is positively correlated with applicant initiated interviews, but not examiner initiated interviews. These results suggest that more "encouraging" language in Office actions may lead to more real-time communication between the examiner and applicant through interviews initiated by the applicant.

Treatment Office actions that use "encourage"

1. Application number 14,545,279 - "To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at `http://www.uspto.gov/interviewpractice`."

2. Application number 13,870,887 - "Applicant is encouraged to reference the prior art cited for proper formatting and content," "If applicant does not receive a courtesy call from the examiner within the noted time, then applicant is invited, and encouraged, to contact the examiner to expedite prosecution" and "While the advice is not required, it is encouraged in order to best protect the applicant's interests."

3. Application number 13,987,623 - "The disclosure is objected to because of the following informalities: Applicant is encouraged to proof read the written description."

4. Application number 14,242,187 - "If applicant does not receive a courtesy call from the examiner within one calendar month, then applicant is invited, and encouraged, to contact the examiner to expedite prosecution," and "While the advice is not required, it is encouraged in order to best protect the applicant's interests."

5. Application number 14,176,117 - "If applicant does not receive a courtesy call from the examiner within the noted time, then applicant is invited, and encouraged, to contact the examiner to expedite prosecution" and "While the advice is not required, it is encouraged in order to best protect the applicant's interests."

Control Office actions that use "encourage"

1. Application number 13,922,213 - "Applicants are encouraged to file the power of attorney form: Form AIA/81 which may be found under the patent forms section of the Patent Office website (www.uspto.gov)."

2. Application number 14,679,011 - "Applicant is encouraged to submit form PTO/SB/439 to accommodate email correspondence."

3. Application number 14,747,040 - "To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at `http://www.uspto.gov/interviewpractice`."

4. Application number number 14,530,722 - "The Applicant is encouraged to call the Examiner to discuss possible amendments to the claims."

5. Application number 13,871,237 - "To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at `http://www.uspto.gov/interviewpractice`."

1.7 Other non-parametric estimators and statistical tests

As a robustness check, we re-estimate the ATEs from our main analysis using other parametric and semi-parametric estimators and non-parametric statistical tests. First, under stratified randomization, linear regression models with strata fixed effects for ATEs (like our Equation 1, except without the gender specific treatment effect) produce consistent estimates of population ATEs if (1), the probability of treatment is 50 percent within each strata, or (2), ATEs are homogeneous across strata (Imbens and Rubin 2015). If neither of these conditions are true, a consistent estimate of the ATE can be obtained by including weighted treatment interactions for each strata, as in the following:

$$Y_{ai} = \nu \cdot W_i \cdot \frac{B_i(J)}{N(J)/N} + \sum_{j=1}^{J} \beta_j B_i(j) + \sum_{j=1}^{J-1} \gamma(j) \cdot W_i \left(B_i(j) - B_i(J) \cdot \frac{N(j)}{N(J)} \right) + \epsilon_{at} \qquad \text{(A2)}$$

where a is for application, i is for inventor, $B_i(j)$ is an indicator for whether inventor-application observation i is in strata j, W_i represents the treatment indicator, $N(j)$ represents the number of inventor-application observations in strata j, N is the number of inventor-application observations across treatment and control groups, and Y is a binary indicator equal to one if the patent application is granted, zero otherwise. Similar to Equation 1, we define strata as Technology Center-by-RCT round.

In our sample, applications were divided between the treatment and control within each TC by RCT round with approximately 50 percent probability. However, the final distribution between the treatment and control may differ within each TC-round for a few reasons, including (1) that after treatment assignment, applications were manually evaluated to make sure the applications were in fact pro se, (2) we dropped application observations where at least one inventor had an unknown gender attribution and those that were not publicly available, and (3) we identified the original technology center at assignment from internal docketing records, which may have introduced error (the original technology centers used at assignment were not recorded with the treatment assignment data). Since treatment assignment within strata may deviate slightly from perfect 50 percent balance, we expect that estimates from a modified Equation 1 (without the $Gender_i \cdot treatment_a$ term) and Equation A2 should produce very similar but perhaps not identical ATE estimates. Table A6 provides the estimates from both regression specifications on three samples: (1) all applications, (2) applications with women inventor teams and (3), men inventor teams. Overall, the estimated coefficients are indistinguishable, indicating either minimal heterogeneity or more likely, treatment probabilities that are close enough to 50 percent within each TC by RCT round.

Next, we assess the robustness of our ATE estimates by using the inverse probability weight (IPW) semi-parametric estimator (Wooldridge 2010). The IPW estimator is consistent for the population ATE under unconfoundedness and overlap provided that the functional form for the treatment probabilities is properly specified. Since our sample was created using stratified randomization, either probit or logit will produce the correct treatment probabilities within strata, ensuring that the IPW estimator is consistent. Table A7 provides the IPW estimates on three samples: (1) all applications, (2) women inventor teams, and (3) men inventor teams. Overall, the results are generally consistent with the estimates we obtained using equation 1, where the IPW estimate for men inventors is 5.8 percentage points (relative to 5.85 percentage points from our main estimates), and 17.7 percentage points for women inventors (relative to 18.15 percentage points from our main estimates).

Finally, we assess the robustness of the statistical significance of our ATE estimates using non-parametric methods. Specifically, we implement Fisher's Exact P-value method (Fisher 1935) for stratified random experiments to test the sharp null that, for each observation, the treatment effect is zero (i.e., $H_0 : \tau_i = 0 \ \forall i$ and $H_1 : \tau_i \neq 0$ for at least one i). We use the following test statistic

(Imbens and Rubin 2015):

$$T = \left| \sum_{s} \frac{N(j)}{N} \left(\bar{Y}_t(s) - \bar{Y}_c(s) \right) \right| \tag{A3}$$

where j is for strata, N is the number of application observations in the sample, $N(j)$ is the number of applications in strata j, $\bar{Y}_t(j)$ is the mean in the treatment across application observations within strata j, and $\bar{Y}_c(j)$ is the mean in the control across applications within strata j. This test statistic is the absolute value of the weighted average strata differences in mean treatment and mean control outcomes (weighted by strata shares). We randomly simulate 1000 statistics under the null hypothesis. The results are contained in Table A8, and for each sample (all applications, applications from women inventor teams, and applications from men inventor teams) we are able to reject the null hypothesis that all treatment effects are zero (with p-values ranging from a low of .001 to a high of .017).

1.8 The impact of the intervention by Technology Center

Finally, we explore the possibility of differences in heterogeneous gender ATEs across technologies. In Table A9, we re-estimate Equation 1 separately for each USPTO technology center (definitions of the technology centers are available in Table A31). Although the data becomes somewhat sparse for certain TCs (ranging from 123 observations for TC 2100 to 783 observations for TC 3700), we find that the relative patenting rate for women teams versus men teams in the control group varies significantly across technology centers. The largest gender gap exists in TCs 2100 (Computer Architecture Software and Information Security), where women teams in the control group are 30.7 percentage points less likely to receive a patent than men teams in the control group, respectively. On the other hand, women are 30 percentage points *more* likely to receive a patent in TC 1700 (Chemical and Materials Engineering) than men in the control group.[5] Finally, while the heterogeneous treatment effect is not always statistically significant, it is generally positive (with the exception of TC1700). Due to the small sample sizes within each technology center however,

[5] Although this is an interesting finding, we interpret the TC 1700 results with caution since the control group for TC 1700 appears to be substantially different from the other TC control groups. Most significantly, the grant rate for the TC 1700 control was 64 percent, which is likely due to sampling error. We note that this grant rate is not only far higher than the other TC control groups in our sample, but also larger than the broader TC 1700 allowance rate that includes non-pro se applications (e.g., the allowance rates for the other pro se control groups, by TC, are far less than their broader allowance rates).

these estimates may be prone to sampling error.

