# *When Goals Align: Examiner-Applicant Interaction and the Speed-Quality Trade-off in Fast-Track Patent Applications*

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**Declaration of Competing Interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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# When Goals Align: Examiner-Applicant Interaction and the Speed-Quality Trade-off in Fast-Track Patent Applications

**Abstract:** Fast-track patent examination regimes accelerate patent granting by imposing binding time constraints on examiners and applicants, but their implications for examination quality remain unclear. We conceptualize patent examination quality along two dimensions: decisional accuracy, reflected in the grant-versus-rejection margin, and scope appropriateness, reflected in the calibration of granted claim scope. This paper studies China's 2012 Fast-track Patent Applications (FPA) policy as a quasi-natural experiment, exploiting eligibility-based variations across technological fields using patent applications filed between 2009 and 2016. The results show that FPA exposure significantly shortens substantive examination duration and increases grant probability, without differential improvements in observable patent quality. More centrally, FPA exposure reduces examiner-cited prior-art references and increases application-to-grant claim-scope narrowing. These findings reveal an examiner-applicant "acceleration alignment": under compressed timelines, examiners reduce the informational basis for examination, while applicants narrow claims more aggressively to secure faster grant. Overall, this study provides empirical evidence on the speed-quality trade-off in patent examination and offers policy-relevant guidance for the design, reform and optimization of fast-track examination schemes.

**Keywords:** Patent Examination Speed; Patent Examination Quality; Patent Scope; Fast-track Patent Applications; Examiner-Applicant Interaction

## 1 Introduction

Patent offices increasingly face pressure to grant rights more quickly without compromising the quality of examination[1]. Faster examination reduces uncertainty over grant status and claim scope, makes patent-based incentives more timely, and facilitates technology transactions and commercialization (Gans et al., 2008; Harhoff et al., 2003). Examination quality, however, is equally important, as inadequate examination undermines the stability, market value, transactional credibility and diffusion function of patent[2] rights. Meanwhile, low-quality patents may give rise to litigation, bargaining costs and resource misallocation (Hall and Harhoff, 2012; Zhu, 2013). Improving speed and quality simultaneously, however, may be difficult. Classic multitasking and incomplete-contract theories suggest that, when performance systems emphasize easily observable speed, less observable dimensions of quality may be underprovided (Dewatripont et al., 1999; Holmstrom and Milgrom, 1991).

[1] China's application process comprises preliminary and substantive examination. Unless otherwise noted, "examination" refers to substantive examination.

[2] In China, patents include invention, utility model, and design. Unless otherwise noted, "patent" refers to invention patents.

Similar tensions have been documented in expert service settings such as auditing, where time pressure can reduce work quality (Broberg et al., 2017; Knechel et al., 2015; McDaniel, 1990). Patent examination shares these features: it is knowledge-intensive, judgment-intensive, and heavily dependent on time-consuming prior-art search and claim comparison. This makes patent examination a natural setting for studying how binding time constraints shape expert decision-making.

This trade-off is particularly salient in China. According to the *2023 statistics of the world's five major intellectual property offices*, the China National Intellectual Property Administration (CNIPA) processed 1.677 million patent applications in 2023, compared with roughly 598,000 at the United States Patent and Trademark Office (USPTO)[1]. CNIPA employed more than 16,000 examiners[2], whereas the USPTO employed 8,237[3]. As shown in Table 1, CNIPA therefore had roughly twice the examiner headcount but nearly three times the application volume, resulting in a substantially higher average caseload per examiner. This workload pressure contributes to backlogs and longer examination cycles, creating strong institutional incentives to improve examination efficiency. Policy documents, including the *14th Five-Year Plan for National Intellectual Property Protection and Utilization*, have repeatedly emphasized improving examination mechanisms and shortening examination cycles[4]. The combination of substantial workload pressure and active policy intervention to accelerate examination makes the Chinese patent system a particularly informative setting for studying how acceleration policies affect examination quality.

**Table 1: Comparison of Patent Examination Workload and Resources: CNIPA vs. USPTO (2023)**

| Indicator | CNIPA | USPTO | Ratio (CNIPA:USPTO) |
|---|---|---|---|
| Patent Applications Filed | 1,677,701 | 598,090 | 2.8:1 |
| Number of Patent Examiners | Over 16,000 | 8,237 | About 2.0:1 |
| Average Number of Applications Handled per Examiner | About 105 | About 73 | About 1.44:1 |

*Source*: *2023 Report on the Statistics of the World's Five Major Intellectual Property Offices*; Official disclosure from China National Intellectual Property Administration.

A central difficulty in evaluating acceleration policies is that "examination quality" is not one-dimensional. The first dimension is decisional accuracy: hawhether patent offices correctly grant patentable applications and reject unpatentable ones. This dimension corresponds to the traditional Type I and Type II error framework and captures the gatekeeping function of patent examination. Existing studies show that time and workload constraints can shape this margin: examiners facing heavier workloads or tighter time allocations tend to process applications more quickly, and faster processing may be associated

1 See https://english.cnipa.gov.cn/art/2024/6/13/art_2975_193030.html, last accessed on August 21, 2025.
2 See https://english.cnipa.gov.cn/art/2024/6/13/art_2975_193030.html, last accessed on August 21, 2025.
3 See https://cnipa.gov.cn/module/download/down.jsp?i_ID=197174&colID=90, last accessed on August 21, 2025.
4 See www.gov.cn/zhengce/content/2021-10/28/content_5647274.htm, last accessed on August 21, 2025.

with a higher likelihood of decisional errors (Frakes and Wasserman, 2017; Lemley and Sampat, 2012). This paper focuses on a second dimension of examination quality: scope appropriateness, which has received comparatively less attention in prior research. We define scope appropriateness as whether the final claim scope of a granted patent is commensurate with the invention's technological contribution. This dimension captures the calibrating function of patent examination: an application may meet the threshold for patentability, yet the resulting patent may still contain claims that are broader or narrower than the underlying invention warrants. Because claim scope defines the legal boundary of a patentee's right to exclude, whether that scope is commensurate with the invention's technological contribution can shape follow-on innovation, licensing and bargaining, and product-market competition.

This paper studies these issues using China's 2012 *Administrative Measures for Fast-track Patent Applications* (*FPA Measures*), which introduced an accelerated substantive examination channel for applications in selected technological fields. FPA differs from acceleration mechanisms that add a separate pre-examination stage and expand examination resources, such as China's pre-examination system run by local intellectual property protection centers. FPA operates within CNIPA's ordinary substantive examination process and compresses the timelines faced by existing examiners and applicants (Zhang et al., 2024). Under the *FPA Measures*, admitted cases should be concluded within one year, examiners must issue the first examination opinion within 30 working days after FPA approval, and applicants must respond or amend within two months. These rules impose binding time constraints on both sides of the examination process, making FPA a suitable setting for studying the speed-quality trade-off under fixed resources.

Our empirical strategy exploits the nationwide implementation of the *FPA Measures* and policy-defined eligibility across technological fields. Rather than comparing applications that actually obtained FPA approval with those that did not, we adopt an eligibility-based cohort difference-in-differences design. Specifically, we compare changes in examination outcomes for applications in FPA-eligible fields before and after the policy with contemporaneous changes for applications in ineligible fields. Because actual FPA take-up may be endogenous, our estimates are interpreted as intent-to-treat effects of policy exposure. We implement this design with patent-level data on Chinese invention patent applications filed between 2009 and 2016. A distinctive feature of our dataset is that it links patent application texts to their corresponding grant texts, allowing us to observe how substantive examination reshapes the scope-calibration dimension of examination quality.

The results show that FPA exposure significantly shortens substantive examination duration for eligible-field applications. It also raises grant probability, while observable application-stage quality proxies do not improve differentially. This pattern is consistent with a relaxation of the grant threshold and suggests an elevated Type I error risk, although the true patentability of each application is unobservable. More centrally for this paper, FPA exposure affects the scope-calibration dimension. It reduces examiner prior-art search effort, as reflected in fewer examiner citations, and increases application-to-grant claim-scope narrowing, measured by the word count changes in the first claim and independent claims. These two results jointly reveal an examiner-applicant "acceleration alignment". Examiners facing compressed deadlines reduce the informational basis for claim-scope calibration, while applicants facing shortened response windows are more likely to add limiting claim features to secure faster grant. This alignment is not deliberate cooperation; it emerges from independent responses to the same institutional pressure for acceleration. The findings are robust to a battery of robustness checks.

This paper makes four contributions. First, it provides micro-level evidence on the speed-quality trade-off in an expert bureaucratic review setting from the perspective of the patent system, showing how binding time constraints shift behavior even when formal legal standards remain unchanged. Second, it extends the study of patent examination quality from decisional accuracy to scope appropriateness, highlighting that acceleration can affect not only whether patents are granted but also the scope of rights granted. Third, it provides direct evidence on the examiner-applicant interaction by showing how examiner-side search compression and applicant-side claim amendment jointly shape examination outcomes. Fourth, it introduces a matched application-grant text dataset that makes it possible to observe how substantive examination reshapes claims from filing to grant.

The paper proceeds as follows. Section 2 reviews the literature on patent examination speed and quality. Section 3 introduces the FPA policy background and develops the theoretical framework. Section 4 presents the research design, data, and variable construction. Section 5 reports the empirical results, robustness tests, and heterogeneity analyses. Section 6 concludes with policy implications.

## 2 Literature Review

This study relates to two strands of literature on patent examination: examination speed and examination quality. The first examines the determinants and consequences of examination duration, while the second evaluates examination quality, primarily through decisional accuracy at the grant-versus-rejection margin.

### 2.1 Literature on Patent Examination Speed

A central insight in the literature is that patent examination speed is shaped by information constraints and organizational responses within the examination process. Existing studies identify three broad determinants. First, institutional workload affects examination duration, as increases in application volume intensify backlog pressure and extend grant delays (Archontopoulos et al., 2007). Second, technological and document complexity increases the informational burden of examination. Applications with longer specifications, more claims, broader technological scope, or more complex IPC classifications require greater search and evaluation effort (Popp et al., 2004; Régibeau and Rockett, 2010; Xu et al., 2024; Zhu et al., 2022). Third, applicant heterogeneity matters. Firms, research institutions, and individual applicants differ in drafting quality, procedural experience, and responsiveness to office actions, leading to variation in examination speed (Xu et al., 2024).

Beyond these structural factors, information provision plays a central role in shaping examination speed. Prior-art disclosure can reduce search costs and accelerate examination when it is targeted and relevant, as it helps examiners identify the most pertinent technological background (Kuhn et al., 2020; Langinier and Marcoul, 2020; Nagaoka and Yamauchi, 2022; Shu et al., 2022; Wen et al., 2025). However, disclosure can also increase screening burden when it is excessive, fragmented, or strategically irrelevant, thereby slowing the review process (Cotropia et al., 2013; Figueroa and Lemus, 2024; Langinier and Marcoul, 2016).

Examination speed is further shaped by the behaviors of examiners and applicants and their interactions. Examiners may process applications more quickly when they accumulate experience or develop standardized routines under workload pressure (Frakes and Wasserman, 2017; Lemley and Sampat, 2012). Applicants influence processing time through drafting strategies, response behaviors, and claim amendments, which affect the informational demands placed on examiners. Institutional arrangements, such as outsourced prior-art search or third-party search support, further modify how information is generated and evaluated during examination (Lampe, 2023; Yamauchi and Nagaoka, 2015).

Overall, this literature suggests that examination speed is not merely an administrative outcome but the result of constrained information processing and strategic interaction among agents in the patent system. However, prior work has primarily treated examination speed as an outcome to be explained, rather than examining how exogenous acceleration policies reorganize these information and interaction structures under fixed institutional resources. This gap motivates our analysis of acceleration as an institutional intervention with downstream implications for examination outcomes.

## 2.2 Literature on Patent Examination Quality

A second strand of literature examines patent examination quality, which is typically defined in terms of decisional accuracy: whether patent offices correctly distinguish patentable from unpatentable applications. This framework is commonly operationalized through Type I and Type II errors and proxied by grant decisions, invalidation, and litigation outcomes (Burke and Reitzig, 2007; Nagaoka and Yamauchi, 2022; Palangkaraya et al., 2011).

