

SHORTER PATENT PENDENCY WITHOUT SACRIFICING QUALITY: THE USE OF EXAMINER'S AMENDMENTS AT THE USPTOⁱ

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INTRODUCTION

“Low quality” patents may reduce innovation and produce other adverse economic outcomes.ⁱⁱ A large portion of the patent quality literature focuses on patent examination characteristics and patent office outcomes.ⁱⁱⁱ Since Jaffe and Lerner (2004), this literature has focused on high patent allowance rates at the United States Patent and Trademark Office (USPTO) as an indication of low quality patent examination (Lemley and Sampat, 2008; Frakes and Wasserman, 2012, 2017; Schuett, 2013). Frakes and Wasserman (2012) postulate that high allowance rates reflect the USPTO's fee setting authority that allows the agency to maximize profits by increasing fee revenue through more allowances and shorter wait times. Schuett (2013), on the other hand, points to examiner incentives that appear to reward production output over quality.

USPTO examiner production requirements vary by seniority and technology to account for the impact of experience and technological complexity on the expected time required to examine an application. Researchers have analyzed these differential incentives and the resulting impact on patent examination quality (Lemley and Sampat, 2012; Frakes and Wasserman, 2017). The patent examination process typically allows for two rounds of review before the applicant needs to pay additional fees to reopen prosecution. However, Lemley and Sampat (2012) find that more experienced examiners cite fewer patents as prior art and are more likely to allow a patent application after just one round of review. The prior literature interprets these “first-action allowances” as lower quality examination, arguing that if examiners with varying degrees of experience receive applications from the same distribution of incoming quality, one should not observe growing allowances on the first round of examination. With an application-level analysis, Frakes and Wasserman (2017) find that the increasing production requirements imposed by the USPTO on more senior patent examiners decreases examination quality, as measured by citations from the examiner and overall allowance rates.

We find that the evidence for increasing first-action allowance rates in the literature fails to account for an important part of the examination process. This leads researchers to draw inappropriate operational and policy conclusions related to USPTO examination and patent quality. In particular, we find that with experience and seniority, examiners increasingly and successfully negotiate with the applicant before the first round of official review (the first-

action). In other words, prior findings reflect an oversight or misunderstanding by researchers of the patent examination process.

The patent examination procedure is called an examiner's amendment and is designed to expedite the patent prosecution process. Its use is consistent with USPTO policy, as one of the stated goals of the USPTO is to decrease patent pendency (the amount of time between filing an application and decision) and “enhance compact patent prosecution initiatives”.^{iv} After accounting for the use of examiner’s amendments, our analysis shows that first-action allowance rates no longer increase with experience, and only increase for the highest seniority level (GS-14). Further, the increase in first-action allowance rates for GS-14 examiners is significantly reduced. Our results also show that examination quality, measured using a metric for patent scope, does not decrease with the use of examiner’s amendments (as shown in the full paper). Specifically, we find no significant difference in the extent to which patent scope is narrowed between a first-action allowance with an examiner's amendment and a first-round office action rejection that leads to a second round allowance (shown in the full paper). Further, patent scope when using an examiner's amendment does not broaden with grade and experience (shown in full paper).

In addition to these implications for examiner incentives and patent quality, examiner's amendments are a means to alleviate intellectual property uncertainty for patent applicants by providing a path to allowance without requiring multiple rounds of examination, and by expediting communication with the applicant. Reducing uncertainty in the patent examination process through pendency-shortening examination mechanisms (such as the examiner's amendment) is likely to benefit innovators and firms by reducing frictions in the market for technology (Gans, Hsu and Stern 2008). We find that the examiner's amendment, compared to a first-round office action rejection, reduces post-first-action pendency by over 50 percent (shown in full paper).

Our findings in part overturn prior literature, and open up new opportunities for study. We find that the examiner's amendment is a little studied, yet impactful mechanism of patent prosecution.