1.9 Additional Tables

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Patent grant	818,589	0.557	0.497	0	1
Ind. claim count (ICC - Grant)	455,838	2.259	1.514	0	60
Ind. claim length (ICL - Grant)	455,834	183.4	123.9	1	8,894
Ind. claim count (ICC - PGPub)	725,365	2.625	2.358	0	523
Ind. claim length (ICL - PGPub)	724,984	108.5	95.70	1	10,747
Team size	818,589	1.844	1.309	1	27
ΔICC ($ICC_{GRANT} - ICC_{PGPUB}$)	362,614	-0.396	2.329	-520	45
ΔICL ($ICL_{GRANT} - ICL_{PGPUB}$)	362,529	62.09	94.17	-5,059	5,245
Proportion of women	818,589	0.131	0.292	0	1
Inventor experience (Prior applications)	818,589	6.662	40.62	0	2,840
Proportion of U.S. inventors	818,589	0.613	0.481	0	1
Proportion of new inventors	818,589	0.438	0.454	0	1
At least 50% women	818,589	0.145	0.352	0	1
At least 50% U.S. inventors	818,589	0.619	0.486	0	1
At least 50% new inventors	818,589	0.472	0.499	0	1

This sample contains all publicly-available non-continuation applications filed between November 29, 2000 and December 31, 2020 that are associated with a small or micro entity. ICC, or independent claim count, is the number of independent claims. ICL, or independent claim length, is measured by the number of words in the shortest independent claim. These variables are measured both at pre-grant publication (PGPub) and at patent grant (if applicable). Inventor exp. (prior applications) is the average number of previously filed applications by the inventors. At least 50% new inventor is equal to one if at least 50% of the inventors on the team have not previously filed a patent application. Proportion of new inventors is the share of inventors that have not filed a prior application.

Table A1: Summary statistics for the small/micro entity sample

	(1) Patent	(2) Patent	(3) Patent	(4) Patent	(5) Patent	(6) Patent
At least 50% women	-0.0571***	-0.0532***	-0.0510***	-0.0593***	-0.0316***	-0.0638***
	(0.00157)	(0.00153)	(0.00153)	(0.00206)	(0.00365)	(0.00257)
Avg. inventor exp.			-9.16e-05***	0.000683***	0.000321***	0.00267***
			(1.04e-05)	(7.03e-05)	(5.72e-05)	(0.000368)
Team size			0.0181***	0.0177***	0.0180***	0.0165***
			(0.000422)	(0.000543)	(0.000702)	(0.000878)
Observations	821,987	818,589	818,589	506,634	252,948	245,508
TC FE	NO	YES	YES	YES	YES	YES
FAOM YR FE	NO	YES	YES	YES	YES	YES
Sample	All	All	All	U.S. Inv.	Exp. U.S. Inv.	New U.S. Inv.

Significant at *** p<0.01, ** p<0.05, * p<0.10. Heteroskedasticity robust standard errors are provided in parentheses. The unit of observation is a patent application and the dependent variable, Patent, is a binary indicator equal to one if the focal application was granted by the USPTO. 'TC' is an abbreviation for technology center, with definitions provided in Table A31. Average inventor experience is equal to the average number of previously filed patent applications across all inventors associated with the application, and team size is defined as the number of inventors listed on the patent application. At least 50% women is a binary variable that is equal to one if at least 50 percent of inventors listed on the patent application are women inventors. The 'U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States. The 'Experienced U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States and at least 50% of whom have at least one prior patent filing. The 'New U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States and at least 50% of whom have not filed a prior patent application.

Table A2: Probability of receiving a patent for small/micro entities

	Attorney experience	
Entity size	Mean	Median
Micro	273.72	151.96
Small	274.83	146.03
Undiscounted	467.53	209.61

Attorney experience is calculated using fractionalized application counts (i.e., an attorney earns (1/N) experience per application where N is equal to the number of attorneys associated with the application in PatEx. Sample includes all non-continuation applications filed between September 16, 2011 and December 31, 2020.

Table A3: Attorney experience by applicant entity size (micro, small and undiscounted)

		Mean			
Attorney exp.	Attorney grant rate	ICC	ΔICC	ICL	ΔICL
Quintile 1	.729	2.81	-0.31	117.23	60.51
Quintile 2	.725	2.62	-0.20	122.01	60.68
Quintile 3	.743	2.59	-0.14	122.84	57.59
Quintile 4	.755	2.59	-0.08	123.23	55.98
Quintile 5	.747	2.2	-0.008	135.06	51.83

ICC, or independent claim count, is measured by the number of independent claims in the granted patent. ICL, or independent claim length, is measured by the number of words in the granted patent's shortest independent claim. ΔICC and ΔICL represent the change in application scope over the course of patent prosecution, calculated using a difference (scope variable at grant minus scope variable at pre-grant publication). Sample includes all non-continuation applications filed between September 16, 2011 and December 31, 2020.

Table A4: Patent and examination characteristics by attorney experience quintiles

	(1)	(2)	(3)
VARIABLES	All interviews	Examiner interviews	Applicant interviews
"Encourage"	0.0967***	-0.00297	0.0926***
	(0.0249)	(0.00826)	(0.0247)
Observations	2,208	2,208	2,208
TC-by-round FE	YES	YES	YES
Obs.-Level	Application	Application	Application

Significant at *** p<0.01, ** p<0.05, * p<0.10. Standard errors are heteroskedasticity robust. 'TC' is for technology center, with definitions provided in Table A31 and 'round' is for RCT round. The regression is estimated at the application observation level. "Encourage" is a binary indicator for whether the first Office action contains the word "encourage."

Table A5: The association between "encouragement" in first Office actions and interviews

VARIABLES	(1) Patent	(2) Patent	(3) Patent	(4) Patent	(5) Patent	(6) Patent
Average treatment effect	0.0786***	0.0773***	0.160***	0.157***	0.0584***	0.0572***
	(0.0203)	(0.0203)	(0.0500)	(0.0488)	(0.0222)	(0.0222)
Observations	2,273	2,273	361	361	1,912	1,912
Weighted TC-by-round interactions	NO	YES	NO	YES	NO	YES
Obs.-Level	Application	Application	Application	Application	Application	Application
Sample	All	All	Women inv. teams	Women inv. teams	Men inv. teams	Men inv. teams

Significant at *** p<0.01, ** p<0.05, * p<0.10. Standard errors are heteroskedasticity robust. All models are estimated at the application observation level. 'TC' is an abbreviation for technology center, with definitions provided in Table A31 and 'round' represents the RCT round. Columns (1), (3) and (5) include TC-by-round fixed effects, and Columns (2), (4), and (6) include TC-by-round fixed effects in addition to the weighted interactions specified in Equation A2. Columns (1) and (2) include all observations, Columns (3) and (4) include all applications where at least 50 percent of inventors listed on the application are women inventors (women inventor teams), and Columns (5) and (6) include applications where at least 50 percent of inventors listed on the application are men inventors (men inventor teams).

Table A6: Other parametric estimators

VARIABLES	(1) Patent	(2) Patent	(3) Patent
ATE	0.077***	0.177***	0.058***
	(0.02)	(0.05)	(0.022)
Observations	2,273	361	1,912
Sample	All	Women inv. teams	Men inv. teams

Significant at *** p<0.01, ** p<0.05, * p<0.10. Standard errors are heteroskedasticity robust. All models are estimated at the application observation level. Column (1) includes all observations. Column (2) contains all applications where at least 50 percent of inventors listed on the application are women inventors (women inventor teams). Column (3) contains applications where at least 50 percent of inventors listed on the application are men inventors (men inventor teams).

Table A7: Inverse probability weighted non-parametric estimates

VARIABLES	(1) Patent	(2) Patent	(3) Patent
Test statistic	0.0773***	0.1568***	0.0572**
P-value	0.001	0.001	0.017
Observations	2,273	361	1,912
Sample	All	Women inv. teams	Men inv. teams

Significant at *** p<0.01, ** p<0.05, * p<0.10. Test statistic is the absolute value of the weighted average strata differences in mean treatment and mean control (weighted by strata shares) (See Equation A3). Fisher's Exact P-value Test is run at the application observation level. Column (1) includes all observations. Column (2) contains all applications where at least 50 percent of inventors listed on the application are women inventors (women inventor teams). Column (3) contains applications where at least 50 percent of inventors listed on the application are men inventors (men inventor teams).