Within this framework, examination quality is shaped by information constraints and institutional incentives. Limited time and search resources may reduce examiner search intensity, increasing the likelihood of erroneous decisions (Frakes and Wasserman, 2017; Lemley, 2001; Lemley and Sampat, 2012). Examiner characteristics and organizational incentives, including workload, experience, compensation, and performance evaluation systems, further influence decision quality (Liu, 2022). Applicant behavior also matters, as strategic disclosure and drafting choices affect the information available to examiners and thus the accuracy of examination decisions (Ashtor, 2022; Cotropia et al., 2013; Figueroa and Lemus, 2024; Freilich, 2018; Langinier and Marcoul, 2020).

Existing research also shows that examination quality has important innovation consequences. Rigorous screening can reduce low-quality patents, limit opportunistic enforcement, and channel innovation resources toward more substantial technological advances (Hou et al., 2022; Jaffe and Lerner, 2006). Conversely, weak examination may generate uncertain rights, fuzzy boundaries, patent thickets, litigation costs, and distorted incentives (Choi, 2010; Choi and Gerlach, 2015; Farrell and Shapiro, 2008; Lemley and Shapiro, 2005; Merges, 1999).

However, this strand of literature primarily conceptualizes examination quality in terms of decisional accuracy. For granted patents, this focus is incomplete because examination also determines the scope of exclusionary rights. The economic literature on patent breadth emphasizes that claim scope is a central dimension of patent protection that shapes innovation incentives, competition, and knowledge diffusion (Gilbert and Shapiro, 1990; Klemperer, 1990; Merges and Nelson, 1990). A granted patent may therefore be correctly issued in a binary sense yet still exhibit a scope that is broader or narrower than warranted by the underlying technological contribution. This scope-calibration dimension remains underexplored in the literature and motivates the analysis in this paper.

### 2.3 Gaps in Existing Research

Despite important advances, existing research provides only a partial understanding of how institutional acceleration reshapes the information-processing and interaction structure of patent examination. Three related gaps remain.

First, the conceptualization of examination quality remains incomplete. Prior research focuses on decisional accuracy and the gatekeeping function of examination, but this view does not capture the scope-calibration dimension of granted patents. For granted rights, the key issue is not only whether an application is granted, but whether the resulting scope of protection is appropriately aligned with the invention's technological contribution. How accelerated examination affects this dimension has received little empirical attention.

Second, the interaction between examiners and applicants is rarely analyzed as an integrated process. Existing studies examine examiner behavior and applicant strategy separately, but patent examination is inherently iterative: examiner search and office actions shape applicant responses, while applicant amendments shape the final granted claims. Little is known about how this interaction structure changes under accelerated timelines.

Third, empirical analysis of the examination process is constrained by limited observability. Most studies rely on aggregate outcomes such as grant decisions, citations, or litigation, which provide limited insight into how claims evolve during examination. Without matched application and grant texts, it is difficult to observe how examination reshapes claim scope over time.

This paper addresses these gaps in a unified framework: it extends the analysis of examination quality from decisional accuracy to scope calibration, models examination as a bilateral interaction under time constraints, and constructs a matched application-grant text dataset that enables direct observation of claim evolution.

## 3 Policy Background and Theoretical Analysis

### 3.1 Policy Background

On 19 June 2012, the State Intellectual Property Office (SIPO; now CNIPA) issued the *Administrative Measures for Fast-track Patent Applications* (*FPA Measures*), fully implemented on 1 August 2012. The *FPA Measures* created an accelerated examination channel for selected patent applications in designated technological fields. As Figure 1 illustrates, a Chinese patent application generally proceeds through filing, formal review, publication, substantive examination, and grant. Formal review checks procedural compliance with patent law and related regulations, while substantive examination evaluates patentability, including novelty, inventiveness, and utility. The FPA mechanism applies only at the substantive examination stage and does not alter earlier procedural steps.

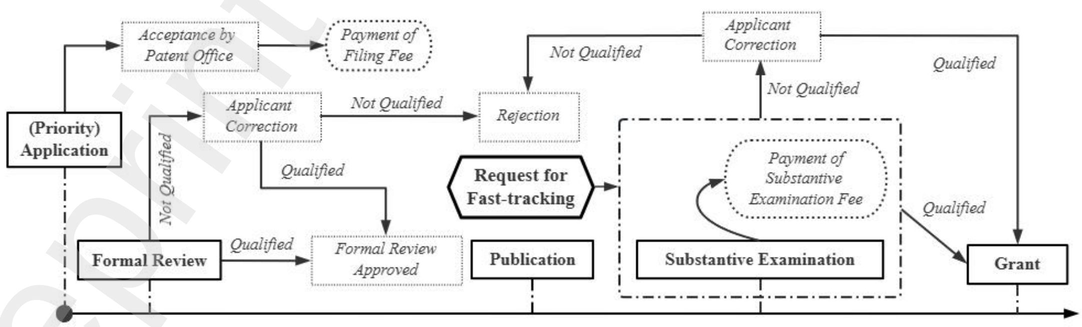


**Figure 1: The Process of the Fast-track Patent Applications**

The *FPA Measures* define both eligibility and administrative capacity. Article 4 designates applications in strategic emerging industries, such as energy conservation and environmental protection, next-generation information technology, biotechnology, and green technologies as eligible for accelerated examination. Article 5 stipulates that actual FPA volume is set by CNIPA with reference to examination capacity by technology field, prior-year grants, and current-year backlogs. These provisions distinguish eligibility from participation. Eligibility is defined by whether an application falls within a technological field covered by Article 4, whereas actual FPA participation depends on applicant take-up and administrative capacity allocation.

The *FPA Measures* impose binding time limits on both the overall examination process and the key interaction windows between examiners and applicants (Figure 2). Under Article 2, eligible cases must be concluded within one year of FPA approval. Article 10 requires CNIPA to issue the first examination opinion within 30 working days after FPA approval. Article 11 requires applicants to submit a response or amendment within two months after receiving an examination opinion.  Failure to comply results in termination of fast-track status and reversion to regular examination procedures.

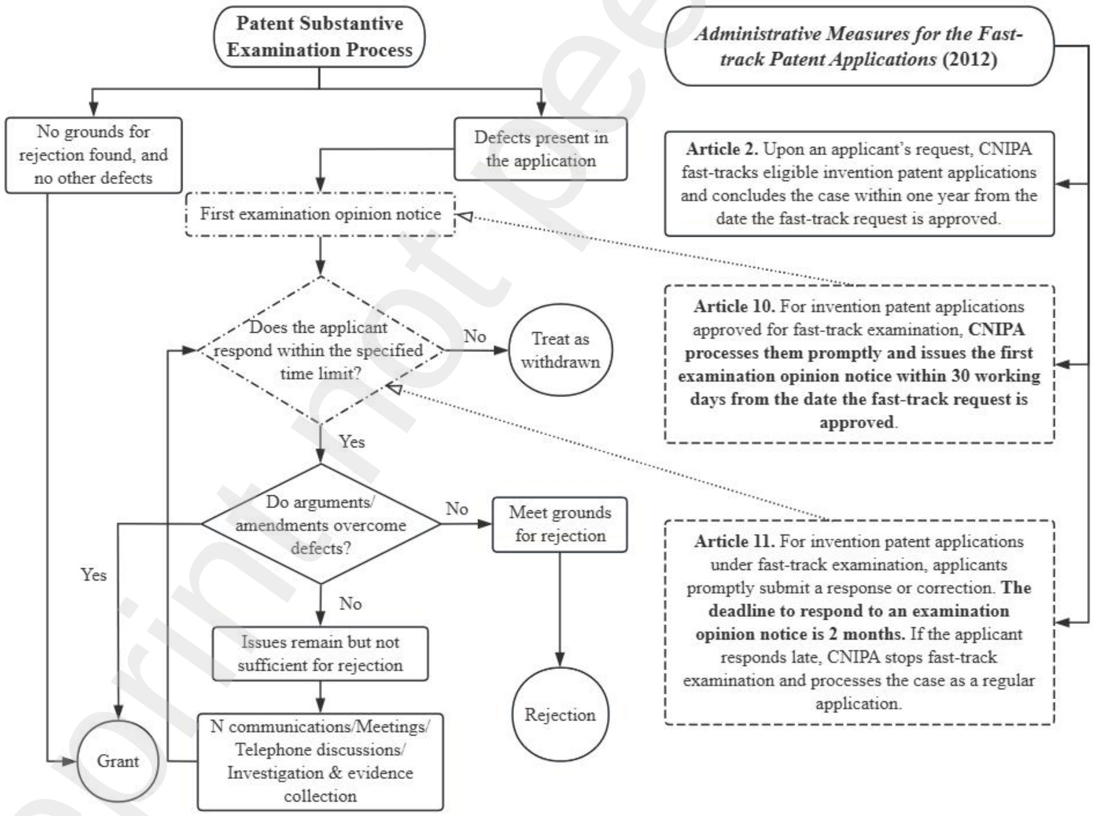


**Figure 2: The Process for Accelerating Patent Examination under the FPA System**

These institutional features make patent examination an iterative process conducted under binding time constraints. Substantive examination involves sequential interaction between the examiner and the applicant: the examiner searches prior art and issues office actions, while the applicant responds through arguments, clarifications and claim amendments. The examiner's first office action frames the patentability issues and identifies the prior art against which the claimed invention is assessed. The applicant's response then determines whether to contest the examiner's position, provide technical and legal arguments, or amend the claims. By compressing both the examiner's initial review window and the applicant's response period, the FPA system alters the timing of examiner-applicant interaction and introduces binding constraints on both sides of the examination process.

## 3.2 Theoretical Analysis

### 3.2.1 Patent Examination Quality

This study examines how faster timelines under China's FPA affect examination quality. Unlike examination speed, which is straightforward, examination quality is a more complex concept that requires careful definition. Prior research typically defines examination quality in terms of whether patent offices apply patentability standards (namely novelty, inventiveness and utility) in a consistent and accurate manner (Burke and Reitzig, 2007). Within this view, examination quality is primarily reflected in the correctness of examination decisions: whether examiners avoid granting applications that should have been rejected (Type I errors), and avoid rejecting applications that should have been granted (Type II errors) (Palangkaraya et al., 2011). This view emphasizes the gatekeeping function of patent examination, through which patent offices screen out applications that do not satisfy statutory requirements and thereby preserve the legal stability and institutional credibility of the patent system.

However, we argue that understanding examination quality solely through the binary decision of grant or rejection provides only a partial picture. Patent examination determines not merely whether an application should be granted, but also the scope of exclusionary rights to be conferred once a grant decision is made. Patent examination quality therefore involves two related but distinct dimensions. The first dimension is decisional accuracy, namely whether patent offices correctly distinguish patentable applications from unpatentable ones. The second is scope calibration, namely whether the claim scope of a granted patent is commensurate with the invention's technological contribution. The former captures the gatekeeping function of examination, while the latter captures its calibrating function.

This study focuses primarily on the second dimension: scope calibration. Although decisional accuracy has received substantial attention in the existing literature, scope calibration has attracted comparatively little empirical study. This gap matters because granted patents are the property rights that enter markets and shape technology transactions, follow-on R&D, and competitive behavior. For these patents, claim scope is the key channel through which examination quality translates into market consequences. It defines the technological space within which the patentee may exclude others from practicing the claimed invention, and thereby determines whether the exclusionary right is commensurate with, exceeds, or falls short of the invention's underlying contribution. Examining scope calibration is therefore essential to a complete understanding of how examination practice shapes the economic consequences of the patent system.

The economic literature on patent breadth provides the theoretical foundation for treating claim scope as a meaningful dimension of examination quality. Classic economic work treats patent breadth, alongside patent length and patent height, as a central dimension of patent protection, showing that changes in breadth affect innovation returns, prices, and welfare losses (Gilbert and Shapiro, 1990; Klemperer, 1990). Merges and Nelson (1990) argue that a patent's economic significance depends critically on its breadth, because broader claims cover a wider range of competing products, processes, or follow-on improvements. Lerner (1994) further shows that patent breadth is associated with firm value. Patent breadth is thus not merely a formal legal attribute, but a policy lever through which the patent system allocates innovation incentives, competitive space, and diffusion opportunities.