DATA

Our sample is comprised of 4.64 million public patent applications filed at the USPTO with a first-action completed between 2001 and 2017. These data are publicly available in a bulk downloadable format from the USPTO's Office of Chief Economist (OCE) in the Patent Examination dataset, called PatEx (Graham, Marco, and Miller, 2018). The application data includes overall prosecution outcomes, filing and disposal dates, anonymized USPTO examiner identification numbers, U.S. patent classification (USPC), technology center (TC), and other patent application characteristics. In addition to the application data, PatEx includes a history of all patent office events for each application. The transaction history includes a list of all USPTO office actions, including rejections and notice of allowances.

Examiner promotion and grade data at first-action are from internal USPTO databases. Examiner experience was calculated by measuring the length of time, in months, between the first-action and the examiner's start date. To control for additional application-level heterogeneity, we include patent scope and parent type variables in our sample. We use the independent claim count and length of the shortest independent claim to measure patent scope (Marco et al. 2017).

To determine the type of parent application, we combine two variables (foreign priority and parent type) from the PatEx data to create a modified parent type variable. From this variable, we can differentiate by type of parent application (Patent Cooperation Treaty, continuation, continuation-in-part, or divisional) and whether an application has been filed previously within another jurisdiction.

EMPIRICAL METHODOLOGY

The first set of regressions explores the relationship between examiner grade and experience, and the likelihood of a first-action examiner's amendment. We define the dependent variable $Ex.a_{eit}$ equal to one if the examiner issued an examiner's amendment on the first-action (only available for allowances), and zero otherwise. γ_t are first-action year fixed effects, γ_e are examiner fixed effects, and γ_g are examiner grade at first-action fixed effects, relative to GS-9. We include claim scope measures at Pre-grant Publication ICL_i and ICC_i (Marco et al. 2017), application parent type fixed effects γ_p , and examiner experience ($Exper_i$) in months at the application first-action date. The purpose is to assess the degree to which the likelihood of an examiner's amendment at first-action varies with grade and experience.

$$Ex.a_{eit} = \beta_0 + \beta_1 Exper_i + \beta_2 ICL_i + \beta_3 ICC_i + \gamma_p + \gamma_t + \gamma_e + \gamma_g + \epsilon_{eit}$$

We run an additional specification to assess the difference between first-action allowance rates without an examiner's amendment across seniority and experience. For this regression, we define $No_Ex.a_Allow_{eit} = 1$ if the application was allowed on the first-action without an examiner's amendment, and $No_Ex.a_Allow_{eit} = 0$ if the application was either allowed with an examiner's amendment, or rejected. The purpose is to examine how grade and experience impact the probability that an application is allowed without an examiner's amendment. We are interested in the degree to which examiner's amendments influence the relationship between first-action allowance rates and examiner grade/experience described in the literature. The regression is provided in the following specification:

$$No_Ex.a_Allow_{eit} = \beta_0 + \beta_1 Exper_i + \beta_2 ICL_i + \beta_3 ICC_i + \gamma_p + \gamma_t + \gamma_e + \gamma_g + \epsilon_{eit}$$

For each of the regressions in the full paper, we subset the data in several ways. First, we run the regression on the entire sample. Second, we limit the applications to only new applications. Finally, we restrict our sample to applications with an examiner less than three years removed from her most recent promotion at the time of first-action. In some cases, examiners will choose to forego or delay promotion to stay at a lower grade for an extended amount of time. For example, some examiners stay at GS-12 for several years though they were eligible for promotion after one year at GS-12. The examination behavior after an examiner delays or foregoes a promotion may be qualitatively different from those on the promotion path. Therefore, sub-setting our sample to first-action decisions within three years of the most recent promotion allows us to examine any differences between examiners on and off the standard promotion path.