Table A8: Fisher's exact p-value test

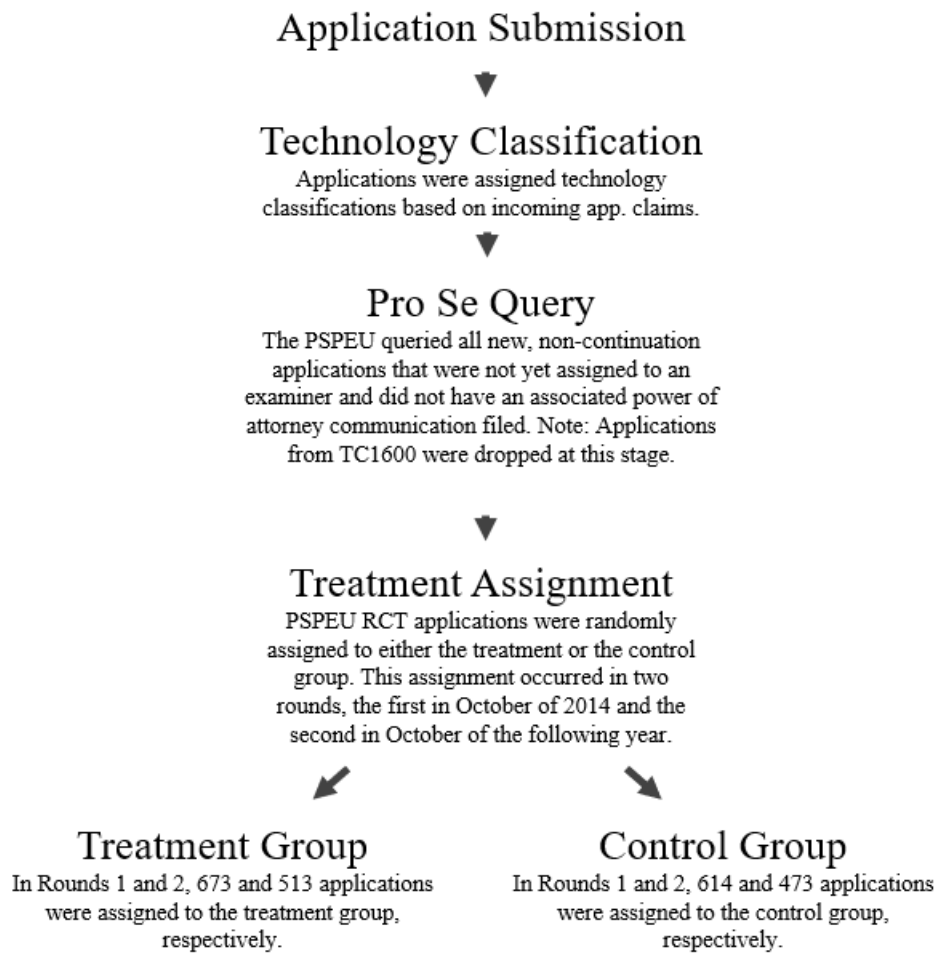

Figure A1: Flow of applications from submission to treatment and control assignment

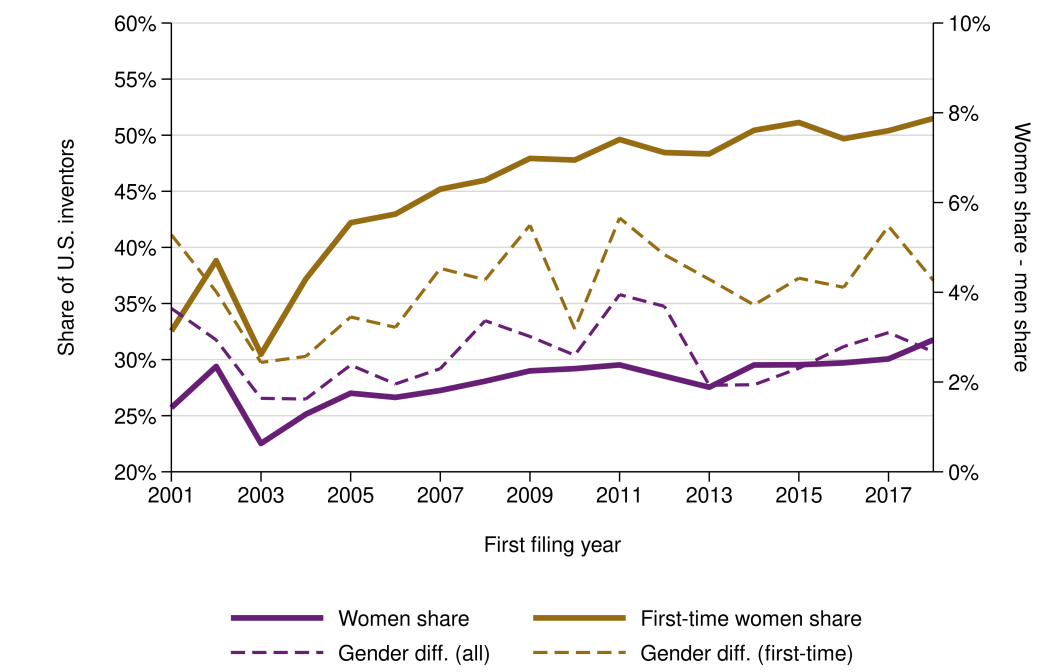

Figure A2: Percentage of U.S. women inventors and first-time U.S. women inventors that are associated with small and micro entities (solid lines; axis on the left). Includes the difference in shares between men and women inventors (dashed lines; axis on the right).

	(1) Patent	(2) Patent	(3) Patent	(4) Patent	(5) Patent	(6) Patent	(7) Patent
Treated	-0.119	0.157*	0.181**	-0.0735	0.0641	0.00603	0.108***
	(0.106)	(0.0930)	(0.0828)	(0.0787)	(0.0561)	(0.0440)	(0.0380)
At least 50% women	0.300**	-0.307***	0.0898	-0.171	0.0854	-0.0458	-0.0739
	(0.127)	(0.0744)	(0.193)	(0.132)	(0.111)	(0.0772)	(0.0592)
Treated x At least 50% women	-0.170	0.355	0.177	0.484***	0.0876	0.288**	0.0420
	(0.180)	(0.289)	(0.260)	(0.183)	(0.146)	(0.115)	(0.0857)
Mean of dep. var. in control	0.64	0.28	0.28	0.44	0.49	0.29	0.30
Observations	137	123	150	194	373	513	783
Round FE	YES	YES	YES	YES	YES	YES	YES
Sample	TC 1700	TC 2100	TC 2400	TC 2600	TC 2800	TC 3600	TC 3700
Obs.-Level	Application	Application	Application	Application	Application	Application	Application

Significant at *** p<0.01, ** p<0.05, * p<0.10. Standard errors are heteroskedasticity robust. The unit of observation is a patent application and the dependent variable, Patent, is a binary indicator equal to one if the application was granted by the USPTO. 'round' represents the RCT round and all regressions include 'round' fixed effects. At least 50% women is a binary variable that is equal to one if at least 50 percent of inventors listed on the application are women inventors. TC 1700 is Chemical and Materials Engineering; TC 2100 is Computer Architecture, Software and Information Security; TC 2400 is Computer Networks, Multiplex, Cable and Cryptography/Security; TC 2600 is Communications; TC 2800 is Semiconductors, Electrical and Optical Systems and Components; TC 3600 is Transportation, Electronic Commerce, Construction and Agriculture; TC 3700 is Mechanical Engineering, Manufacturing and Products.

Table A9: Probability of receiving a patent by Technology Center

VARIABLES	(1) ICC	(2) ICL	(3) Modified FA Allow
Treated	-0.128	-3.671	-0.0210**
	(0.115)	(11.90)	(0.00876)
At least 50% women	0.753	-11.09	-0.00652
	(0.700)	(22.62)	(0.0172)
Treated x At least 50% women	-0.714	6.269	0.0193
	(0.712)	(29.15)	(0.0227)
Inc. scope (ICC - PgPub)	0.157***	4.336*	
	(0.0484)	(2.224)	
Inc. scope (ICL - PgPub)	-0.000259	0.747***	
	(0.000301)	(0.107)	
Observations	582	582	1,877
TC-by-round FE	YES	YES	YES

Significant at *** p<0.01, ** p<0.05, * p<0.10. Standard errors are heteroskedasticity robust. The unit of observation is at the application level. ICC, or independent claim count, is measured by the number of independent claims in the granted patent. ICL, or independent claim length, is measured by the number of words in the granted patent's shortest independent claim. Modified First-action (FA) Allow is a binary indicator equal to one if the application was allowed on the first action without an examiner's amendment, zero otherwise. Incoming scope variables represent independent claim count and length, measured at pre-grant publication (PGPub). 'TC' is an abbreviation for technology center, with definitions provided in Table A31 and 'round' represents the RCT round. At least 50% women is a binary variable that is equal to one if at least 50 percent of inventors listed on the application are women inventors. The sample includes applications that do not have inventors that appear in both treatment and control groups (i.e., the 'non-spillover sample').