Within this framework, an appropriate scope of protection does not mean that broader protection is always better, nor that narrower protection is necessarily preferable. Rather, it means that the exclusionary boundary of a granted patent should correspond to the marginal technological contribution that the invention makes over the prior art. The social function of the patent system is to provide temporary exclusivity as an incentive for innovation, while promoting knowledge accumulation and diffusion through disclosure (Arrow, 1962; Schumpeter, 1942; Hall and Harhoff, 2012). If protection is overly broad, patentees may obtain exclusionary control beyond their actual technological contribution. Such overbroad protection can raise product prices, constrain competition, increase licensing and bargaining costs, and, in cumulative innovation settings, contribute to anti-commons problems that impede follow-on innovation (Bessen and Maskin, 2009; Nordhaus, 1969; Scotchmer, 1991). If protection is overly narrow, patentees may be unable to fully internalize returns from their inventions, weakening incentives for risky R&D, reducing the value of patents in licensing, financing, and technology transfer, and potentially encouraging innovators to rely on secrecy or delayed disclosure. In both cases, a mismatch between claim scope and technological contribution can reduce the dynamic efficiency of the patent system.

Accordingly, our conceptualization does not displace the traditional Type I and Type II error framework. Rather, it extends that framework by emphasizing that examination quality may also vary along the scope margin. This perspective provides the conceptual basis for our central empirical question: whether FPA, by compressing examination timelines, causes the claim scope of granted patents to deviate from what they would have received under regular examination. Although the conventional grant-versus-rejection margin remains important, this study places the scope margin at the core of its analysis of examination quality.

### 3.2.2 Two Mechanisms by Which FPA May Reduce Examination Quality

Building on the conceptualization above, the scope appropriateness of a granted patent is not determined at a single moment. It is shaped through an interaction between examiners and applicants during substantive examination. Examiners search and compare prior art to identify the boundary between the invention and existing knowledge. Applicants then respond to office actions, present arguments, and amend claims in order to secure allowance while preserving the scope of protection they consider justified. In this sense, claim-scope calibration depends on both sides of the examination process: the informational basis generated by examiners' prior-art search and the responses generated by applicants' claim amendments.

The first mechanism operates on the examiner side. Prior-art search is central not only to the grant-versus-rejection decision, but also to the calibration of claim scope. A well-grounded office action depends on identifying the closest prior art and comparing it carefully with the claimed invention. This process enables examiners to identify which parts of the claimed scope extend beyond the actual contribution and which parts are legitimately supported by it. Examiner citations therefore provide an important observable trace of the information used in examination and of the search effort underlying patentability judgments (Hegde and Sampat, 2009). Under regular timelines, examiners have greater room to conduct broader searches and more detailed claim analyses before forming office actions (Lemley and Sampat, 2012).

FPA changes this condition by imposing a tight deadline for issuing the first office action. Given fixed examination resources, compressed timelines increase examiners' cognitive load and leave less time for systematic analysis (Sweller, 1988). Prior studies show that time pressure and workload constraints may induce examiners to economize on search effort and complete applications more quickly (Frakes and Wasserman, 2017; Lemley, 2001; Lemley and Sampat, 2012). Because both rejection decisions and claim-scope limitations generally require documentary support from the prior art, reduced search effort may weaken the informational basis for identifying the invention's marginal contribution. This mechanism may affect decisional accuracy by increasing the risk of false grants and false rejections (Jaffe and Lerner, 2006; Palangkaraya et al., 2011). For the purposes of this study, however, the more salient implication is that compressed search may also impair scope calibration. When relevant prior art comparators are missed or insufficiently developed, examiners become less able to determine the claim scope that is warranted relative to the prior art. Thus, by compressing examiners' search effort, FPA may reduce examination quality along the scope margin.

**H1:** Strict FPA deadlines reduce examiner prior-art search effort, weakening the informational basis on which granted claim scope is calibrated to the invention's technological contribution.

The second mechanism operates on the applicant side. Once an office action is issued, applicants must decide how to respond: they may contest the examiner's rejection by presenting legal and technical arguments, amend the claims or do both. This response stage is crucial for scope calibration because the final granted scope is shaped through successive rounds of argument and amendment. Applicants need time to evaluate the prior art cited by the examiner, assess the strength of the rejection, consult patent agents or internal technical teams, and draft amendments that preserve as much justified scope as possible. In regular examination, this process usually gives applicants sufficient time to defend a claim scope commensurate with the invention's technological contribution.

Article 11 of the FPA Measures narrows this room for response by imposing a two-month deadline and making continued fast-track treatment conditional on a timely reply. This changes the applicant's trade-off. To retain accelerated examination and secure a faster grant, applicants may be more willing to accept the examiner's position, curtail their arguments, or introduce additional limitations into the claims. It is important to note that claim narrowing during examination is not, in itself, evidence of impaired examination quality. On the contrary, narrowing is intrinsic to the calibrating function of examination: when prior-art comparison reveals that an initial claim exceeds the invention's contribution, narrowing the claim is precisely how the examination process aligns granted scope with that contribution. The concern raised here is not narrowing per se, but narrowing driven by time pressure rather than by substantive prior-art assessment, which goes beyond what genuine calibration would require. In such cases, applicants may forgo claim breadth that they could otherwise have justified through fuller search, argument, or amendment. The resulting granted patent may therefore receive a narrower scope than the invention's technological contribution would warrant.

**H2:** Strict FPA response deadlines induce applicants to narrow claims more aggressively, increasing the likelihood that granted patents receive a narrower scope than they would have received under regular examination.

Together, these two mechanisms explain how FPA may affect examination quality along the scope margin. Examiner-side time pressure reduces the informational basis for identifying the invention's marginal contribution, while applicant-side time pressure affects the amendment process through which that contribution is ultimately written into the granted claims. FPA may therefore create what we term an "acceleration alignment" between examiners and applicants: both sides have an incentive to resolve the case quickly, but this convergence of individually rational responses may collectively weaken the calibration of granted claim scope to technological contribution.

## 4 Research Design

### 4.1 Identification Strategy

Estimating the effects of FPA exposure on examination outcomes raises three identification challenges, each arising from the structure of the policy and the data.

The first is selection into the fast-track channel. Actual FPA participation is endogenous: it reflects both applicants' decisions to request accelerated examination and CNIPA's discretion to allocate fast-track capacity across each technology field according to examination resources, prior-year grant volumes, and current backlogs. Comparing approved cases with non-approved ones would therefore conflate the effect of accelerated examination with selection into it. We address this by constructing treatment from policy-defined eligibility rather than observed participation. The treatment indicator identifies designated applications in eligible fields, regardless of whether a given application is ultimately accepted into the fast-track examination. This exploits the quasi-experimental variation generated by the interaction between a nationwide policy shock and field-level eligibility, so that the resulting estimates are intent-to-treat (ITT) effects of FPA exposure.

The second challenge is that treatment is defined at the patent level. Each application has a single exposure status, determined by its filing cohort and field-level eligibility, and is not observed repeatedly across multiple pre- and post-policy years. Identification therefore cannot rely on within-patent before-and-after comparisons. For granted patents, the application and grant texts record two stages of the same examination process, rather than annual observations of the same unit. We address this with a cohort difference-in-differences design that compares changes in outcomes for eligible-field applications filed before and after the reform with contemporaneous changes for ineligible-field applications. The effect is identified from cross-cohort variation between eligibility groups, rather than within-patent changes over time.

The third challenge is that eligible and ineligible fields may differ systematically in applicant composition, examiner assignment, and technological trajectories. Consequently, a simple comparison between the two groups could reflect such heterogeneity rather than the policy itself. We address this on two fronts. First, we absorb the principal sources of confounding variation through a high-dimensional fixed-effects structure. Second, and more substantively, identification rests on a conditional parallel-trends assumption: absent the *FPA Measures*, the two groups would have followed parallel cohort trends conditional on the controls and fixed effects included in the specification.

### 4.2 Data and Sample Construction

Our analysis draws on patent-level data from CNIPA covering Chinese patent applications filed between 2009 and 2016. The starting year ensures comparability after the

2008 revision of the Patent Law, which introduced the absolute-novelty standard for patents. The sample ends in 2016 because CNIPA revised the accelerated-examination rules in 2017 and repealed the *2012 FPA Measures*.

For each application, we extract bibliographic and procedural information, including filing, substantive-examination, and grant dates, IPC classification, applicant and inventor information, agency representation, priority status, claim counts, and citation records. For granted patents, we match the application text to the corresponding grant text by filing number, observing the same application at two stages: the application text before substantive examination, and the grant text reflecting the legally operative claims after substantive examination. This matching is central to our scope-calibration analysis, and the examiner citation record is embedded in the grant document and observable only for granted patents. Because outcomes are defined on different samples, observation counts vary across analyses: examination speed and grant decisions are measured in the application sample, while examiner citations and claim-scope outcomes are measured in the granted-patent sample with matched texts.

Table 2 compares characteristics between application and grant texts. First-claim and independent-claim word counts increase from application to grant, while claim counts decrease, indicating that claim amendment and consolidation are common, consistent with the calibrating function of examination discussed before. Our analysis examines whether FPA exposure induces narrowing beyond what such calibration would require.

**Table 2: Comparison of Patent Characteristics between Application Texts and Grant Texts**

| Patent Characteristics | (1) Observations in Application Texts | (2) Mean in Application Texts | (3) Observations in Grant Texts | (4) Mean in Grant Texts | (5) Mean Difference |
|---|---|---|---|---|---|
| First Claim Words | 2,613,481 | 287.744 | 2,613,481 | 414.398 | -126.654*** |
| Independent Claim Words | 2,613,481 | 501.114 | 2,613,481 | 667.292 | -166.178*** |
| Application File Pages | 2,613,481 | 15.248 | 2,613,481 | 15.290 | -0.042** |
| Number of Claims | 2,613,481 | 10.210 | 2,613,481 | 8.613 | 1.597*** |
| Number of Independent Claims | 2,613,481 | 2.059 | 2,613,481 | 1.869 | 0.190*** |
| Number of Dependent Claims | 2,613,481 | 8.141 | 2,613,481 | 6.742 | 1.399*** |
| Number of Applicants | 2,613,481 | 1.115 | 2,613,481 | 1.120 | -0.005*** |
| Number of Inventors | 2,613,481 | 3.557 | 2,613,481 | 3.593 | -0.037*** |

*Note:* Mean differences are calculated as (mean in application texts) − (mean in grant texts), ***$p$<0.01, **$p$<0.05, *$p$<0.1.

### 4.3 Empirical Specification and Variable Construction

We estimate the eligibility-based exposure effect using the following cohort difference-in-differences specification at the patent-application level:

$$Y_i = \alpha + \beta\left(Eligible_i \times Post_i\right) + \theta Control_i + \Phi_i + \varepsilon_i$$

$Eligible_i$ equals one if the patent belongs to a field designated as eligible, and $Post_i$ equals one for applications filed after nationwide implementation. The coefficient of interest, $\beta$, captures the eligibility-based ITT effect of FPA exposure, identified from the differential change in outcomes between eligible and ineligible fields before and after the reform.

### 4.3.1 Outcome variables

The outcome $Y_i$ denotes one of five examination outcomes. Examination speed, *examlag*, is the number of months from CNIPA's receipt of the substantive-examination request to the final examination outcome. The grant margin, *grant*, is an indicator equal to one if the application is eventually granted. These two capture the direct effect of acceleration. The remaining three capture the scope-calibration dimension central to this study. Examiner search effort, *effort*, is proxied by the number of examiner-cited prior-art references in the grant text (Frakes and Wasserman, 2017; Hegde and Sampat, 2009; Kuhn et al., 2020). Claim-scope change is measured by comparing claim word counts between application and grant texts (Marco et al., 2019)[1]:

$$diff\_claim_i = \frac{\left|claimwords_i^{grant} - claimwords_i^{application}\right|}{claimwords_i^{application}}$$

where $diff\_firstclaim$ and $diff\_indclaim$ capture the relative change for the first claim and for independent claims, respectively. These measures allow us to identify whether FPA exposure induces additional claim-scope narrowing relative to regular examination. It is worth noting that we do not interpret claim narrowing itself as quality deterioration. The relevant concern is whether accelerated examination induces narrowing beyond what ordinary claim-scope calibration would require. Larger values of these measures after FPA exposure are interpreted as evidence of additional claim-scope adjustment relative to regular examination.