IDENTIFICATION STRATEGY

Our identification strategy is based on the pseudo-random assignment of patent applications to examiners within art units at the USPTO. Researchers have used this research design to answer questions related to the patent system (Lemley and Sampat, 2012; Frakes and Wasserman, 2017; Williams 2013; Farre-Mensa, Hegde, and Ljungqvist 2017). This strategy is validated in the literature through discussions with patent examiners (Lemley and Sampat, 2012) and empirical research (Righi and Simcoe, 2018) suggesting that patent applications are generally pseudo-randomly assigned within USPTO art units by technology groups.^v However, Righi and Simcoe (2018) also find evidence that more specialized examiners have lower grant rates. We argue that non-random assignment based on examiner technological specialization could be absorbed by the examiner and technology fixed effects. In robustness checks, we add measures to proxy for examiner specialization. As noted by Lemley and Sampat (2012), any non-random assignment correlated with grade/experience and patent application quality would be problematic for identification, but this is unsupported by the literature on random assignment. Additionally, office policy effects on grant rates are absorbed in the year fixed effects (Frakes and Wasserman, 2013; Frakes and Wasserman, 2014). Since examiner cohorts (Frakes and Wasserman, 2016) and initial examiner ability might impact prosecution behavior, we note that the examiner fixed effects control for starting grade, cohort and ability since none of these vary within examiner. We also note that our micro-level data allows us to identify both the GS-level and experience of the examiner at first-action simultaneously. Experience and grade do not increase in lock step because starting grades and time to promotion for each grade vary across examiners.

Consistent with Lemley and Sampat (2012), we analyze examination behavior at the first-action decision. Our reasoning for this choice is twofold: First, the first-action decision allows us to better isolate an examiner's decision from the influence of subsequent applicant behavior. Second, grade estimates in allowance rate regressions may suffer from unobserved variable bias due to the varying timing of application disposals based on application quality in relation to promotion dates.

For the overall allowance rate, the allowance decision depends on both examiner negotiating ability and applicant behavior (the persistence of applicants after rejections, the willingness of applicants to narrow the claims to meet patentability requirements, etc.), which increases the complexity of identifying examiner behavior. The first-action decision does not suffer from this weakness. In our full paper, we show that first-action allowance rates are increasing in grade and experience, which is consistent with the results of Lemley and Sampat (2012). Once the examination process has begun, the examiner conducts the first round of substantive examination and typically does not interact with the applicant prior to the first-action decision.^{vi} Therefore, the influence of the applicant on the first-action decision, other than through the quality of the incoming patent application, is limited. By focusing on new applications, and isolating examiner behavior at the first-action, we allow for the cleanest look at examination behavior.

Even under the pseudo-random assignment assumption, examiner grade and patent quality may be correlated, leading to omitted variable bias. Under the assumptions of random assignment, the quality of an incoming application should not be correlated with grade, however the quality of existing applications on an examiner's docket may become correlated with grade as the examiner climbs the GS scale. For example, take the set of randomly assigned applications docketed to a new examiner. Only a fraction of these applications will be disposed before the examiner's next promotion.^{vii} Applications that are disposed before the next promotion date may

exist in the extremes of the patent application quality distribution, i.e. very low- and high-quality applications. Alternatively, applicants that are more persistent may prolong prosecution, and if more likely to be ultimately successful, could bias upward grade and experience estimates in full allowance rate regressions. Despite this, the evolution of an examiner's docket is generally ambiguous, not allowing us to sign the bias. Therefore, we mitigate this endogeneity problem by concentrating on new applications and the first-action allowance decision.

Finally, we note that the promotion path for examiners within the USPTO is standardized, based on performance metrics, and, once an examiner is hired, does not depend on the availability of positions at the next GS-level. An examiner may advance from their starting grade to GS-14 based on satisfying production and quality requirements among other training and certifications. To advance to GS-13, an examiner must pass the certification examination and, to advance to GS-14, an examiner must pass the signatory authority program. These promotions are well regimented but production and quality requirements may be correlated with unobserved examiner characteristics. Therefore, we control for examiner, first-action year, and TC-by-year fixed effects (along with other robustness checks shown in full paper).

RESULTS

In our regression results (not shown), we find that the probability of a first-action examiner's amendment is increasing in both grade and experience.^{viii} Relative to a GS-9 examiner, the probability of an examiner's amendment associated with a first-action is 0.27, 0.42, 0.7 and 1.4 percentage points higher for GS-11, GS-12, GS-13 and GS-14 examiners, respectively. This confirms that examiners increasingly use examiner's amendments with higher seniority levels. Additionally, the coefficient on experience is positive and statistically significant and each additional year leads to a 0.16 percentage point increase in the probability of using an examiner's amendment on the first-action. This verifies that more experienced examiners are more likely to use examiner's amendments. As for the magnitudes of these estimates, recall that examiners use examiner's amendments on first-action allowances in our sample, which are a relatively rare event. Because of this, the marginal increase in examiner's amendment rates with grade and experience are a far larger percentage of first-action allowances.