Table A10: Examination and patent quality in the PSPEU RCT – Non-spillover Sample

	(1) Patent	(2) Patent	(3) Patent	(4) Patent	(5) Patent	(6) Patent
Treated	0.00783	-0.0238	-0.00851	0.00604	0.0249	0.0244
	(0.0264)	(0.0300)	(0.0254)	(0.0254)	(0.0251)	(0.0251)
At least 50% women	-0.101**	-0.102**	-0.0872**	-0.112***	-0.0916**	-0.0846*
	(0.0410)	(0.0407)	(0.0422)	(0.0433)	(0.0442)	(0.0441)
Treated x At least 50% women	0.159***	0.155**	0.137**	0.165***	0.151**	0.153**
	(0.0603)	(0.0603)	(0.0608)	(0.0614)	(0.0625)	(0.0625)
Examiner exp.	0.00725***					
	(0.00193)					
Historical grant rate			0.466***			
			(0.0613)			
Historical pro se grant rate				0.345***		
				(0.0543)		
Historical gender difference grant rate					0.290***	0.364***
					(0.102)	(0.115)
Historical gender difference grant rate x At least 50% women						-0.384
						(0.241)
Observations	1,868	1,880	1,819	1,772	1,801	1,801
TC-by-round FE	YES	YES	YES	YES	YES	YES
Position Factor FE	NO	YES	NO	NO	NO	NO

Significant at *** p<0.01, ** p<0.05, * p<0.10. Standard errors are heteroskedasticity robust. The unit of observation is a patent application and the dependent variable, Patent, is a binary indicator equal to one if the application was granted by the USPTO. 'TC' is an abbreviation for technology center, with definitions provided in Table A31 and 'round' represents the RCT round. At least 50% women is a binary variable that is equal to one if at least 50 percent of inventors listed on the application are women inventors. Examiner experience is the number of years between the examiner's start date and the first action date of the application. The historical examiner grant rate is the examiner's proportion of pre-RCT disposed applications that were allowed. Position factors are the adjustments applied to examiner expected outputs, and vary by seniority (along the general service, or GS, scale). The historical pro se grant rate is the examiner's pre-RCT grant rate for pro se applications. The historical grant rate gender difference is the difference between the examiner's pre-RCT grant rate for men versus women inventor teams. The sample includes applications that do not have inventors that appear in both treatment and control groups (i.e., the 'non-spillover sample').

Table A11: Explaining the treatment – Examiner characteristics – Non-spillover Sample

VARIABLES	(1) Encourage	(2) FAOM page length	(3) FAOM page length	(4) All interviews	(5) Ex.a	(6) Ex.a	(7) Ex.a	(8) Ex.a
Treated	0.377***	-0.603*	1.092**	0.0430**	0.0590***	0.0448*	0.0610*	0.0318
	(0.0351)	(0.336)	(0.426)	(0.0219)	(0.0209)	(0.0247)	(0.0351)	(0.0346)
At least 50% women	-0.0387	-0.858	-0.728	0.00293	-0.0774**	-0.0845**	-0.0245	-0.0929**
	(0.0491)	(0.714)	(0.690)	(0.0411)	(0.0320)	(0.0381)	(0.0845)	(0.0443)
Treated x At least 50% women	0.0536	0.854	0.748	0.0589	0.0993*	0.140**	0.0131	0.184**
	(0.0873)	(0.808)	(0.788)	(0.0584)	(0.0509)	(0.0600)	(0.119)	(0.0715)
Observations	1,828	1,828	1,828	1,881	1,881	1,448	719	729
TC-by-round FE	YES	YES	YES	YES	YES	YES	YES	YES
Position Factor FE	NO	NO	YES	No	No	NO	NO	NO
Sample	All	All	All	All	All	U.S.	Exp. U.S.	New U.S.

Significant at *** p<0.01, ** p<0.05, * p<0.10. Standard errors are heteroskedasticity robust. 'TC' is an abbreviation for technology center, with definitions provided in Table A31 and 'round' represents the RCT round. At least 50% women is a binary variable that is equal to one if at least 50 percent of inventors listed on the application are women inventors. Position factors are the adjustments applied to examiner expected outputs, and vary by seniority (along the general service, or GS, scale). 'Encourage' (Column 1) is a binary indicator equal to 1 if the word encourage appears in the first Office action, zero otherwise. 'FAOM Page Length' (Columns 2-3) is equal to the length (in pages) of the first Office action. 'All interviews' (Column 4) is a binary indicator equal to one if an interview occurs during patent examination. 'Ex.a' (Columns 5-8) is a binary indicator equal to one if the application had an examiner's amendment, zero otherwise. The 'U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States. The 'Experienced U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States and at least 50% of whom have at least one prior patent filing. The 'New U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States and at least 50% of whom have not filed a prior patent application. The unit of observation is at the application level. The sample includes applications that do not have inventors that appear in both treatment and control groups (i.e., the 'non-spillover sample').

Table A12: Explaining the treatment – Intermediate application outcomes – Non-spillover Sample

	(1) Patent	(2) Patent	(3) Patent	(4) Patent	(5) Patent	(6) Patent
Treated	0.0553**	0.0448*	0.0439*	0.0312	0.00558	0.0678*
	(0.0254)	(0.0254)	(0.0255)	(0.0290)	(0.0415)	(0.0398)
At least 50% women	-0.0874**	-0.0851**	-0.0861**	-0.127***	-0.0569	-0.0961*
	(0.0443)	(0.0429)	(0.0432)	(0.0467)	(0.112)	(0.0524)
Treated x At least 50% women	0.129**	0.123**	0.125**	0.186***	0.154	0.153*
	(0.0633)	(0.0622)	(0.0623)	(0.0688)	(0.152)	(0.0795)
Inventor exp.			0.000614			
			(0.00114)			
Team size			0.0105			
			(0.0184)			
Observations	1,723	1,723	1,723	1,337	620	717
TC-by-round FE	NO	YES	YES	YES	YES	YES
Sample	All	All	All	U.S. Inv.	Exp. U.S. Inv.	New U.S. Inv.

Significant at *** p<0.01, ** p<0.05, * p<0.10. Standard errors are heteroskedasticity robust. The unit of observation is a patent application and the dependent variable, Patent, is a binary indicator equal to one if the application was granted by the USPTO. 'TC' is an abbreviation for technology center, with definitions provided in Table A31 and 'round' represents the RCT round. Average inventor experience is the average number of previously filed patent applications across all inventors associated with the application, and team size is the number of inventors on the patent application team. At least 50% women is a binary variable that is equal to one if at least 50 percent of inventors on the patent application team are women inventors. The 'U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States. The 'Experienced U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States and at least 50% of whom have at least one prior patent filing. The 'New U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States and at least 50% of whom have not filed a prior patent application. The sample includes applications where all inventors had a single application in the RCT.

Table A13: Probability of receiving a patent in the RCT– Applications where all inventors had a single application in the RCT sample

VARIABLES	(1) ICC	(2) ICL	(3) Modified FA Allow
Treated	-0.109	-2.566	-0.0194**
	(0.119)	(10.88)	(0.00915)
At least 50% women	0.801	-9.176	-0.0113
	(0.721)	(22.08)	(0.0162)
Treated x At least 50% women	-0.839	13.56	0.0109
	(0.734)	(29.04)	(0.0205)
Inc. scope (ICC - PgPub)	0.144***	4.180**	
	(0.0484)	(2.059)	
Inc. scope (ICL - PgPub)	-0.000449	0.656***	
	(0.000299)	(0.0991)	
Observations	529	529	1,721
TC-by-round FE	YES	YES	YES

Significant at *** p<0.01, ** p<0.05, * p<0.10. Standard errors are heteroskedasticity robust. The unit of observation is an application. ICC, or independent claim count, is measured by the number of independent claims in the granted patent. ICL, or independent claim length, is measured by the number of words in the granted patent's shortest independent claim. Modified First-action (FA) Allow is a binary indicator equal to one if the application was allowed on the first action without an examiner's amendment, zero otherwise. Incoming scope variables represent independent claim count and length, measured at pre-grant publication (PGPub). 'TC' is an abbreviation for technology center, with definitions provided in Table A31 and 'round' represents the RCT round. At least 50% women is a binary variable that is equal to one if at least 50 percent of inventors on the patent application team are women inventors. The sample includes applications where all inventors had a single application in the RCT.