### 4.3.2 Control variables

[1] Pursuant to Article 33 of the *Patent Law of the People's Republic of China*, applicants may amend their application documents, but amendments may not extend beyond the scope disclosed in the original claims. Accordingly, during substantive examination the scope of claims in the patent grant text can only remain unchanged or become narrower; it cannot expand beyond the scope set out in the patent application text. As a general matter, holding the number of claims constant, an increase in the word count of independent claims typically reflects more specific drafting and more tightly defined technical features, thereby narrowing the scope of protection; conversely, a decrease in word count often signals broader expression and a potentially expanded scope. That said, rare cases exist in which linguistic simplification nonetheless yields a narrower scope. To capture protection-range adjustments comprehensively, we therefore take the absolute value in the relative-change measure, ensuring the indicator accurately reflects the magnitude of any reduction in claim scope over the application-to-grant process.

The vector $Control_i$ includes patent-level characteristics measured at the application stage that may affect examination outcomes and differ systematically between eligible and ineligible fields. To capture application complexity and technological breadth, we include the word counts of the first claim (*firstwords*), the number of independent claims (*indclaims*), the number of dependent claims (*dependentclaims*), the number of pages in the application document (*pages*), and IPC width (*ipcwidth*). To capture drafting quality and procedural sophistication, we include indicators for whether the application claims international priority (*priority*) and whether it is filed through a patent agency (*agency*). Finally, to capture pre-policy differences in applicants' patenting capacity and potential quota-related administrative considerations, we include the log of the applicant's number of granted invention patents in 2011 (*lngrant_2011*). All controls are measured before or at the application stage, thereby avoiding adjustment for post-treatment outcomes.

### 4.3.3 Fixed-effects structure

The vector $\Phi_i$ comprises five sets of high-dimensional fixed effects that jointly constitute the core of our identification strategy, absorbing the principal sources of omitted-variable bias that a simple eligibility comparison would leave open. Each set removes a distinct confounding margin, progressively narrowing the identifying variation.

(1) Examiner-by-examination-year fixed effects (*Examiner×Examineyear FE*) absorb all examiner-specific factors that vary from year to year, such as workload, accumulated experience, performance pressure, and individual leniency. Without them, the estimate could be driven by eligible and ineligible applications being routed to systematically different examiners, or by examiner behavior shifting over time for reasons unrelated to FPA. Identification is thus confined to comparisons within the same examiner in the same examination year.

(2) IPC4-by-examination-year fixed effects (*IPC4×Examineyear FE*) absorb time-varying shocks common to a technology field, such as changes in prior-art stocks, technological complexity, and field-specific examination practices. This directly addresses the central threat that eligible fields—concentrated in strategic emerging industries—follow different technological and examination trajectories from ineligible fields. Any field-level trend, whether or not related to the policy, is differenced out.

(3) Applicant-by-application-year fixed effects (*Applicant×Appliyear FE*) absorb applicant-specific annual shocks such as R&D intensity, filing strategy, and demand for accelerated processing. This is the key control for applicant-level self-selection: identification comes from within-applicant-year comparisons of that applicant's own applications that differ eligibility status, so that differences in applicant quality, sophistication, or filing motives

cannot drive the result.

(4) Province-by-examination-year fixed effects (*Province×Examineyear FE*) absorb province-specific time-varying administrative factors, including local innovation policies, IP-office behavior, and the local administrative allocation of fast-track capacity, which Article 5 explicitly delegates. This guards against the estimate reflecting regional differences in how the policy was implemented, rather than the policy itself.

(5) Examiner-by-applicant fixed effects (*Examiner×Applicant FE*) absorb persistent factors specific to each examiner-applicant pair, including acquaintance effects[1], star effects[2], and selection effects[3] that neither examiner nor applicant fixed effects alone can capture. Repeated examiner-applicant relationships may shape both search effort and grant propensity in ways correlated with eligibility, and this pair-level control removes such confounding.

Taken together, these fixed effects strip out examiner-year, technology-field-year, applicant-year, province-year, and examiner-applicant heterogeneity, so that $\beta$ is identified only from differential, cross-cohort changes between eligible and ineligible applications across cohorts that survive this demanding set of controls. The remaining identifying variation is therefore unlikely to be contaminated by the standard omitted-variable concerns in patent-examination settings.

We estimate the models by OLS. Because each application is observed only once in the sample, baseline inference relies on heteroskedasticity-robust standard errors; we further assess robustness by clustering at the applicant and technological-field levels. Table 3 reports descriptive statistics for all variables.

**Table 3: Descriptive Statistics**

| VARIABLES | Observations | Mean | Standard Deviation | Min | Median | Max |
|---|---|---|---|---|---|---|
| Dependent Variables | | | | | | |
| *examlag* | 681,696 | 24.417 | 9.219 | 1 | 24 | 116 |
| *lnexamlag* | 681,696 | 3.169 | 0.374 | 0.693 | 3.219 | 4.762 |
| *lnclaims* | 681,696 | 2.220 | 0.486 | 0.693 | 2.303 | 5.858 |
| *bcitation* | 631,651 | 5.398 | 3.043 | 1 | 5 | 172 |
| *diff_firstclaim* | 681,696 | 0.983 | 2.564 | 0 | 0.377 | 547.667 |
| *diff_indclaim* | 681,680 | 0.789 | 2.436 | 0 | 0.288 | 367.157 |
| *effort* | 681,696 | 3.445 | 2.664 | 0 | 3 | 40 |
| Core Explanatory Variables | | | | | | |
| *Eligible × Post* | 681,696 | 0.541 | 0.498 | 0 | 1 | 1 |
| Control Variables | | | | | | |
| *priority* | 681,696 | 0.050 | 0.218 | 0 | 0 | 1 |
| *agency* | 681,696 | 0.876 | 0.329 | 0 | 1 | 1 |

[1] Examiners may be more lenient toward longstanding applicants ("old clients"), yielding more favorable outcomes.
[2] Prominent applicants can influence examiner behavior, making it either more cautious or more lenient.
[3] Applicants may strategically steer assignment to particular examination tracks or examiners to secure more favorable outcomes.

| | | | | | | |
|---|---|---|---|---|---|---|
| *firstwords* | 681,696 | 280.690 | 273.113 | 1 | 212 | 10922 |
| *pages* | 681,696 | 12.529 | 7.658 | 1 | 11 | 428 |
| *indclaims* | 681,696 | 1.925 | 1.300 | 1 | 2 | 52 |
| *otherclaims* | 681,696 | 7.481 | 5.666 | 1 | 7 | 333 |
| *indclaimwords* | 681,696 | 492.834 | 529.155 | 0 | 363.333 | 10922 |
| *ipcwidth* | 681,696 | 2.434 | 1.934 | 1 | 2 | 63 |
| *lnfirstwords* | 681,696 | 5.370 | 0.724 | 0.693 | 5.361 | 9.299 |
| *lnpages* | 681,696 | 2.494 | 0.456 | 0.693 | 2.485 | 6.061 |
| *lnindclaims* | 681,696 | 1.004 | 0.347 | 0.693 | 1.099 | 3.97 |
| *lnotherclaims* | 681,696 | 1.982 | 0.561 | 0.693 | 2.079 | 5.811 |
| *lnindclaimwords* | 681,696 | 5.915 | 0.724 | 0 | 5.898 | 9.299 |
| *lnipcwidth* | 681,696 | 1.126 | 0.433 | 0.693 | 1.099 | 4.159 |
| *lngrant_2011* | 681,696 | 3.121 | 2.646 | 0 | 3.219 | 8.034 |

*Note*: Variables prefixed with *ln* are transformed as *ln(x+1)*, where *x* denotes the corresponding raw variable.

# 5 Empirical Results

## 5.1 Preliminary Analysis

Before turning to the mechanisms through which FPA may affect claim-scope calibration, which is the central focus of this study, we first examine whether exposure to the FPA regime altered the examination process in the expected direction. This preliminary analysis serves two purposes. First, it verifies whether FPA exposure shortens examination duration, which is the direct objective of the fast-track regime. Second, it examines whether accelerated examination is accompanied by changes in grant outcomes, thereby providing evidence on the grant-versus-rejection margin.

**Table 4: The Impact of FPA Exposure on Examination Duration**

| VARIABLES | (1) | (2) |
|---|---|---|
| | examlag | lnexamlag |
| *Eligible × Post* | -0.094***<br>(0.025) | -0.002**<br>(0.001) |
| *Controls* | Yes | Yes |
| *Examiner×Examineyear FE* | Yes | Yes |
| *IPC4×Examineyear FE* | Yes | Yes |
| *Applicant×Appliyear FE* | Yes | Yes |
| *Province×Examineyear FE* | Yes | Yes |
| *Examiner×Applicant FE* | Yes | Yes |
| Observations | 1,556,750 | 1,556,750 |
| Adjusted $R^2$ | 0.632 | 0.603 |

*Note*: The numbers in parentheses represent clustered standard errors. ***$p$<0.01, **$p$<0.05, *$p$<0.1.

Table 4 reports the effect of FPA exposure on examination duration. Column (1) uses examination duration in months as the dependent variable, while column (2) uses its logarithmic transformation. The estimated coefficient in column (1) is negative and statistically significant, and the log specification in column (2) indicates that FPA exposure is associated with an approximately 0.2% reduction in examination duration for eligible-field applications relative to ineligible-field applications after the reform. These results confirm that the FPA regime achieved its immediate institutional objective: applications in targeted technological fields completed substantive examination more quickly after the policy's implementation.

Having established that FPA exposure accelerates examination, we next examine whether it also changes grant outcomes using the application sample. Table 5 reports the results. In both columns (1) and (2), *grant* is the dependent variable. Column (1) presents a specification with *Examiner×Examineyear FE* and *IPC4×Examineyear FE*, while column (2) adds the full set of baseline fixed effects. In both columns, the coefficient on *Eligible* × *Post* is positive and statistically significant, indicating that FPA exposure raises the probability of grant in targeted technological fields, an effect that accompanies the acceleration in examination duration documented in Table 4.

A natural alternative explanation, however, is that the higher grant probability reflects improvements in underlying application quality rather than a change in examination threshold. Columns (3)-(5) of Table 5 test this possibility using three observable application-stage quality proxies: the number of claims, the number of inventors, and the number of backward citations. The coefficients on *Eligible* × *Post* are statistically insignificant across all three specifications, indicating that the observable composition of applications in eligible fields did not change differentially after the reform. This finding is inconsistent with the view that the increase in grant probability is driven by improved application quality.

Taken together, Table 4 and Table 5 provide two pieces of preliminary evidence. First, FPA exposure shortens examination duration, confirming that the policy generated meaningful acceleration. Second, grant probability increases even though observable application-stage quality did not improve differentially. This pattern is consistent with a relaxation of the grant threshold, and therefore speaks to the gatekeeping dimension of examination quality. Because the true patentability of each application is unobservable, however, we interpret these results as suggestive of an elevated Type I error risk, rather than as direct evidence of decisional inaccuracy.

**Table 5: The Impact of FPA Exposure on Grant Outcomes and Application-Stage Quality**

| VARIABLES | (1)<br>*grant (parsimonious FE)* | (2)<br>*grant (full FE)* | (3)<br>*claims* | (4)<br>*inventors* | (5)<br>*bcitation* |
|---|---|---|---|---|---|
| *Eligible* × *Post* | 0.005***<br>(0.000) | 0.002***<br>(0.000) | 0.002<br>(0.001) | 0.001<br>(0.007) | 0.004<br>(0.016) |
| *Controls* | Yes | Yes | No | No | No |
| *Examiner×Examineyear FE* | Yes | Yes | Yes | Yes | Yes |
| *IPC4×Examineyear FE* | Yes | Yes | Yes | Yes | Yes |
| *Applicant×Appliyear FE* | No | Yes | Yes | Yes | Yes |
| *Province×Examineyear FE* | No | Yes | Yes | Yes | Yes |
| *Examiner×Applicant FE* | No | Yes | Yes | Yes | Yes |
| Observations | 4,171,448 | 3,370,858 | 2,234,482 | 2,234,483 | 2,061,738 |
| Adjusted $R^2$ | 0.916 | 0.954 | 0.628 | 0.501 | 0.464 |

*Note*: The numbers in parentheses represent clustered standard errors. ****p*<0.01, ***p*<0.05, **p*<0.1.