Since examiners increasingly use examiner's amendments on the first-action, we expect the difference in first-action allowance rates across grade and experience to diminish after accounting for the examiner's amendment. To assess the degree of these differences, we explore the probability of issuing a first-action allowance without an examiner's amendment. Our regression results (not provided) show that the impact of experience and grade (GS-9,11,12 and 13) do not impact the probability of issuing a first-action allowance without an examiner's amendment for new applications. Further, overall, GS-14 examiners are 3.28 percentage points more likely to issue a first-action allowance, but after accounting for the examiner's amendment, GS-14 examiners are only 1.95 percentage points more likely to issue the application without any changes. Therefore, the examiner's amendment reduces the percentage point increase by 40.5 percent. Although the GS-7 first-action allowance rate without an examiner's amendment is negative and significant relative to a GS-9 examiner in our base regressions, we show in the robustness checks section of our whole paper that this result is not robust. Despite this, it's reasonable that very new examiners are less likely to issue first-action allowances without any change to the claims. For this reason, and the overall lack of robustness, we do not emphasize these GS-7 results. Finally, in the full paper we show that use of the examiner's amendment does

not affect one aspect of patent quality (patent scope), and significantly reduces patent grant delay.

DISCUSSION AND CONCLUSION

Our results provide counter evidence against the most compelling argument in the literature for misaligned examiner seniority-based incentives; that first-action allowance rates generally increase with both experience and seniority (Lemley and Sampat 2012). Researchers used first-action allowance rates under the belief that the patent application does not generally change with a first-action allowance. We show this to be a flawed assumption. Further, since first-action allowances are the fastest way to satisfy examiner productivity requirements, non-increasing first-action allowance rates may be inconsistent with previous empirical findings of “binding time constraints” using overall allowance rates (Frakes and Wasserman 2017). In addition, we identify several issues with the identification strategy used in existing literature to analyze the impact of examiner incentives on overall allowance rates (Frakes and Wasserman 2017). Beyond this, as our results show for first-action allowance rates, examiner learning may similarly bias inference about examiner incentives from overall allowance rates. We leave the exploration of the impact of examiner learning and overall allowance rates for further research.

REFERENCES AVAILABLE FROM THE AUTHORS

ⁱ The views expressed are those of the individual authors and do not necessarily reflect official positions of the Office of Chief Economist or the U. S. Patent and Trademark Office. The authors are listed in alphabetical order.

ⁱⁱ See Scotchmer, 1991; Bessen and Meurer, 2008; Choi, 2010; Galasso and Schankerman, 2014; Sampat and Williams, 2014; Choi and Gerlach, 2015.

ⁱⁱⁱ See Alcacer et al., 2009; Cockburn, et al., 2002; Cotropia et al., 2013; Frakes and Wasserman, 2016a, 2016b; Kovacs, 2017; Langinier and Marcoul, 2012, 2016; Lei and Wright, 2017; Lemley, 2001; Mann and Underweiser, 2012; Tabakovic and Wollmann, 2017; and Whalen, 2018

^{iv} https://www.uspto.gov/sites/default/files/documents/USPTO_2014-2018_Strategic_Plan.pdf

^v Lemley and Sampat (2012) informally interviewed several members of the USPTO examination core.

^{vi} Limited Interaction is possible. For example, an applicant or examiner may request an interview prior to first-action or the examiner may contact the applicant for an examiner's amendment.

^{vii} Average total pendency for an application in our sample is 3.4 years for a new U.S. application but an examiner can be promoted from GS-7 to GS-12 in only a little more than two years.

^{viii} All regression results provided in this draft are for the sample of new applications, for first-action decisions within 3 years of examiner promotion.