Table A14: Examination and patent quality in the RCT– Applications where all inventors had a single application in the RCT sample

	(1) Patent	(2) Patent	(3) Patent	(4) Patent	(5) Patent	(6) Patent
Treated	0.00523	-0.0335	-0.0104	0.00570	0.0221	0.0215
	(0.0275)	(0.0317)	(0.0266)	(0.0265)	(0.0262)	(0.0262)
At least 50% women	-0.0852**	-0.0892**	-0.0708	-0.0959**	-0.0764*	-0.0689
	(0.0425)	(0.0423)	(0.0439)	(0.0452)	(0.0459)	(0.0459)
Treated x At least 50% women	0.128**	0.126**	0.107*	0.136**	0.120*	0.121*
	(0.0620)	(0.0620)	(0.0626)	(0.0634)	(0.0643)	(0.0643)
Examiner exp.	0.00757***					
	(0.00202)					
Historical grant rate			0.452***			
			(0.0636)			
Historical pro se grant rate				0.344***		
				(0.0569)		
Historical gender difference grant rate					0.259**	0.337***
					(0.105)	(0.120)
Historical gender difference grant rate x At least 50% women						-0.390
						(0.248)
Observations	1,713	1,722	1,670	1,625	1,651	1,651
TC-by-round FE	YES	YES	YES	YES	YES	YES
Position Factor FE	NO	YES	NO	NO	NO	NO

Significant at *** p<0.01, ** p<0.05, * p<0.10. Standard errors are heteroskedasticity robust. The unit of observation is a patent application and the dependent variable, Patent, is a binary indicator equal to 1 if the application was granted by the USPTO. 'TC' is an abbreviation for technology center, with definitions provided in Table A31 and 'round' represents the RCT round. At least 50% women is a binary variable that is equal to 1 if at least 50 percent of inventors listed on the application are women inventors. Examiner experience is the number of years between the examiner's start date and the first action date of the application. The historical examiner grant rate is the examiner's proportion of pre-RCT disposed applications that were allowed. Position factors are the adjustments applied to determine examiner expected outputs, and vary by seniority (along the general service, or GS, scale). The historical pro se grant rate is the examiner's pre-RCT grant rate for pro se applications. The historical grant rate gender difference is the pre-RCT difference between the examiner's grant rate for men versus women inventor teams. The sample includes applications where all inventors had a single application in the RCT.

Table A15: Explaining the treatment– Examiner characteristics– Applications where all inventors had a single application in the RCT sample

VARIABLES	(1) Encourage	(2) FAOM page length	(3) FAOM page length	(4) All interviews	(5) Ex.a	(6) Ex.a	(7) Ex.a	(8) Ex.a
Treated	0.381***	-0.479	1.207***	0.0288	0.0525**	0.0333	0.0395	0.0326
	(0.0380)	(0.343)	(0.459)	(0.0232)	(0.0219)	(0.0256)	(0.0374)	(0.0350)
At least 50% women	-0.0339	-0.726	-0.577	0.00760	-0.0725**	-0.0825**	0.0282	-0.0937**
	(0.0521)	(0.741)	(0.716)	(0.0431)	(0.0335)	(0.0400)	(0.1000)	(0.0445)
Treated x At least 50% women	0.0234	0.804	0.690	0.0615	0.105**	0.153**	-0.00215	0.184**
	(0.0908)	(0.840)	(0.818)	(0.0607)	(0.0528)	(0.0622)	(0.137)	(0.0718)
Observations	1,673	1,673	1,673	1,723	1,723	1,337	620	717
R-squared	0.155	0.058	0.099	0.012	0.014	0.018	0.020	0.029
TC-by-round FE	YES	YES	YES	YES	YES	YES	YES	YES
PF FE	NO	NO	YES	No	No	NO	NO	NO
Sample	All	All	All	All	All	U.S.	Exp. U.S.	New U.S.
Obs.-Level	App.	App.	App.	App.	App.	App.	App.	App.

Significant at *** p<0.01, ** p<0.05, * p<0.10. Standard errors are heteroskedasticity robust. 'TC' is an abbreviation for technology center, with definitions provided in Table A31 and 'round' represents the RCT round. At least 50% women is a binary variable that is equal to 1 if at least 50 percent of inventors listed on the application are women inventors. Position factors are the adjustments applied to determine examiner expected outputs, and vary by seniority (along the general service, or GS, scale). 'Encourage' (Column 1) is a binary indicator equal to 1 if the word encourage appears in the first Office action, zero otherwise. 'FAOM Page Length' (Columns 2-3) is equal to the length (in pages) of the first Office action. 'All interviews' (Column 4) is a binary indicator equal to one if an interview occurs during patent examination. 'Ex.a' (Columns 5-8) is a binary indicator equal to 1 if the focal application had an examiner's amendment, zero otherwise. The 'U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States. The 'Experienced U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States and at least 50% of whom have at least one prior patent filing. The 'New U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States and at least 50% of whom have not filed a prior patent application. The unit of observation is at the application level. The sample includes applications where all inventors had a single application in the RCT.

Table A16: Explaining the treatment– Other examination characteristics– Applications where all inventors had a single application in the RCT sample

VARIABLES	(1) Patent	(2) Patent	(3) Patent
Treated	0.0585***	0.0586***	0.0584***
	(0.0222)	(0.0220)	(0.0220)
At least 50% women	-0.0118	-0.0122	-0.0137
	(0.0389)	(0.0405)	(0.0406)
Treated x At least 50% women	0.123**	0.118**	0.121**
	(0.0549)	(0.0546)	(0.0548)
Observations	2,273	2,273	2,273
TC-by-round FE	YES	YES	YES
Model	LPM	Logit	Probit

Significant at *** p<0.01, ** p<0.05, * p<0.10. Standard errors are heteroskedasticity robust. All models are estimated at the application level. Estimates are average partial effects, rather than coefficient estimates. 'TC' is an abbreviation for technology center, with definitions provided in Table A31 and 'round' represents the RCT round. Each regression contains TC-by-round fixed effects. LPM is for the linear probability model, Logit is for the logistic model and probit is for the probit model.

Table A17: Average partial effects for the probability of receiving a patent - Linear probability, Probit and Logit models

	(1) Patent	(2) Patent	(3) Patent	(4) Patent	(5) Patent	(6) Patent
Treated	0.0617***	0.0600***	0.0597***	0.0480*	0.0580*	0.0485
	(0.0224)	(0.0224)	(0.0224)	(0.0256)	(0.0335)	(0.0392)
At least one woman	0.000103	-0.00192	-0.00846	-0.0362	0.106	-0.0980*
	(0.0388)	(0.0375)	(0.0374)	(0.0420)	(0.0701)	(0.0507)
Treated x At least one woman	0.107**	0.105**	0.105**	0.163***	0.126	0.153**
	(0.0542)	(0.0529)	(0.0522)	(0.0599)	(0.0918)	(0.0768)
Inventor exp.			0.00183***			
			(0.000640)			
Team size			0.00580			
			(0.0152)			
Observations	2,273	2,273	2,273	1,733	977	756
TC-by-round FE	NO	YES	YES	YES	YES	YES
Sample	All	All	All	U.S. Inv.	Exp. U.S. Inv.	New U.S. Inv.

Significant at *** p<0.01, ** p<0.05, * p<0.10. Standard errors are heteroskedasticity robust. The unit of observation is a patent application and the dependent variable, Patent, is a binary indicator equal to one if the application was granted by the USPTO. 'TC' is an abbreviation for technology center, with definitions provided in Table A31 and 'round' represents the RCT round. Average inventor experience is equal to the average number of previously filed patent applications across all inventors associated with the application, and team size is defined as the number of inventors listed on the patent application. At least 50% women is a binary variable that is equal to 1 if at least 50 percent of inventors listed on the patent application are women. The 'U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States. The 'Experienced U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States and at least 50% of whom have at least one prior patent filing. The 'New U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States and at least 50% of whom have not filed a prior patent application. At least one woman is a binary variable that is equal to one if there is at least one woman listed on the focal patent application.

Table A18: Probability of receiving a patent in the RCT - Women inventor teams are those with at least one woman

	(1) Patent	(2) Patent	(3) Patent	(4) Patent	(5) Patent	(6) Patent
Treated	0.0702***	0.0678***	0.0664***	0.0579**	0.0633*	0.0611
	(0.0217)	(0.0216)	(0.0216)	(0.0247)	(0.0327)	(0.0374)
All women	-0.0276	-0.0241	-0.0223	-0.0627	0.0863	-0.144***
	(0.0460)	(0.0446)	(0.0439)	(0.0503)	(0.0866)	(0.0544)
Treated x All women	0.0922	0.0928	0.0974	0.160**	0.153	0.158*
	(0.0643)	(0.0635)	(0.0625)	(0.0722)	(0.116)	(0.0851)
Inventor exp.			0.00190***			
			(0.000643)			
Team size			0.0129			
			(0.0149)			
Observations	2,273	2,273	2,273	1,733	977	756
TC-by-round FE	NO	YES	YES	YES	YES	YES
Sample	All	All	All	U.S. Inv.	Exp. U.S. Inv.	New U.S. Inv.