## 5.2 Baseline Results

We next examine the two mechanisms through which FPA exposure may affect examination quality along the scope calibration margin. As discussed before, the first mechanism concerns examiner-side search constraints: compressed deadlines may reduce prior-art search effort and weaken the informational basis for calibrating claim scope. The second mechanism concerns applicant-side response constraints: shortened reply windows may induce applicants to narrow claims more aggressively in order to secure faster grants. Table 6 reports the results.

Column (1) examines examiner search effort. The coefficient on *Eligible* × *Post* is negative and statistically significant, indicating that FPA exposure reduced examiner citations for eligible-field patents relative to ineligible-field patents after the reform. This pattern is consistent with the examiner-side information constraint: under compressed deadlines, examiners curtail the breadth and depth of prior-art search, leaving a sparser informational foundation for assessing the boundary between the claimed invention and existing knowledge. This result therefore supports H1.

Columns (2) and (3) examine claim-scope changes between application and grant texts. The coefficients on *Eligible* × *Post* are positive and significant for both *diff_firstclaim* and *diff_indclaim*. The results indicate that, after FPA implementation, eligible-field patents undergo more pronounced claim-scope narrowing during examination than comparable patents in ineligible fields. This pattern is consistent with the applicant-side response constraint: under compressed reply windows, applicants are more inclined to introduce limiting features in order to retain fast-track status and secure faster grant. This result supports H2.

The joint pattern across the three columns provides additional support for the time-induced-acquiescence interpretation, beyond what any single result establishes on its own. Consider the alternative interpretation that the observed claim-scope changes reflect ordinary substantive calibration rather than time-induced acquiescence. Under this interpretation, larger application-to-grant changes in claim scope should be supported by more intensive prior-art search, because well-grounded narrowing requires a richer documentary basis for identifying which parts of the initial claims exceed the invention's contribution. Table 6 shows the opposite pattern. Examiner citations decline, indicating a sparser informational foundation, yet claim narrowing intensifies rather than diminishes. If anything, weaker examiner search should tend to provide applicants with less documentary leverage to require narrowing. Under purely substantive calibration, then, FPA exposure should have produced smaller changes in claim scope rather than larger ones; the fact that we observe the opposite is inconsistent with the ordinary-calibration interpretation.

**Table 6: FPA Exposure, Examiner Search Effort, and Claim-Scope Calibration**

| VARIABLES | (1) | (2) | (3) |
|---|---|---|---|
| | *effort* | *diff_firstclaim* | *diff_indclaim* |
| *Eligible × Post* | -0.035*<br>(0.020) | 0.035***<br>(0.012) | 0.076***<br>(0.020) |
| *priority* | -0.018<br>(0.020) | 0.115***<br>(0.019) | 0.107***<br>(0.022) |
| *agency* | -0.018<br>(0.020) | -0.009<br>(0.020) | 0.056**<br>(0.028) |
| *lnfirstwords* | 0.055***<br>(0.010) | -2.065***<br>(0.025) | 0.356***<br>(0.083) |
| *lnpages* | -0.035***<br>(0.012) | 0.560***<br>(0.015) | 0.892***<br>(0.029) |
| *lnindclaims* | 0.018<br>(0.021) | -1.204***<br>(0.036) | 1.078***<br>(0.129) |
| *lnotherclaims* | 0.087***<br>(0.010) | 0.062***<br>(0.010) | -0.085***<br>(0.021) |
| *lnindclaimwords* | 0.029***<br>(0.011) | 0.683***<br>(0.024) | -1.617***<br>(0.095) |
| *lnipcwidth* | 0.061***<br>(0.011) | 0.069***<br>(0.009) | 0.024**<br>(0.010) |
| *lngrant_2011* | -0.007<br>(0.006) | -0.003<br>(0.004) | 0.001<br>(0.006) |
| *Examiner×Examineyear FE* | Yes | Yes | Yes |
| *IPC4×Examineyear FE* | Yes | Yes | Yes |
| *Applicant×Appliyear FE* | Yes | Yes | Yes |
| *Province×Examineyear FE* | Yes | Yes | Yes |
| *Examiner×Applicant FE* | Yes | Yes | Yes |
| Observations | 681,696 | 681,592 | 681,666 |
| Adjusted $R^2$ | 0.350 | 0.425 | 0.177 |

*Note*: The numbers in parentheses represent clustered standard errors. ***$p$<0.01, **$p$<0.05, *$p$<0.1.

The remaining interpretation aligns with the applicant-side mechanism: under compressed reply windows, applicants accept examiner positions more readily, curtail their arguments, or introduce additional limitations into the claims, in order to avoid losing fast-track status and secure a faster grant. Crucially, the ineligible-field trajectory in our DID design already captures the extent of routine application-to-grant calibration that occurs under regular examination. The differential narrowing observed in eligible fields after FPA implementation therefore captures the additional acquiescence induced by accelerated timelines, beyond what ordinary calibration would require. In this sense, the observed claim-scope changes are best understood as deviations from the scope that would have been granted under regular examination, rather than as ordinary calibration alone.

Overall, Table 6 provides evidence consistent with both proposed mechanisms. FPA exposure reduces examiner prior-art search effort and induces more pronounced claim-scope narrowing by applicants. Read together, the two findings document the acceleration-alignment process. Examiners and applicants, each responding to their own time constraints, converge on a process that moves cases more quickly through examination but weakens the calibration of granted claim scope to technological contribution. Neither side's behavioral response constitutes deliberate cooperation. The alignment emerges from independent reactions to a shared institutional pressure. This convergence complements the grant-threshold evidence and constitutes the central behavioral evidence that FPA weakens examination quality along the claim scope calibration margin.

### 5.3 Identification and Robustness Tests

#### 5.3.1 Parallel Trends and Dynamic Effects

We first examine whether the baseline mechanism results are driven by differential pre-policy trends between eligible and ineligible fields. To do so, we replace the baseline *Eligible* × *Post* indicator with a set of interactions between policy eligibility and application-cohort indicators, using 2011 as the omitted cohort. This event-study allows us to assess whether eligible and ineligible fields were already evolving differently before the introduction of FPA.

Figure 3 reports the event-study estimates. The pre-policy coefficients provide no evidence of systematic differential trends, suggesting that the baseline effects are unlikely to be driven by pre-existing divergence between eligible and ineligible fields. After the implementation of FPA, the estimates move in the directions predicted by the baseline analysis. Examiner search effort declines for eligible-field patents relative to ineligible-field patents, while both claim-scope change measures increase. Overall, the event-study evidence supports the parallel-trends assumption for the three baseline outcomes and strengthens the interpretation that the baseline effects appear after the FPA regime changed the examination environment for eligible fields.

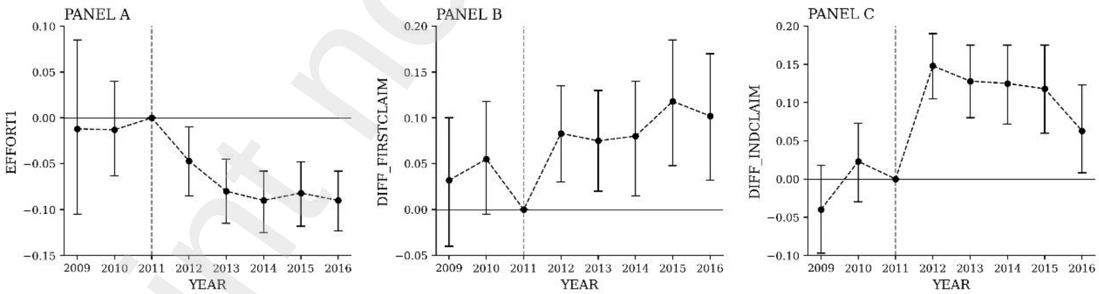


**Figure 3: Event-study Estimates for Mechanism Outcomes**

*Note:* Panel A: Examiner search effort; Panel B: First-claim scope change; Panel C: Independent-claim scope change. The figure reports coefficients from event-study specifications that interact policy eligibility with application-cohort indicators. The omitted cohort is 2011. The vertical dashed line marks the last pre-policy cohort. Error bars represent 95% confidence intervals.

#### 5.3.2 Alternative Exposure Timing

Two distinct timing concepts are relevant for defining policy exposure. The baseline specification defines post-policy exposure by filing cohort, consistent with the cohort DID design. However, FPA directly governs the timing of substantive examination, which may begin years after filing. As a result, some applications filed before 2012 may have entered substantive examination after the FPA regime took effect. Defining exposure by filing cohort therefore risks misclassifying these cases. To assess whether this potential misclassification drives the baseline results, we redefine the treatment timing using the year of substantive examination rather than the filing cohort. Table 7 reports the results. Across all three outcomes, the coefficients on *Eligible* × *Post* retain the sign, statistical significance, and approximate magnitude of the baseline estimates. The baseline findings are therefore not driven by the use of filing cohort to define post-policy exposure.

**Table 7: Robustness to Alternative Exposure Timing Based on Substantive Examination Year**

| VARIABLES | (1) *effort* | (2) *diff_firstclaim* | (3) *diff_indclaim* |
|---|---|---|---|
| *Eligible × Post* | -0.043** (0.019) | 0.036*** (0.012) | 0.061*** (0.021) |
| *Controls* | Yes | Yes | Yes |
| *Examiner×Examineyear FE* | Yes | Yes | Yes |
| *IPC4×Examineyear FE* | Yes | Yes | Yes |
| *Applicant×Applyear FE* | Yes | Yes | Yes |
| *Province×Examineyear FE* | Yes | Yes | Yes |
| *Examiner×Applicant FE* | Yes | Yes | Yes |
| Observations | 681,696 | 681,592 | 681,666 |
| Adjusted $R^2$ | 0.350 | 0.640 | 0.485 |

*Note*: The numbers in parentheses represent clustered standard errors. ***$p$<0.01, **$p$<0.05, *$p$<0.1.

### 5.3.3 Field-Specific Trends

Eligible and ineligible technological fields may follow different long-run trends even in the absence of FPA. Although the event-study evidence does not show systematic differential pre-trends, it does not by itself rule out the possibility that eligible and ineligible fields followed different smooth trajectories over the full sample period. To provide a stricter test, we further include eligibility-specific linear time trends in the baseline specification. This allows eligible and ineligible fields to evolve along different smooth trajectories over the entire sample period, so that the FPA effect is identified from the post-2012 deviation from these field-specific trends rather than from the overall difference between the two groups.

Table 8 reports the results. The coefficients for the claim-scope outcomes are smaller in magnitude than in the baseline. This attenuation indicates that a portion of the baseline effect on claim-scope outcomes is absorbed by field-specific smooth trends. Nonetheless, the coefficients remain positive and statistically significant, indicating that even after accounting for differential long-run trends between eligible and ineligible fields, FPA implementation produced a discrete shift in claim-scope outcomes consistent with the applicant-side response constraint. The effect on examiner search effort, by contrast, is essentially unchanged from the baseline, suggesting that this outcome is not driven by field-specific trends.

**Table 8: Robustness to Eligibility-Specific Time Trends**

| VARIABLES | (1) | (2) | (3) |
|---|---|---|---|
| | *effort* | *diff_firstclaim* | *diff_indclaim* |
| *Eligible × Post* | -0.037*** | 0.016* | 0.024** |
| | (0.011) | (0.008) | (0.010) |
| *Controls* | Yes | Yes | Yes |
| *Examiner×Examineyear FE* | Yes | Yes | Yes |
| *IPC4×Examineyear FE* | Yes | Yes | Yes |
| *Applicant×Appliyear FE* | Yes | Yes | Yes |
| *Province×Examineyear FE* | Yes | Yes | Yes |
| *Examiner×Applicant FE* | Yes | Yes | Yes |
| *Eligible-specific linear trend* | Yes | Yes | Yes |
| Observations | 681,696 | 681,592 | 681,666 |
| Adjusted $R^2$ | 0.379 | 0.366 | 0.244 |

*Note*: The numbers in parentheses represent clustered standard errors. ****p*<0.01, ***p*<0.05, **p*<0.1.

