Digitization of Courts: Impacts on Judicial Efficiency and Firms

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Abstract

The use of technology in the courts has been shown to improve the efficiency of proceedings and the timely application of justice. Recent innovations in the judicial system have also created new opportunities for empirical research in the judicial branch. This article contributes to this literature by evaluating the impact of the Electronic Processing Law (LTE) on judicial and business results in Chile. The LTE, published in 2015, requires that the filing of claims, pleadings, and resolutions occur electronically, ending paper-based court processes. Using court administrative information and an event study strategy, we found that the introduction of LTE increased the number of cases filed per month by 28%. We also found that LTE reduced the median duration of incoming cases by an average of 25% and that the proportion of cases with a duration of less than 6 months increased by 4.3%. In addition, the total number of writes per case decreased by 6.5% on average after LTE. Finally, we found that a higher number of low-profit companies began filing cases, indicating greater accessibility of the courts.

1 Introduction

A well-functioning justice system is indispensable to economic growth and to a society as a whole. Efficient, fair, and accessible justice systems promote peace and security by creating a deterrent effect on criminal acts and increasing citizens' trust in the quality of institutions (Ramos-Maqueda and Chen, 2021). Judicial efficiency also improves the business climate, attracts foreign direct investment, secures tax revenues, and promotes economic growth (Bénassy-Quéré et al., 2007). As a result, economies with a more efficient judicial system also have higher development levels overall (Dam, 2006).

Effective case management is essential to a well-functioning justice system, but cases can be handled in a manner that is both timely and deliberate (Conference, 2020). Court automation has become a new avenue for courts to enhance their effectiveness as Information Communication Technology (ICT) becomes more affordable (World Bank, 2016). Despite heavy investments in technological solutions in courts, there is little evidence of the impact that these investments actually have on the efficiency of, and access to, justice. Previous studies suggest a link between technology and efficiency in courts (Rabinovich-Einy, 2008; Van Dijk and Dumbrava, 2013; Reiling 1, 2006), but there has yet to be experimental or quasi-experimental evidence documenting this causal relationship. In addition, there is scant literature evaluating the impact of these investments on the firms that go through judicial proceedings. Recent innovations in judicial systems around the world have also opened up new opportunities for empirical research on the delivery of justice or on their economic impacts.

This paper contributes to this literature by exploring the impact of the Electronic Processing Law (LTE in its Spanish acronym) on judicial and firms' outcomes in Chile. The Electronic Processing Law, or Law 20.086, was published on December 18, 2015 and determines that all the milestones of judicial proceedings are processed exclusively by the electronic system of the courts. By extinguishing proceedings through physical files, LTE aims to enhance access to the system, increase security, lower litigation costs, and create an integrated judicial information system (Kush and Donoso).

Studies that examine impacts of applying technology in courts remain limited and tend to use survey data on the perceptions of users or court staff (Van Dijk and Dumbrava, 2013). In contrast, we utilize administrative data on courts, containing detailed information on commercial cases filed from January 2015 to December 2019.

Analyses of the effect of technology on courts' productivity and efficiency face a key challenge: unobserved heterogeneity. Wealthier and more dynamic areas are able to afford and may demand better justice systems (Lichand and Soares, 2014). To deal with these potential problems, we use an event study strategy that allows us to isolate the causal effect of the LTE on various court and firm outcomes.

In terms of court outcomes, we find that after the introduction of LTE, there is a significant increase in the number of cases filed and resolved in a month, per tribunal. The changes are mainly driven by the increase in filings of executive cases (those that lead to the seizure and subsequent sale of a debtor's assets to satisfy an obligation). We also find that LTE reduces the duration of both incoming and ended cases. The proportion of cases with duration below 6 months increases significantly after LTE. Since LTE affects the number of incoming cases positively, we expected the law to alter the number of writings per case in a similar direction. On the contrary, we found that the total number of writings per case decreases after LTE.

We also investigate the impacts of LTE on firms' outcomes. We find that, after the introduction of LTE, more lower-profit firms started to file cases, which suggests that LTE made the justice system more accessible by decreasing the cost of procedures. Higher-profit firms and firms that filed high numbers of cases before LTE, filed even more cases after the reform.

The paper is organized as follows. Section 2 presents a literature review of previous studies on justice reforms and their impacts on court and firm outcomes. Section 3 explores the background context of Chilean civil courts and the transformation of courts in Chile. Section 4 outlines the data and empirical strategy we use in this study. We explain the findings of our analysis in Section 5, first discussing the impacts of LTE on court efficiency and then focusing on LTE's effects on outcomes for firms. We conclude in Section 6.