Significant at *** p<0.01, ** p<0.05, * p<0.10. Standard errors are heteroskedasticity robust. The unit of observation is a patent application and the dependent variable, Patent, is a binary indicator equal to one if the application was granted by the USPTO. 'TC' is an abbreviation for technology center, with definitions provided in Table A31 and 'round' represents the RCT round. Average inventor experience is equal to the average number of previously filed patent applications across all inventors associated with the application, and team size is defined as the number of inventors listed on the patent application. At least 50% women is a binary variable that is equal to 1 if at least 50 percent of inventors listed on the patent application are women. The 'U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States. The 'Experienced U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States and at least 50% of whom have at least one prior patent filing. The 'New U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States and at least 50% of whom have not filed a prior patent application. 'All women' is a binary variable that is equal to one if all inventors listed on the focal patent application are women.

Table A19: Probability of receiving a patent in the RCT - Women inventor teams are those with all women inventors

	(1) Patent	(2) Patent	(3) Patent	(4) Patent	(5) Patent	(6) Patent
Treated	0.0635***	0.0615***	0.0607***	0.0500**	0.0583*	0.0498
	(0.0222)	(0.0222)	(0.0222)	(0.0254)	(0.0333)	(0.0387)
Proportion of women	-0.0160	-0.0150	-0.0196	-0.0557	0.108	-0.138**
	(0.0446)	(0.0433)	(0.0426)	(0.0489)	(0.0830)	(0.0551)
Treated x Proportion of women	0.119*	0.117*	0.119*	0.185***	0.163	0.183**
	(0.0624)	(0.0615)	(0.0606)	(0.0699)	(0.110)	(0.0848)
Inventor exp.			0.00186***			
			(0.000640)			
Team size			0.0106			
			(0.0148)			
Observations	2,273	2,273	2,273	1,733	977	756
TC-by-round FE	NO	YES	YES	YES	YES	YES
Sample	All	All	All	U.S. Inv.	Exp. U.S. Inv.	New U.S. Inv.

Significant at *** p<0.01, ** p<0.05, * p<0.10. Standard errors are heteroskedasticity robust. The unit of observation is a patent application and the dependent variable, Patent, is a binary indicator equal to one if the application was granted by the USPTO. 'TC' is an abbreviation for technology center, with definitions provided in Table A31 and 'round' represents the RCT round. Average inventor experience is equal to the average number of previously filed patent applications across all inventors associated with the application, and team size is defined as the number of inventors listed on the patent application. At least 50% women is a binary variable that is equal to 1 if at least 50 percent of inventors listed on the patent application are women. The 'U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States. The 'Experienced U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States and at least 50% of whom have at least one prior patent filing. The 'New U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States and at least 50% of whom have not filed a prior patent application. 'Proportion of women' is equal to the proportion of inventors listed on a focal patent application that are women.

Table A20: Probability of receiving a patent in the RCT - Women composition of inventor teams defined by the proportion of women inventors

VARIABLES	(1) Patent	(2) Patent	(3) Patent	(4) Patent	(5) Patent	(6) Patent
Treated	0.0619***	0.0607***	0.0594**	0.0469*	0.0526	0.0507
	(0.0240)	(0.0235)	(0.0234)	(0.0269)	(0.0327)	(0.0403)
Woman inv.	-0.0218	-0.0277	-0.0375	-0.0628*	0.0629	-0.134***
	(0.0361)	(0.0339)	(0.0339)	(0.0374)	(0.0590)	(0.0460)
Treated x Woman inv.	0.111**	0.107**	0.113**	0.150***	0.0797	0.179**
	(0.0504)	(0.0486)	(0.0482)	(0.0550)	(0.0803)	(0.0731)
Inventor exp.			0.00152***			
			(0.000445)			
Team size			0.0223			
			(0.0143)			
Observations	3,062	3,062	3,062	2,307	1,356	951
TC-by-round FE	NO	YES	YES	YES	YES	YES
Sample	All	All	All	U.S. Inv.	Exp. U.S. Inv.	New U.S. Inv.
Obs.-Level	Inventor	Inventor	Inventor	Inventor	Inventor	Inventor

Significant at *** p<0.01, ** p<0.05, * p<0.10. Standard errors are clustered at the application number level. Observations are at the inventor-application level. 'TC' is for technology center, with definitions provided in Table A31 and 'round' is for RCT round. Inventor experience is the number of previously filed patent applications for the focal inventor and team size is the number of inventors on the patent application team. New U.S. inventors are inventors in the U.S. where the focal application is their first patent application and Exp. U.S. Inventors are those U.S. inventors who have previously filed an application.

Table A21: Probability of receiving a patent in the RCT - Inventor level observations

	(1) Patent	(2) Patent	(3) Patent	(4) Patent	(5) Patent	(6) Patent
Treated	0.0688***	0.0732***	0.0733***	0.0608**	0.0917**	0.0290
	(0.0239)	(0.0238)	(0.0239)	(0.0270)	(0.0358)	(0.0411)
At least 50% women	-0.0141	-0.00815	-0.00722	-0.0412	0.104	-0.116**
	(0.0421)	(0.0416)	(0.0414)	(0.0468)	(0.0867)	(0.0543)
Treated x At least 50% women	0.0885	0.0847	0.0839	0.135**	0.122	0.147*
	(0.0604)	(0.0599)	(0.0598)	(0.0672)	(0.116)	(0.0811)
Inventor exp.			0.000740			
			(0.000815)			
Team size			-0.0100			
			(0.0184)			
Observations	1,904	1,904	1,904	1,492	812	680
TC-by-round FE	NO	YES	YES	YES	YES	YES
Sample	All	All	All	U.S. Inv.	Exp. U.S. Inv.	New U.S. Inv.

Significant at *** p<0.01, ** p<0.05, * p<0.10. Standard errors are heteroskedasticity robust. The unit of observation is a patent application and the dependent variable, Patent, is a binary indicator equal to one if the application was granted by the USPTO. 'TC' is an abbreviation for technology center, with definitions provided in Table A31 and 'round' represents the RCT round. Average inventor experience is equal to the average number of previously filed patent applications across all inventors associated with the application, and team size is defined as the number of inventors listed on the patent application. At least 50% women is a binary variable that is equal to 1 if at least 50 percent of inventors listed on the patent application are women. The 'U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States. The 'Experienced U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States and at least 50% of whom have at least one prior patent filing. The 'New U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States and at least 50% of whom have not filed a prior patent application. Includes applications that are not associated with an organizational applicant or assignee.

Table A22: Probability of receiving a patent in the RCT - Independent inventors sub-sample

VARIABLES	(1) Patent	(2) Patent	(3) Patent	(4) Patent	(5) Patent	(6) Patent	(7) Patent
Treated	0.0585***	0.0734***	0.0728*	0.0593	0.0142	0.0706**	0.0132
	(0.0222)	(0.0235)	(0.0434)	(0.0427)	(0.0281)	(0.0277)	(0.0641)
At least 50% women	-0.0118	-0.0173	-0.0149	-0.0115	0.0164	0.0168	0.00847
	(0.0389)	(0.0377)	(0.0392)	(0.0389)	(0.0389)	(0.0391)	(0.0378)
Treated x At least 50% women	0.123**	0.126**	0.125**	0.123**	0.0922*	0.101*	0.0948*
	(0.0549)	(0.0540)	(0.0551)	(0.0549)	(0.0556)	(0.0562)	(0.0547)
Avg. inventor exp.		0.00312***					0.00342***
		(0.000921)					(0.000934)
Treated x Avg. inventor exp.		-0.00212*					-0.00233*
		(0.00119)					(0.00119)
Team size			0.0170				0.0193
			(0.0223)				(0.0218)
Treated x Team size			-0.0117				0.00734
			(0.0297)				(0.0294)
U.S. inventor share				0.0113			-0.0141
				(0.0335)			(0.0337)
Treated x U.S. inventor share				-0.00124			0.00906
				(0.0479)			(0.0483)
Inc. scope (ICL)					0.000226**		0.000231*
					(0.000115)		(0.000118)
Treated x Inc. scope (ICL)					0.000418***		0.000434***
					(0.000154)		(0.000158)
Inc. scope (ICC)						0.00334	0.00581
						(0.00490)	(0.00532)
Treated x Inc. scope (ICC)						-0.00328	-0.000669
						(0.00674)	(0.00761)
Observations	2,273	2,273	2,273	2,273	2,098	2,107	2,098
TC-by-round FE	YES	YES	YES	YES	YES	YES	YES

Significant at *** p<0.01, ** p<0.05, * p<0.10. Standard errors are heteroskedasticity robust. The unit of observation is a patent application and the dependent variable, Patent, is a binary indicator equal to one if the application was granted by the USPTO. 'TC' is an abbreviation for technology center, with definitions provided in Table A31 and 'round' represents the RCT round. All regressions include TC-by-round fixed effects. Average inventor experience is the average number of previously filed patent applications across all inventors associated with the application, and team size is the number of inventors on the patent application team. At least 50% women is a binary variable that is equal to one if at least 50 percent of inventors listed on the patent application are women inventors. U.S. inventor share is equal to the share of inventors listed on the patent application that are located in the United States. ICC, or independent claim count, is measured by the number of independent claims in the application's pre-grant publication. ICL, or independent claim length, is measured by the number of words in the pre-grant publication's shortest independent claim.