### 5.3.4 Sensitivity to Unobservable Selection

Our high-dimensional fixed effects absorb the main structural sources of confounding, with key dimensions interacted with time where appropriate to account for time-varying heterogeneity. They cannot, however, rule out selection on unobservables that varies within these fixed-effect cells, such as differences in latent technological quality across an applicant's own eligible and ineligible applications in a given year. To gauge whether such residual selection could account for our results, we implement the coefficient-stability approach of Oster (2019), which builds on Altonji et al. (2005). The test asks how strong selection on unobservables would have to be, relative to selection on observables, to explain away the estimate. We report two quantities: $\delta^*$, the relative strength of unobservable selection required to drive the coefficient to zero ($\delta^* > 1$ means unobservables would need to be stronger than observables), and $\beta^*(\delta=1)$, the bias-adjusted coefficient under equal selection. Following Oster (2019), we use $R_{max} = 1.3\dot{R}$ as the default fit bound and also report the more conservative $R_{max} = \dot{R} + 0.05$. The short and long specifications, and the constant-sample requirement, are described in the note to Table 9.

Table 9 reports the results. Moving from the short to the long specification sharply raises explanatory power ($R^2$ rises from 0.031 to 0.593 for examiner citations, 0.188 to 0.639 for first-claim scope, and 0.075 to 0.485 for independent-claim scope). The high long-specification $R^2$ makes this a demanding test: little residual variance remains for unobservables to operate within, so any remaining confounding would have to be highly concentrated to overturn the estimates.

**Table 9: Oster Bounds for Sensitivity to Unobservable Selection**

| Outcome | $\tilde{\beta}$ (short) | $\dot{\beta}$ (long) | $\tilde{R}$ (short) | $\dot{R}$ (long) | $\delta^*[R_{max} = \dot{R} + 0.05]$ | $\delta^*$ $[R_{max} = 1.3\dot{R}]$ | $\beta^*$ ($\delta = 1$) | Identified set |
|---|---|---|---|---|---|---|---|---|
| *effort* | -0.128 | -0.033 | 0.031 | 0.593 | 3.99 | 1.12 | -0.004 | [-0.033, -0.004] |
| *diff_firstclaim* | 0.069 | 0.036 | 0.188 | 0.639 | 9.93 | 2.59 | 0.022 | [0.022, 0.036] |
| *diff_indclaim* | 0.203 | 0.077 | 0.075 | 0.485 | 5.02 | 1.72 | 0.032 | [0.032, 0.077] |

*Note*: This table reports bias-adjusted bounds following Oster (2019). The short specification includes the FPA exposure indicator, core patent-level controls, and application-year fixed effects. The long specification additionally includes high-dimensional interacted fixed effects that absorb applicant, technology, examiner, province-year and examiner-applicant heterogeneity. The sample is held constant across the two specifications. $\tilde{\beta}$ and $\tilde{R}$ denote the treatment coefficient and $R^2$ from the short specification; $\dot{\beta}$ and $\dot{R}$ denote those from the long specification. $\delta^*$ is the relative degree of selection on unobservables required to drive the treatment coefficient to zero. $\beta^*(\delta$=1) is the bias-adjusted coefficient under equal selection on observables and unobservables. The identified set is computed using Oster's recommended $R_{max}$=1.3$\dot{R}$. Following Altonji et al. (2005) and Oster (2019), $\delta^*$>1 is interpreted as evidence of robustness to unobservable selection.

Under the default $R_{max} = 1.3\dot{R}$, all three $\delta^*$ exceed one: overturning the examiner-citation result would require unobservable selection at least 1.12 times as strong as the combined observable controls and fixed effects, and the two claim-scope results require 2.59 and 1.72 times, respectively. Under the conservative $R_{max} = \dot{R} + 0.05$, the required values are larger still (3.99 to 9.93). The bias-adjusted coefficients point the same way: under the equal-selection benchmark ($\delta$=1) and $R_{max} = 1.3\dot{R}$, $\beta^*(\delta$=1) preserves the baseline sign for all three outcomes and the identified sets exclude zero. Even if unobservable selection were as strong as the comprehensive observable selection, the estimated effects would remain in the same direction.

These bounds do not prove that unobserved confounding is absent, but they indicate that the baseline results are unlikely to be explained by omitted-variable bias unless selection on unobservables is substantially stronger than selection on an already rich set of observed controls and high-dimensional fixed effects.

### 5.3.5 Alternative Estimators and Inference

We next examine whether the mechanism results are sensitive to functional-form assumptions or to alternative ways of accounting for residual correlation across related applications (Table 10).

**Table 10: Robustness to Alternative Estimators and Inference**

| Panel A. Alternative estimator: PPML | | | |
|---|---|---|---|
| VARIABLES | (1) | (2) | (3) |
| | *effort* | *diff_firstclaim* | *diff_indclaim* |
| *Eligible × Post* | -0.010***<br>(0.005) | 0.037***<br>(0.008) | 0.078***<br>(0.012) |
| *Controls* | Yes | Yes | Yes |
| Fixed effects | Yes | Yes | Yes |
| Observations | 644,939 | 669,796 | 671,983 |
| Pseudo R2 | 0.213 | 0.471 | 0.467 |
| Panel B. Alternative inference: applicant-level clustering | | | |
| VARIABLES | (4) | (5) | (6) |
| | *effort* | *diff_firstclaim* | *diff_indclaim* |
| *Eligible × Post* | -0.035*<br>(0.020) | 0.035**<br>(0.014) | 0.076***<br>(0.022) |
| *Controls* | Yes | Yes | Yes |
| Fixed effects | Yes | Yes | Yes |
| Observations | 681,696 | 681,592 | 681,666 |
| Adjusted $R^2$ | 0.235 | 0.339 | 0.485 |
| Panel C. Alternative inference: technological-field clustering | | | |
| VARIABLES | (7) | (8) | (9) |
| | *effort* | *diff_firstclaim* | *diff_indclaim* |
| *Eligible × Post* | -0.035*<br>(0.021) | 0.035**<br>(0.014) | 0.076***<br>(0.024) |
| *Controls* | Yes | Yes | Yes |
| Fixed effects | Yes | Yes | Yes |
| Observations | 681,696 | 681,592 | 681,666 |
| Adjusted $R^2$ | 0.350 | 0.425 | 0.485 |

*Note*: The full set of baseline fixed effects is included in all specifications across Panels A-C. ***$p$<0.01, **$p$<0.05, *$p$<0.1

Because the three outcomes are non-negative and potentially skewed, Panel A re-estimates the baseline models using PPML. The coefficients retain their signs and remain significant at the 1% level, indicating that the baseline findings are not driven by applying a linear estimator to non-negative outcomes. Panels B and C cluster standard errors at the applicant and technological-field (full primary IPC level), respectively. Across all schemes, *Eligible* × *Post* remains negative for *effort* and positive for *diff_firstclaim* and *diff_indclaim*, with the claim-scope results significant throughout and the examiner-search result significant under each procedure. The baseline results are therefore not artifacts of the OLS functional form or the baseline standard-error adjustment.

### 5.3.6 IV Evidence on Actual Participation

The preceding analyses estimate eligibility-based ITT effects of exposure to the FPA regime, which avoid conditioning on actual FPA take-up. As a complementary exercise, we move closer to actual fast-track participation by constructing a proxy and applying an IV strategy. We emphasize that this exercise is intended as supporting evidence rather than as the primary identification strategy. The proxy cannot be directly verified, and the instrument's exclusion restriction rests on assumptions that cannot be fully tested.

We define *Tag* as an indicator equal to one if substantive examination is completed within one year, and zero otherwise. The one-year threshold is grounded in Article 2 of the *FPA Measures*, which provides that cases admitted to FPA should be concluded within one year from approval. Although not all one-year examinations are necessarily formal FPA cases, this threshold captures applications whose realized examination speed is consistent with the statutory FPA completion target. *Tag* is endogenous to multiple factors that may simultaneously affect mechanism outcomes, so OLS estimation would conflate the causal effect of fast-track-like processing with these confounders. To address this endogeneity, we instrument *Tag* with the ratio of tea plantation area to total crop-sown area in the applicant's province in the relevant year. The conceptual motivation is that tea cultivation may proxy for a local "slow-culture" orientation that shapes applicants' propensity to enter fast-track-like processing. Because this measure is based on agricultural land-use structure at the applicant-province level, it is plausibly predetermined with respect to the examination behavior of individual patent examiners. The first stage supports this interpretation. Applicants in provinces with stronger tea-cultivation intensity are less likely to be associated with fast-track-like examination. The first-stage F statistic and the Kleibergen–Paap Wald rk F statistic are both 173.03, well exceeding the Stock and Yogo (2005) critical value of 16.38 for the 10% maximal IV size benchmark.

Two caveats are worth noting. First, the exclusion restriction assumes that province-year variation in tea cultivation affects baseline outcomes only through fast-track-like participation, conditional on controls and fixed effects. Provinces that expand tea cultivation may simultaneously experience changes in economic structure or local administrative practices that directly affect examination outcomes. Our specification includes applicant, examiner, IPC4, and province fixed effects to absorb the principal sources of time-invariant heterogeneity. Second, the IV specification does not include year fixed effects, because *Tag* is constructed at the patent level from examination duration and its identifying variation would be substantially absorbed by year fixed effects. The robustness checks above, which rely on different identifying assumptions and explicitly account for time trends, provide reassurance against the time-trend concern arising from this omission.

Table 11 reports the second-stage estimates. The coefficient on *Tag* is negative and significant for examiner search effort, and positive and significant for both *diff_firstclaim* and *diff_indclaim*. The qualitative pattern reproduces that of the baseline regressions: fast-track processing is associated with reduced examiner search effort and more pronounced claim-scope narrowing. The IV magnitudes are larger than the baseline ITT estimates, consistent with the standard relationship between ITT and LATE estimates, which is that incomplete take-up attenuates the ITT estimate relative to the local average treatment effect on compliers.

The value of this analysis lies not in providing a more credible causal estimate than the baseline DID, but in showing that the same qualitative pattern appears when treatment is measured closer to actual fast-track processing rather than eligibility-based policy exposure. Because the DID and IV approaches rely on different sources of variation and identifying assumptions, the consistency of the results provides corroborating evidence that accelerated examination weakens examination quality along the claim scope calibration margin[1].

**Table 11: Complementary IV Evidence Based on a Proxy for Actual Fast-Track Participation**

| VARIABLES | (1) | (2) | (3) |
|---|---|---|---|
| | *effort* | *diff_firstclaim* | *diff_indclaim* |
| *Tag* | -1.026** | 2.784** | 1.463*** |
| | (0.456) | (1.402) | (0.519) |
| *Controls* | Yes | Yes | Yes |
| *Applicant FE* | Yes | Yes | Yes |
| *Examiner FE* | Yes | Yes | Yes |
| *IPC4 FE* | Yes | Yes | Yes |
| *Province FE* | Yes | Yes | Yes |
| Observations | 158,093 | 158,093 | 158,093 |

Note: The numbers in parentheses represent clustered standard errors. ***$p$<0.01, **$p$<0.05, *$p$<0.1.

### 5.4 Heterogeneity Analysis

The baseline mechanism results show that FPA exposure reduces examiner search effort and increases application-to-grant claim-scope narrowing. We next examine whether these effects vary across examiners, applicants, patent characteristics, and examiner-applicant interaction settings. These heterogeneity analyses are not intended to establish separate causal channels. Rather, they clarify the conditions under which the examiner-side search constraint and applicant-side response constraint are more pronounced, thereby helping to identify the boundary conditions of acceleration alignment.

We organize the heterogeneity analysis along three dimensions. First, we examine characteristics of the examination participants, focusing on examiner experience and applicant size. Second, we examine characteristics of the examined object, focusing on patent value. Third, we examine interaction conditions between examiners and applicants, asking whether applicant size conditions examiner search behavior and whether the informational intensity of examiner feedback conditions applicant claim narrowing.

#### 5.4.1 Examiner and Applicant Characteristics

Examiners and applicants are the two primary participants in substantive examination, and their characteristics may shape how they respond to accelerated timelines. We first examine examiner experience. Experienced examiners may possess greater familiarity with

[1] We also apply the IV specification to the heterogeneity analyses reported below. The IV-based heterogeneity results are qualitatively consistent with the baseline heterogeneity patterns. To keep the main text focused, these additional results are reported in Appendix Table A.1.

technological fields, examination routines, and prior-art structures. Under regular timelines, such experience may improve examination efficiency. Under compressed FPA deadlines, however, experienced examiners may also rely more heavily on accumulated knowledge and screening routines, thereby reducing observable prior-art search effort. We therefore expect FPA-induced search compression to be more pronounced among more experienced examiners.