2 Literature Review

A well-functioning, independent, and productive justice system reflects a strong institutional framework that encourages investment and economic growth (Pande and Udry, 2005; Rodrik, 2000, 2005). Ensuring that decisions are predictable, taken within a rea-

sonable timeframe, and effectively enforced, guarantees that individual rights (including property rights) are adequately protected (Bank, 2015). Many institutions serve to secure property rights and enforce contracts. While some of them are entirely private, economists are generally most optimistic about courts as the main institution to meet this objective (Djankov et al., 2003).

By securing property rights and enforcing contracts, courts strengthen economic agents' incentives to save and invest, and support entrepreneurship in a broader sense. Courts also dissuade opportunistic behavior and reduce transaction costs, promoting competition, innovation, and growth (Lorenzani et al., 2014). Regarding firms, an effective judicial system has positive effects on their outcomes and growth, and even affects the output of other industries that heavily rely on contracting (Ramos-Maqueda and Chen, 2021).

This is reflected in studies finding a positive relationship between average firm size and the quality of the legal system (Laeven and Woodruff, 2007; Giacomelli and Menon, 2013; Dougherty, 2014). The latter is defined as reduced idiosyncratic risk for firm owners, shorter durations of civil proceedings and enforceability of contracts. However, this literature relies on survey data or estimates. Dougherty (2014) uses measures comprised of expert opinion surveys completed by litigation attorneys. Similarly, Laeven and Woodruff (2007) use surveys from firms involved in proceedings. Finally, Giacomelli and Menon (2013) use data provided by the Italian Ministry of Justice to estimate the average length of proceedings. In contrast, we utilize administrative data on courts, containing information on commercial cases filed from January 2015 to December 2019.

Even though the association between a stronger judiciary and economic performance may sound evident, there is thus far limited experimental evidence documenting this causal relationship. Kondylis and Stein (2018) find that a simple procedural reform can have a large impact on the speed of justice without undermining the quality of pre-trial proceedings and deliberation. These authors also use high-frequency data on court cases to document the causal effect of a legal reform in Senegal on the quality of legal decisions. We build on this literature by analyzing a broader time frame and, consequently, a larger number of cases and firms. In addition, we innovate in tracking the effects on the firms involved in the caseload by using downstream outcomes on firm profits rather than primary enterprise survey data.

The administration of justice cannot be exempt from technological advances. Another set of previous studies finds that investment in courts' technology, such as Information and Communication Technology (ICT) has a positive effect on courts' productivity by benefiting judicial administration and the users of justice service (Reiling 1, 2006; Louro et al., 2017; Gomes et al., 2018). We contribute to this literature by taking advantage of both individual and temporal heterogeneity to document the causal relationship between the electronic filing of cases and judicial efficiency.

Technology can shape judicial performance in aspects other than efficiency and productivity, such as accountability, fairness and equality. Rabinovich-Einy (2008) argues that this is now possible because of the ways in which technology curbs discretion, documents decision-making and uncovers inaction, inappropriate conduct, and systematic problems. Similarly, Van Dijk and Dumbrava (2013) shows that reforms aimed to reduce the cost per case (as simplifying and digitizing procedures in courts) also improve access to justice, judicial independence, and professionalism in EU countries. This paper expands on this literature by exploring greater accessibility to courts through analyzing the effects of technology on both low- and high-income firms' outcomes.

While automation and digitization improve courts' performance by saving time and resources, improving court record reliability, and increasing access to information and accountability, court automation is not as widespread as expected (Bank, 2015). In 74 out of 189 economies, none of the features of court automation, such as electronically filing complaints, serving process, and paying court fees are present (Bank, 2015). In Latin American economies, only 5.9% have electronic filing (e-filing) and 20.6% have electronic service (e-service) (World Bank, 2016). E-filing is also the least implemented good practice in courts, with only 24 out of 189 economies reporting to utilize it in the World Bank's Doing Business 2016 report. We hope that the empirical evidence presented in this paper contributes to expanding the use of automation and digitization in courts.

3 Civil Justice in Chile

In 2020, Chile ranked 54^{th} out of 190 countries in the 'Doing Business' report's 'Enforcing Contracts' indicator . This indicator assesses the efficiency of courts handling commercial cases, taking into account the time and cost to resolve a commercial dispute and the

quality of the judicial process. Chile also ranked 26^{th} out of 119 economies in the Civil Justice Indicator of the World's Justice Project's Rule of Law Index.