Table A23: Probability of receiving a patent in the RCT – Interaction between other pre-treatment characteristics and the treatment

	(1) Patent	(2) Patent	(3) Patent	(4) Patent	(5) Patent	(6) Patent
At least 50% women	-0.0647***	-0.0579***	-0.0561***	-0.0756***	-0.0270***	-0.0724***
	(0.00395)	(0.00390)	(0.00393)	(0.00464)	(0.00747)	(0.00598)
Average inventor exp.			2.60e-05***	0.000678***	0.000280***	0.00432***
			(7.40e-06)	(0.000144)	(0.000101)	(0.00126)
Team size			0.0301***	0.0292***	0.0217***	0.0428***
			(0.00107)	(0.00130)	(0.00149)	(0.00268)
Observations	123,549	117,818	117,818	87,074	51,677	34,022
TC FE	NO	YES	YES	YES	YES	YES
FAOM YR FE	NO	YES	YES	YES	YES	YES
Sample	All	All	All	U.S. Inv.	Exp. U.S. Inv.	New U.S. Inv.

Significant at *** p<0.01, ** p<0.05, * p<0.10. Heteroskedasticity robust standard errors are provided in parentheses. The unit of observation is a patent application and the dependent variable, Patent, is a binary indicator equal to one if the application was granted by the USPTO. 'TC' is an abbreviation for technology center, with definitions provided in Table A31. FAOM YR represents the 'first action on the merits' year. Average Inventor experience is the average number of previously filed patent applications for the inventors associated with the patent applications and team size is the number of inventors on the patent application team. At least 50% women is a binary variable that is equal to one if at least 50 percent of inventors listed on the patent application are women inventors. The 'U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States. The 'Experienced U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States and at least 50% of whom have at least one prior patent filing. The 'New U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States and at least 50% of whom have not filed a prior patent application. The sample includes all pro se applications filed between 2001 and 2020.

Table A24: Probability of receiving a patent - All pro se applications filed between 2001 and 2020

VARIABLES	(1) Examiner's amendment	(2) Examiner's amendment	(3) Examiner's amendment	(4) Examiner's amendment	(5) Examiner's amendment	(6) Examiner's amendment
At least 50% women	-0.0364***	-0.0337***	-0.0337***	-0.0297***	-0.0269***	-0.0286***
	(0.00348)	(0.00428)	(0.00509)	(0.00127)	(0.00174)	(0.00214)
Observations	86,157	62,931	30,948	817,453	505,753	245,113
TC FE	YES	YES	YES	YES	YES	YES
FAOM YR FE	YES	YES	YES	YES	YES	YES
SME or Pro Se	Pro se	Pro se	Pro se	SME	SME	SME
Sample	U.S. Inv.	Exp. U.S. Inv.	New U.S. Inv.	U.S. Inv.	Exp. U.S. Inv.	New U.S. Inv.

Significant at *** p<0.01, ** p<0.05, * p<0.10. Heteroskedasticity robust standard errors are provided in parentheses. Each regression contains TC and FAOM YR fixed effects where 'TC' is an abbreviation for technology center, with definitions provided in Table A31, and FAOM YR represents the 'first action on the merits' year. At least 50% women is a binary variable that is equal to one if at least 50 percent of inventors listed on the patent application are women inventors. The pro se sample contains all pro se applications filed between 2001 and 2020. The Small and micro entity (SME) sample contains all applications filed between 2001 and 2020 by small and micro entities. The 'U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States. The 'Experienced U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States and at least 50% of whom have at least one prior patent filing. The 'New U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States and at least 50% of whom have not filed a prior patent application.

Table A25: Probability of an examiner's amendment– Pro se and small and micro entity (SME) samples

VARIABLES	(1) Encourage	(2) All interviews	(3) Ex.a	(4) Ex.a	(5) Ex.a	(6) Ex.a
Treated	0.380***	0.0762***	0.0528**	0.0342	0.0673*	-0.00249
	(0.0313)	(0.0235)	(0.0231)	(0.0274)	(0.0363)	(0.0423)
At least 50% women	-0.0411	0.0208	-0.0344	-0.0435	0.0632	-0.112**
	(0.0407)	(0.0369)	(0.0312)	(0.0374)	(0.0679)	(0.0447)
Treated x At least 50% women	0.0597	-0.00165	0.0802*	0.127**	0.0277	0.203***
	(0.0748)	(0.0513)	(0.0476)	(0.0569)	(0.0970)	(0.0713)
Observations	2,208	2,273	2,273	1,733	977	756
TC-by-round FE	YES	YES	YES	YES	YES	YES
PF FE	YES	YES	YES	YES	YES	YES
Sample	All	All	All	U.S.	Experienced U.S.	New U.S.
Obs.-Level	Application	Application	Application	Application	Application	Application

Significant at *** p<0.01, ** p<0.05, * p<0.10. Standard errors are heteroskedasticity robust. 'TC' is an abbreviation for technology center, with definitions provided in Table A31 and 'round' represents the RCT round. At least 50% women is a binary variable that is equal to 1 if at least 50 percent of inventors listed on the application are women inventors. Position factors (PF) are the adjustments applied to determine examiner expected outputs, and vary by seniority (along the general service, or GS, scale). 'Encourage' (Column 1) is a binary indicator equal to 1 if the word encourage appears in the first Office action, zero otherwise. 'FAOM Page Length' (Columns 2-3) is equal to the length (in pages) of the first Office action. 'All interviews' (Column 4) is a binary indicator equal to one if an interview occurs during patent examination. 'Ex.a' (Columns 5-8) is a binary indicator equal to 1 if the focal application had an examiner's amendment, zero otherwise. The 'U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States. The 'Experienced U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States and at least 50% of whom have at least one prior patent filing. The 'New U.S. inventors' sub-sample contains only applications where at least 50% of listed inventors are located in the United States and at least 50% of whom have not filed a prior patent application. The unit of observation is at the application level.

Table A26: Explaining the treatment – Intermediate application outcomes – Examiner position factors fixed effects

	Men inv. teams			Women inv. teams			Difference	
	count	mean	sd	count	mean	sd	b	t-stat
Team size	1912	1.26	0.66	361	1.42	0.74	-0.15***	(-3.67)
Inc. scope (ICC)	1769	2.46	2.92	338	2.05	1.62	0.40***	(3.61)
Inc. scope (ICL)	1761	119.81	142.76	337	130.82	130.75	-11.02	(-1.40)
Average inventor exp.	1912	7.00	16.16	361	9.83	26.81	-2.83*	(-1.94)
Proportion of U.S. inventors	1912	0.76	0.42	361	0.75	0.43	0.01	(0.54)

Significant at *** p<0.01, ** p<0.05, * p<0.10. ICC, or independent claim count, is measured by the number of independent claims in the application's pre-grant publication. ICL, or independent claim length, is measured by the number of words in the pre-grant publication's shortest independent claim. Average inventor exp. is the average number of previously filed applications by the inventor team. Proportion of U.S. inventors is the share of inventors that are from the U.S. Women inventor teams are defined as those applications where at least 50 percent of inventors listed on the patent application are women inventors. Men inventor teams are defined as those applications where at least 50 percent of inventors listed on the patent application are men inventors.