We use two proxies for examiner experience. The first is cumulative examination duration, measured by the total time the examiner has spent on prior examinations before the focal case. The second is examination experience, measured by the number of years between the examiner's first observed case and the focal case. Table 12 reports the subsample results. Across both proxies, the decline in examiner citations is larger and statistically significant among more experienced examiners. When experience is measured by cumulative examination duration, the coefficient on *Eligible* × *Post* is insignificant for less experienced examiners but negative and significant for more experienced examiners. The same pattern appears when experience is measured by examination experience. These results suggest that the examiner-side search constraint is not uniform across examiners. It is stronger among examiners who may be better positioned to economize on search by relying on accumulated expertise and established routines under time pressure.

**Table 12: Heterogeneity Analysis Based on Examiner Work Experience**

| VARIABLES | Examiner Review Time | | Examiner Work Experience | |
|---|---|---|---|---|
| | (1) Less Experienced | (2) More Experienced | (3) Less Experienced | (4) More Experienced |
| *Eligible* × *Post* | -0.020<br>(0.032) | -0.082**<br>(0.030) | -0.035<br>(0.027) | -0.079**<br>(0.038) |
| *Controls* | Yes | Yes | Yes | Yes |
| *Examiner×Examineyear FE* | Yes | Yes | Yes | Yes |
| *IPC4×Examineyear FE* | Yes | Yes | Yes | Yes |
| *Applicant×Appliyear FE* | Yes | Yes | Yes | Yes |
| *Province×Examineyear FE* | Yes | Yes | Yes | Yes |
| *Examiner×Applicant FE* | Yes | Yes | Yes | Yes |
| Observations | 305,929 | 325,372 | 364,243 | 255,897 |
| Adjusted $R^2$ | 0.354 | 0.354 | 0.356 | 0.349 |

Note: The numbers in parentheses represent clustered standard errors. ***$p$<0.01, **$p$<0.05, *$p$<0.1.

We next examine applicant size. Applicant size affects the applicant-side response constraint because applicants differ in procedural resources, portfolio strategy, and capacity to contest office actions. Large applicants typically have more experience with patent examination, greater access to patent agents and internal technical staff, and broader patent portfolios. These resources may allow them to resist excessive claim narrowing, formulate more targeted amendments, or preserve justified claim scope even under compressed deadlines. Smaller applicants, by contrast, may face higher relative costs of prolonged examination and stronger incentives to secure faster grant, making them more likely to accept examiner positions or introduce additional limiting features.

We proxy applicant size using the applicant's pre-treatment cumulative number of filed patents. Table 13 reports the subsample results. The claim-scope effects of FPA are concentrated among small applicants. For small applicants, FPA exposure significantly increases both first-claim and independent-claim scope changes. For large applicants, the coefficients are positive but statistically insignificant. This pattern supports the applicant-side response constraint: applicants with smaller portfolios appear more likely to narrow claims under accelerated timelines. It also reinforces the interpretation that FPA-induced narrowing is not merely a mechanical feature of examination, but a behavioral response conditioned by applicants' ability to defend claim scope.

**Table 13: Heterogeneity Analysis Based on Applicant Size**

| VARIABLES | Small-Scale Applicants | | Large-Scale Applicants | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | *diff_firstclaim* | *diff_indclaim* | *diff_firstclaim* | *diff_indclaim* |
| *Eligible × Post* | 0.036**<br>(0.015) | 0.090***<br>(0.023) | 0.033<br>(0.027) | 0.050<br>(0.044) |
| *Controls* | Yes | Yes | Yes | Yes |
| *Examiner×Examineyear FE* | Yes | Yes | Yes | Yes |
| *IPC4×Examineyear FE* | Yes | Yes | Yes | Yes |
| *Applicant×Applyear FE* | Yes | Yes | Yes | Yes |
| *Province×Examineyear FE* | Yes | Yes | Yes | Yes |
| *Examiner×Applicant FE* | Yes | Yes | Yes | Yes |
| Observations | 351,515 | 351,605 | 261,292 | 261,287 |
| Adjusted $R^2$ | 0.479 | 0.249 | 0.402 | 0.106 |

Note: The numbers in parentheses represent clustered standard errors. ***$p$<0.01, **$p$<0.05, *$p$<0.1.

### 5.4.2 Patent Value and Scope-Calibration Stakes

We next examine whether the characteristics of the examined application condition the two mechanisms. Patent value matters because it affects both examiner search and applicant response. On the examiner side, low-value or technologically narrower cases may be more vulnerable to search compression under time pressure. When the perceived stakes or technological reach of a case are lower, examiners may have stronger incentives to economize on prior-art search in order to satisfy accelerated deadlines. On the applicant side, low-value cases may also reduce the marginal cost of surrendering claim scope. Applicants may be less willing to spend time and resources contesting office actions when the expected value of preserving broader scope is relatively limited. Under FPA timelines, this may lead to faster acquiescence and more pronounced claim narrowing.

We proxy patent value using IPC width (Danish and Sharma, 2024; Lerner, 1994; Zhu et al., 2022), following the idea that patents covering broader technological space tend to have greater potential value and wider technological reach. Table 14 reports the subsample results. The effects of FPA exposure are concentrated in the low-value subsample. For low-value patents, FPA exposure significantly reduces examiner citations and significantly increases both first-claim and independent-claim scope changes. By contrast, the coefficients for high-value patents are smaller and statistically insignificant. This pattern indicates that the acceleration-alignment mechanism is stronger when the perceived value or technological reach of the application is lower.

These results are consistent with both sides of the mechanism. For examiners, low-value cases appear more susceptible to search truncation under compressed deadlines. For applicants, low-value cases create weaker incentives to invest in extended argumentation or more carefully calibrated amendments, making claim-scope concessions more likely. The findings therefore suggest that FPA-induced time pressure does not affect all patents equally. It has stronger scope-margin consequences where the expected returns to fuller search and scope defense are lower.

**Table 14: Heterogeneity Analysis Based on Patent Value**

| (a) Low Patent Value | | | |
|---|---|---|---|
| VARIABLES | (1) | (2) | (3) |
| | *diff_firstclaim* | *diff_indclaim* | *effort* |
| *Eligible × Post* | 0.067***<br>(0.016) | 0.142***<br>(0.033) | -0.051*<br>(0.028) |
| *Controls* | Yes | Yes | Yes |
| *Examiner×Examineyear FE* | Yes | Yes | Yes |
| *IPC4×Examineyear FE* | Yes | Yes | Yes |
| *Applicant×Appliyear FE* | Yes | Yes | Yes |
| *Province×Examineyear FE* | Yes | Yes | Yes |
| *Examiner×Applicant FE* | Yes | Yes | Yes |
| Observations | 401,641 | 401,612 | 401,641 |
| Adjusted $R^2$ | 0.401 | 0.178 | 0.331 |
| (b) High Patent Value | | | |
| VARIABLES | (4) | (5) | (6) |
| | *diff_firstclaim* | *diff_indclaim* | *effort* |
| *Eligible × Post* | 0.006<br>(0.032) | 0.010<br>(0.030) | -0.015<br>(0.048) |
| *Controls* | Yes | Yes | Yes |
| *Examiner×Examineyear FE* | Yes | Yes | Yes |
| *IPC4×Examineyear FE* | Yes | Yes | Yes |
| *Applicant×Appliyear FE* | Yes | Yes | Yes |
| *Province×Examineyear FE* | Yes | Yes | Yes |
| *Examiner×Applicant FE* | Yes | Yes | Yes |
| Observations | 164,078 | 164,106 | 164,106 |
| Adjusted $R^2$ | 0.512 | 0.119 | 0.408 |

Note: The numbers in parentheses represent clustered standard errors. ***$p$<0.01, **$p$<0.05, *$p$<0.1.

### 5.4.3 Examiner-Applicant Interaction Conditions

The preceding analyses examine characteristics of examiners, applicants, and patents separately. Substantive examination, however, is an interactive process in which examiner search and claim comparison shape office actions, and applicants respond through arguments, amendments, or acceptance. We therefore examine two interaction-oriented margins: whether applicant size moderates FPA-induced changes in examiner search effort, and whether the informational intensity of examiner feedback shapes applicant claim narrowing.

We first examine whether examiner search compression differs by applicant size. Applicant size is observable to examiners and may shape how examiners allocate attention under compressed timelines. Larger applicants may carry stronger innovation reputations, more professionalized patent drafting, and greater expected capacity to contest office actions. These features may induce examiners to maintain more cautious search behavior even under FPA deadlines. Smaller applicants, by contrast, may be perceived as less likely to challenge office actions extensively, making search compression more likely.

Table 15 reports the results. FPA exposure significantly reduces examiner citations for applications filed by small applicants, while the corresponding coefficient for large applicants is statistically insignificant. This pattern complements the applicant-size results in Table 13. Applicant size affects not only applicants' own claim-amendment behavior, but also examiner search behavior under time pressure. The result is consistent with an interaction-based account of acceleration alignment: the same applicant characteristic that makes claim-scope defense more difficult may also make examiner search compression more likely.

We then examine whether applicant-side claim narrowing varies with the informational intensity of examiner feedback. Because we do not observe the full text of the first office action, we use the number of examiner citations recorded in the final grant text as an observable proxy for the prior-art information developed during examination. This measure is imperfect, but it provides the closest available trace of the informational basis on which examiner feedback was formed.

**Table 15: Examiner Search Effort by Applicant Size**

| VARIABLES | Small-Scale Applicants | Large-Scale Applicants |
|---|---|---|
| | (1) | (2) |
| | *effort* | *effort* |
| *Eligible × Post* | -0.060** | 0.007 |
| | (0.026) | (0.040) |
| *Controls* | Yes | Yes |
| *Examiner×Examineyear FE* | Yes | Yes |
| *IPC4×Examineyear FE* | Yes | Yes |
| *Applicant×Appliyear FE* | Yes | Yes |
| *Province×Examineyear FE* | Yes | Yes |
| *Examiner×Applicant FE* | Yes | Yes |
| Observations | 351,618 | 261,292 |
| Adjusted $R^2$ | 0.333 | 0.413 |

Note: The numbers in parentheses represent clustered standard errors. ***$p$<0.01, **$p$<0.05, *$p$<0.1.

Table 16 reports the results. FPA exposure significantly increases both first-claim and independent-claim scope changes in cases with more examiner citations, while the effects are statistically insignificant in cases with fewer examiner citations. This pattern suggests that applicant acquiescence under compressed deadlines is especially pronounced when examiner feedback is more information-intensive. When office actions are backed by more cited prior art, applicants facing short response windows may find it more costly to contest the examiner's position, and may instead choose to narrow claims in order to preserve fast-track processing and secure faster grant.

**Table 16: Applicant Claim Narrowing by Examiner Citation Intensity**

| VARIABLES | Fewer Examiner Citations | | More Examiner Citations | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| | *diff_firstclaim* | *diff_indclaim* | *diff_firstclaim* | *diff_indclaim* |
| *Eligible × Post* | -0.007<br>(0.027) | 0.024<br>(0.038) | 0.059***<br>(0.016) | 0.119***<br>(0.023) |
| *Controls* | Yes | Yes | Yes | Yes |
| *Examiner×Examineyear FE* | Yes | Yes | Yes | Yes |
| *IPC4×Examineyear FE* | Yes | Yes | Yes | Yes |
| *Applicant×Appliyear FE* | Yes | Yes | Yes | Yes |
| *Province×Examineyear FE* | Yes | Yes | Yes | Yes |
| *Examiner×Applicant FE* | Yes | Yes | Yes | Yes |
| Observations | 271,478 | 271,499 | 272,654 | 272,717 |
| Adjusted $R^2$ | 0.414 | 0.099 | 0.464 | 0.256 |

Note: The numbers in parentheses represent clustered standard errors. ***$p$<0.01, **$p$<0.05, *$p$<0.1.

Taken together, Table 15 and Table 16 show that examiner-applicant interaction conditions both sides of the acceleration-alignment process. Applicant size affects examiner search effort, and examiner citation intensity affects applicant claim narrowing. These findings reinforce the view that FPA changes the strategic environment in which examiners and applicants respond to each other under compressed deadlines.

Overall, the heterogeneity analyses clarify where the two mechanisms are most pronounced. Examiner-side search compression is stronger among more experienced examiners, lower-value patents, and applications filed by smaller applicants. Applicant-side claim narrowing is stronger among smaller applicants, lower-value patents, and cases involving more citation-intensive examiner feedback. These patterns are consistent with acceleration alignment: compressed timelines affect both sides of the examination process, but the strength of each response depends on examiner routines, applicant resources, patent value, and the informational intensity of examiner-applicant interaction.

## 6 Conclusion and Policy Implications

### 6.1 Conclusion

In an era of growing application volumes and persistent examination backlogs, fast-track examination programs have become an increasingly common policy response. Yet the quality consequences of accelerated examination remain insufficiently understood, especially when acceleration is achieved under fixed examination resources. This paper studies this issue using China's 2012 *Administrative Measures for Fast-track Patent Applications* as a policy shock.

Exploiting the nationwide implementation of the *FPA Measures* and policy-defined eligibility across technological fields, we estimate eligibility-based ITT effects of FPA exposure through a cohort difference-in-differences design. By matching patent application texts with their corresponding grant texts, we are able to use examination duration and grant outcomes as preliminary evidence on the speed and gatekeeping margins, while focusing more centrally on the claim scope-calibration process through which granted claim scope is shaped.

The results show that FPA exposure accelerates substantive examination. This speed gain, however, comes with measurable changes in examination outcomes and examiner-applicant behavior. FPA exposure increases grant probability without corresponding improvements in observable application-stage quality proxies, a pattern consistent with a relaxation of the grant threshold and an elevated Type I error risk. More centrally for this paper, FPA exposure also affects the scope-calibration dimension of examination quality. Eligible-field patents experience fewer examiner-cited prior-art references after FPA implementation, indicating reduced examiner search effort. They also undergo more pronounced application-to-grant claim-scope narrowing, measured by changes in the first claim and independent claims. These two mechanisms provide behavioral evidence on how accelerated timelines affect the calibration of granted claim scope. The heterogeneity analyses further show that these mechanisms are more pronounced in settings where examiners can more readily economize on search or where applicants face weaker incentives and resources to defend claim scope.

Beyond the specific results, the findings point to a broader phenomenon: examiner-applicant "acceleration alignment." This alignment should not be understood as deliberate cooperation or collusion. Rather, it emerges from independent responses to the same institutional pressure for faster processing. Examiners facing shorter deadlines economize on prior-art search, thereby weakening the informational basis for calibrating claim scope to technological contribution. Applicants facing compressed response windows are more likely to accept examiner positions or add limiting features in order to retain accelerated processing and secure faster grant. The concept of acceleration alignment extends the classical speed-quality trade-off literature by identifying a specific behavioral channel through which time pressure operates in expert review settings: when both sides of an interaction face binding deadlines, their individually rational responses can converge in ways that may not appear as quality compromises from either side's perspective, yet collectively weaken the substantive function of the review process. As a result, acceleration may move applications more quickly through the examination system while weakening the calibration of granted claim scope.

Taken together, these findings suggest that the economic consequences of accelerated examination cannot be evaluated solely through pendency, grant rates, or post-grant disputes.

They also depend on how accelerated examination reshapes the scope of granted claims. The grant decision determines whether a patent right exists, but the granted claims determine the boundaries of that right. By linking examiner search effort, applicant claim amendments, and application-to-grant text evolution, this paper shows that the speed-quality trade-off operates not only through decisional accuracy, but also through scope appropriateness. In this sense, the paper extends the study of patent examination quality from the gatekeeping function of examination to its calibrating function.

Several limitations should be noted. First, the baseline design estimates eligibility-based exposure effects rather than the treatment-on-the-treated effect of actual FPA participation, because actual FPA approval records are not directly observed and may be endogenous. We mitigate this limitation by interpreting the baseline estimates as ITT effects and by providing complementary IV evidence based on a proxy for FPA. Second, claim-scope measures based on word-count changes are necessarily imperfect. Although increases in independent-claim word counts generally reflect additional limiting features and narrower scope in the Chinese examination context, claim language can be complex, and not every textual change maps mechanically onto legal breadth. Third, examiner citations provide a quantitative proxy for prior-art search effort, but they cannot fully capture the qualitative dimensions of search, including the relevance of cited references, the depth of comparison with the claimed invention, and the reasoning underlying patentability assessments. While reductions in examiner citations under accelerated timelines plausibly reflect reduced search effort, the absence of citation declines would not necessarily imply unchanged search quality. Future research combining text-based measures with office-action data, examiner reasoning records, post-grant validity outcomes, licensing outcomes, or litigation evidence could further evaluate how acceleration affects examination quality.

### 6.2 Policy Implications

The findings have several implications for the design of accelerated patent examination programs.

First, acceleration programs should embed quality safeguards into the examination process rather than relying only on post-grant correction. Our results show that faster timelines can reduce examiner search effort and raise grant probability without observable improvements in application-stage quality. Patent offices should therefore ensure that fast-track cases satisfy search and reasoning standards comparable to those applied in regular examination. Concrete instruments may include minimum prior-art search requirements, internal quality review for accelerated cases, and ongoing monitoring of examiner citation patterns in fast-track channels. The objective is not to slow all accelerated cases, but to prevent speed targets from substituting for substantive patentability analysis.

Second, accelerated examination should preserve meaningful opportunities for applicant response and claim-scope defense. The evidence indicates that compressed response windows can induce applicants to narrow claims more aggressively, potentially resulting in granted claim scope that is narrower than the invention's technological contribution would warrant. Fast-track systems should therefore avoid treating applicant response speed as the sole indicator of procedural efficiency. Even under accelerated timelines, applicants should have sufficient opportunities to evaluate office actions, consult technical and legal advisers, present arguments, and draft amendments that preserve justified claim scope. Structured examiner–applicant interviews, limited extensions for complex cases, or differentiated response windows for high-value or technically complex applications may help maintain the calibrating function of examination while preserving the benefits of acceleration.

Third, patent offices should monitor claim-scope evolution as a core quality indicator. Existing performance systems often emphasize pendency, disposal volume, grant rates, or post-grant invalidation outcomes. These indicators are important but incomplete. Because the economic value and competitive effect of a patent depend on the scope of granted claims, changes from application claims to granted claims provide valuable information about how examination reshapes patent rights. Systematic monitoring of application-to-grant claim changes could help identify cases in which accelerated examination produces narrowing that deviates substantially from the baseline magnitude observed under regular examination. Such monitoring would also allow patent offices to evaluate whether acceleration policies affect different applicant groups, technological fields, or patent-value segments unevenly.

Fourth, accelerated examination should be capacity-aware and differentiated. The quality effects of acceleration are unlikely to be uniform across technologies, applicants, and examination contexts. Complex technologies, high-value patents, inexperienced applicants, or cases requiring extensive prior-art comparison may be more vulnerable to scope miscalibration under tight deadlines. Rather than expanding fast-track access uniformly, patent offices may consider tiered acceleration mechanisms with clear eligibility criteria, volume caps tied to examiner capacity, and stronger quality review for cases where accelerated processing is most likely to affect substantive outcomes. International experience provides useful reference points. For example, the USPTO's Track One prioritized examination program uses a voluntary request system, specific prioritized-examination fees, and an annual cap on accepted requests. This type of design illustrates how user costs and capacity-based caps can discipline demand, allocate accelerated examination to applicants with stronger need for speed, and reduce the risk that fast-track access expands beyond available examination capacity.

Taken together, these recommendations point to a broader principle: fast-track examination can remain a targeted tool for improving the timeliness of patent rights, but its design must safeguard the calibrating function through which examination aligns granted claim scope with technological contribution. As application backlogs grow and examination efficiency becomes a policy priority, maintaining this balance is essential to preserving the patent system's integrity as a mechanism for allocating and delimiting exclusive rights.

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## Appendix

This appendix reports IV-based heterogeneity analyses corresponding to the baseline heterogeneity results in Tables 12–16 of the main text. Tag is an indicator equal to one if substantive examination is completed within one year, instrumented by the ratio of tea plantation area to total crop-sown area in the applicant's province in the relevant year.

**Table A.1: IV-Based Heterogeneity Analyses**

| **Panel A. Examiner Work Experience (Dependent Variable: effort; Corresponding to Table 12)** | | | | |
|---|---|---|---|---|
| VARIABLES | Examiner Review Time | | Examiner Work Experience | |
| | (1) Less Experienced | (2) More Experienced | (3) Less Experienced | (4) More Experienced |
| *Tag* | 2.046<br>(1.657) | -2.668***<br>(0.767) | 1.138<br>(2.252) | -1.305***<br>(0.480) |
| Observations | 79,089 | 74,641 | 79,611 | 73,693 |
| Control | Yes | | | |
| Applicant FE | Yes | | | |
| Examiner FE | Yes | | | |
| IPC4 FE | Yes | | | |
| Province FE | Yes | | | |
| **Panel B. Applicant Size (Corresponding to Table 13)** | | | | |
| VARIABLES | Small-Scale Applicants | | Large-Scale Applicants | |
| | *(1) diff_firstclaim* | *(2) diff_indclaim* | *(3) diff_firstclaim* | *(4) diff_indclaim* |
| *Tag* | 2.838***<br>(1.033) | 4.721***<br>(1.218) | 0.639<br>(0.919) | -0.127<br>(0.335) |
| Observations | 69,794 | 69,791 | 86,127 | 86,125 |
| Control | Yes | | | |
| Applicant FE | Yes | | | |
| Examiner FE | Yes | | | |
| IPC4 FE | Yes | | | |
| Province FE | Yes | | | |

| **Panel C. Patent Value (Corresponding to Table 14)** | | | |
|---|---|---|---|
| ***(a) Low Patent Value*** | | | |
| VARIABLES | *(1) diff_firstclaim* | *(2) diff_indclaim* | *(3) effort* |
| *Tag* | 1.837***<br>(0.631) | 1.272***<br>(0.379) | -1.098*<br>(0.569) |
| Observations | 51,658 | 51,657 | 51,658 |
| Control | Yes | | |
| Applicant FE | Yes | | |
| Examiner FE | Yes | | |
| IPC4 FE | Yes | | |
| Province FE | Yes | | |
| ***(b) High Patent Value*** | | | |
| VARIABLES | *(4) diff_firstclaim* | *(5) diff_indclaim* | *(6) effort* |
| *Tag* | 1.680<br>(1.154) | 1.487*<br>(0.794) | -1.059<br>(0.665) |
| Observations | 100,751 | 100,748 | 100,751 |

| | | | |
|---|---|---|---|
| Control | | Yes | |
| Applicant FE | | Yes | |
| Examiner FE | | Yes | |
| IPC4 FE | | Yes | |
| Province FE | | Yes | |

**Panel D. Examiner–Applicant Interaction (Corresponding to Tables 15 and 16)**

***(a) Fewer Examiner Citations / Small-Scale Applicants***

| VARIABLES | Fewer Examiner Citations | | Small-Scale Applicants |
|---|---|---|---|
| | *(1) diff_firstclaim* | *(2) diff_indclaim* | *(3) effort* |
| *Tag* | 1.657 | 0.652 | -3.441*** |
| | (1.287) | (2.048) | (1.006) |
| Observations | 61,619 | 61,616 | 69,794 |
| Control | | Yes | |
| Applicant FE | | Yes | |
| Examiner FE | | Yes | |
| IPC4 FE | | Yes | |
| Province FE | | Yes | |

***(b) More Examiner Citations / Large-Scale Applicants***

| VARIABLES | More Examiner Citations | | Large-Scale Applicants |
|---|---|---|---|
| | *(4) diff_firstclaim* | *(5) diff_indclaim* | *(6) effort* |
| *Tag* | 1.756** | 1.677*** | -0.564 |
| | (0.708) | (0.434) | (0.566) |
| Observations | 89,594 | 89,592 | 86,127 |
| Control | | Yes | |
| Applicant FE | | Yes | |
| Examiner FE | | Yes | |
| IPC4 FE | | Yes | |
| Province FE | | Yes | |

Note: This table reports second-stage IV estimates. Panels A–D correspond to the baseline heterogeneity analyses in Tables 12–16 of the main text, respectively. Panel D reports examiner search effort by applicant size (Columns (3) and (6)) alongside applicant claim narrowing by examiner citation intensity (Columns (1)–(2) and (4)–(5)). All specifications include the full set of baseline controls and applicant, examiner, IPC4, and province fixed effects. The numbers in parentheses represent standard errors clustered at the patent level. ***$p$<0.01, **$p$<0.05, *$p$<0.1.