Table A27: Pre-treatment characteristics - Comparing men and women inventor teams

	Treatment			Control			Difference	
	count	mean	sd	count	mean	sd	b	t
Filing date	922	19760.69	249.62	990	19750.54	253.05	10.15	(0.88)
Team size	922	1.24	0.63	990	1.29	0.69	-0.05*	(-1.66)
Proportion of U.S. inventors	922	0.75	0.43	990	0.77	0.42	-0.02	(-1.08)
Inc. scope (ICC)	854	2.46	2.97	915	2.45	2.87	0.01	(0.05)
Inc. scope (ICL)	850	123.33	162.62	911	116.52	121.34	6.82	(0.99)
Proportion of women	922	0.01	0.05	990	0.00	0.04	0.00	(0.75)
At least 50% women	922	0.00	0.00	990	0.00	0.00	0.00	(.)
Inventor exp. (prior applications)	922	6.98	15.14	990	7.02	17.06	-0.04	(-0.06)
At least 50% U.S. inventor	922	0.75	0.43	990	0.77	0.42	-0.02	(-1.02)
Proportion of new inventors	922	0.37	0.47	990	0.38	0.47	-0.01	(-0.67)
At least 50% new inventor	922	0.39	0.49	990	0.40	0.49	-0.02	(-0.76)

Significant at *** p<0.01, ** p<0.05, * p<0.10. ICC, or independent claim count, is measured by the number of independent claims in the an application's first pre-grant publication. ICL, or independent claim length, is measured by the number of words in the pre-grant publication's shortest independent claim. The filing date is measured as the number of days from January 1, 1960. Inventor exp. (prior applications) is the average number of previously filed applications by the inventors. At least 50% new inventor is equal to one if at least 50% of the inventors on the team have not previously filed a patent application. Proportion of new inventors is the share of inventors that have not filed a prior application. The sample includes applications where less than 50 percent of inventors are women.

Table A28: Summary statistics for the treatment and control groups– Men inventor teams

	Treatment			Control			Difference	
	count	mean	sd	count	mean	sd	b	t
Filing date	165	19791.30	249.97	196	19814.62	233.14	-23.33	(-0.91)
Team size	165	1.42	0.72	196	1.41	0.76	0.01	(0.14)
At least 50% U.S. inventor	165	0.73	0.44	196	0.77	0.42	-0.04	(-0.83)
Inc. scope (ICC)	158	2.07	1.91	180	2.04	1.32	0.03	(0.17)
Inc. scope (ICL)	158	122.74	103.63	179	137.96	150.62	-15.22	(-1.09)
Proportion of women	165	0.86	0.22	196	0.86	0.22	0.00	(0.04)
At least 50% women	165	1.00	0.00	196	1.00	0.00	0.00	(.)
Inventor exp. (prior applications)	165	8.72	22.87	196	10.77	29.75	-2.06	(-0.74)
At least 50% U.S. inventor	165	0.73	0.44	196	0.77	0.42	-0.04	(-0.81)
Proportion of new inventors	165	0.51	0.48	196	0.50	0.47	0.01	(0.15)
At least 50% new inventor	165	0.55	0.50	196	0.55	0.50	0.01	(0.11)

Significant at *** p<0.01, ** p<0.05, * p<0.10. ICC, or independent claim count, is measured by the number of independent claims in the an application's first pre-grant publication. ICL, or independent claim length, is measured by the number of words in the pre-grant publication's shortest independent claim. The filing date is measured as the number of days from January 1, 1960. Inventor exp. (prior applications) is the average number of previously filed applications by the inventors. At least 50% new inventor is equal to one if at least 50% of the inventors on the team have not previously filed a patent application. Proportion of new inventors is the share of inventors that have not filed a prior application. The sample includes applications where at least 50 percent of inventors are women.

Table A29: Summary statistics for the treatment and control groups– Women inventor teams

VARIABLES	(1) Patent
Treated	0.0574**
	(0.0230)
At least 50% women	-0.0120
	(0.0457)
Treated x At least 50% women	0.130**
	(0.0575)
Woman examiner	0.00390
	(0.0267)
At least 50% women x Woman examiner	0.0176
	(0.0622)
Observations	2,117
TC/ROUND FE	YES
Obs.-Level	Application

Significant at *** p<0.01, ** p<0.05, * p<0.10. Standard errors are heteroskedasticity robust. The unit of observation is a patent application and the dependent variable, Patent, is a binary indicator equal to one if the focal application was granted by the USPTO. 'TC' is an abbreviation for technology center, with definitions provided in Table A31 and 'round' represents the RCT round. At least 50% women is a binary variable that is equal to one if at least 50 percent of inventors listed on the focal patent application are women inventors. The gender of each examiner was obtained from the attribution package in Stata called genderit.

Table A30: Probability of receiving a patent in the RCT– Includes examiner gender information obtained from genderit attribution package

Technology Center	Definition
TC 1700	Chemical and Materials Engineering
TC 2100	Computer Architecture, Software and Information Security
TC 2400	Computer Networks, Multiplex, Cable and Cryptography/Security
TC 2600	Communications
TC 2800	Semiconductors, Electrical and Optical Systems and Components
TC 3600	Transportation, Electronic Commerce, Construction and Agriculture
TC 3700	Mechanical Engineering, Manufacturing and Products

More information on Technology Centers within the USPTO is available at `https://www.uspto.gov/patents/contact-patents/patent-technology-centers-management`. Please note that our sample does not contain any applications from TC1600 - Biotechnology and Organic fields.

Table A31: Technology center definitions

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Treated	2,273	0.522	0.500	0	1
Patent grant	2,273	0.397	0.489	0	1
Ind. Claim Count (ICC - Grant)	903	1.946	1.363	1	20
Ind. Claim Length (ICL - Grant)	903	226.4	163.8	8	1,500
Ind. Claim Count (ICC - PGPub)	2,107	2.393	2.753	0	53
Ind. Claim Length (ICL - PGPub)	2,098	121.6	140.9	4	2,180
Team size	2,273	1.289	0.678	1	7
ΔICC ($ICC_{GRANT} - ICC_{PGPUB}$)	737	-0.460	2.193	-23	17
ΔICL ($ICL_{GRANT} - ICL_{PGPUB}$)	734	85.93	135.1	-1,047	1,001
Proportion of women	2,273	0.142	0.327	0	1
Inventor experience (prior applications)	2,273	7.448	18.29	0	239
Proportion of U.S. inventors	2,273	0.760	0.424	0	1
Proportion of new inventors	2,273	0.396	0.472	0	1
At least 50% women	2,273	0.159	0.366	0	1
At least 50% U.S. inventor	2,273	0.762	0.426	0	1
At least 50% new inventor	2,273	0.419	0.494	0	1

Our sample contains all publicly-available PSPEU RCT applications for which all inventors listed on the patent have a gender attribution in PatentsView. ICC, or independent claim count, is the number of independent claims. ICL, or independent claim length, is measured by the number of words in the shortest independent claim. These variables are measured both at pre-grant publication (PGPub) and at patent grant (if applicable). Inventor exp. (prior applications) is the average number of previously filed applications by the inventors. At least 50% new inventor is equal to one if at least 50% of the inventors on the team have not previously filed a patent application. Proportion of new inventors is the share of inventors that have not filed a prior application.

Table A32: RCT sample summary statistics

Survey question	Treatment	Control	Difference
1. Based on your most recently filed non-provisional application for a patent, please rate your overall satisfaction with the patent process:			
All applicants (controlling for experience)			
Satisfied or very satisfied	56.27%	48.60%	7.67*
First-time applicant			
Satisfied or very satisfied	55.1%	41.4%	13.7**
Between two and three prior applications			
Satisfied or very satisfied	51.1%	49.1%	2
Four or more prior applications			
Satisfied or very satisfied	62.5%	62.8%	-0.3
2. When receiving a correspondence from the USPTO, were the requirements clear to you with assistance?			
All applicants			
Understood all of the requirements	57.6%	52.5%	5.1

Significant at *** p<0.01, ** p<0.05, * p<0.10. For survey question 1., there were 241 treatment responses, 138 first time applicants, 47 with between two and three prior applications and 56 with at least four prior applications. There were 264 control responses, 133 first time applicants, 53 with between two and three prior applications, and 78 with at least four prior applications. For survey question 2., there were 184 treatment responses and 177 control responses. To control for applicant experience, the overall experience shares calculated from the treatment and control groups combined were used as weights to calculate the satisfaction proportions in both the treatment and control groups.

Table A33: Surveying the PSPEU treatment and control applicants