3.1 A Brief Summary of Civil Cases

In Chile, civil cases are processed in 221 courts distributed throughout all 17 jurisdictions in the country. Out of the 221 courts, 100 are specialized courts and 121 are mixed courts with civil jurisdiction. The most common cases in civil courts are contentious (meaning that they consist of determining a matter between two parties), and, in particular, executive cases where plaintiffs (mostly firms) file lawsuits against another natural or legal person who owes them an amount of money.

Civil cases are divided into "massive" and "non-massive". Massive cases, in accordance with the provisions of Act 34-2011, are those "*for which the plaintiff has previously stated its intention not to give it a progressive course, which is why all of them are considered not submitted*". Even though a litigation process is not held for these cases, they are presented to declare the credit to be noncollectable. For a case to be massive it also needs to comply with the requirements demanded by the Internal Revenue Service and the amounts demanded must be equal to or less than $1,380,000. All other cases are called "non-massive."

Massive cases correspond to about 60% of the total incoming cases in the civil courts. These cases have simple and fast processing times (in general about 2 to 4 days). Non-massive causes are more complex cases, have a longer duration and they demand greater dedication from the courts. Therefore, they may involve a large number of procedures that were affected by the LTE.

3.2 The Transformation in Chilean Courts

Before the LTE, most of the cases in Chilean courts were processed physically, though some courts had also implemented optional electronic procedures since the early 2000s. Even though the Judiciary implemented multiple improvements aimed at electronic processing before the LTE, a regulatory framework was needed to provide greater certainty and regulation, especially in those matters and instances in which paper was still a valid medium for recording judicial proceedings. LTE covers all powers of justice, including civil, labor, criminal, and family courts, in addition to the Courts of Appeal and the

Supreme Court. We focus our analysis on civil courts since it is expected to be especially affected by LTE: it has not undergone any reform and commercial cases are mainly processed by these courts.

LTE was first introduced on July 18, 2016 for 13 of the 17 jurisdictions in Chile. The second stage of this law began on December 18 2016, when the four largest jurisdictions were added: Valparaiso, Santiago, San Miguel and Concepcion. Once implemented, all jurisdictions had to immediately adopt electronic processing so that all cases entered as of the implementation dates were processed exclusively electronically. The Virtual Judicial Office was also implemented, a website where users of the Judiciary (the parties, lawyers and prosecutors) entered their lawsuits and documents associated with the cases in process. The advanced electronic signature was also introduced with the LTE, removing the need for judges and users to manually sign any type of document. Table 1 presents the changes to the Chilean judicial process resulting from LTE.

These changes facilitated the access to, and availability of, information online and expedited those procedures that previously required physical submission of the case file, allowing for the status of cases to be viewed from any place and at any time. This proximity of the judiciary to all its users, contributes to the transparency and the strengthening of trust. Likewise, in transforming the interaction between courts and their users, LTE signified a step towards modernization of the administration of justice and promoted the interconnection of the judiciary with other institutions (Valdes and Montero, 2019).

Between June 2016 and August 2019, more than 4.5 million lawsuits have been filed with the judiciary through the virtual judicial office alone. These account for around 85% of all the cases filled (Valdes and Montero, 2019). The COVID-19 pandemic was a significant turning point that led to the use of all available technological resources to maintain the administration of justice. During the course of 2020, and as a response to this crisis, hearings and notifications to parties were also formalized through digital and virtual platforms. The LTE is also a prelude to the Civil Procedural Reform that was presented to Congress by the current government. This reform aims to expedite the processes, reduce litigation costs, promote greater responsibility on the part of lawyers and improve access to justice. It is also our objective that the insights from this research can contribute to this policy debate.

Table 1: Summary of LTE changes in civil justice

Item	Definition	Before LTE	After LTE
Electronic processing	The ability to process cases electronically, as opposed to manual processing.	Hybrid system where cases processed using both physical and electronic files. Some procedures could be done online, but they all had a physical version. Files were published online and it was possible to consult digital versions of cases.	New cases are processed exclusively electronically and only the cases entered before the LTE keep physical records.
Electronic filing	The ability to file a case online.	Did not exist. Cases had to be filed in-person at courts.	All cases and writings must be entered online using the Virtual Judicial Office (*Oficina Judicial Virtual*).
Electronic signature	The ability to sign documents electronically.	There was hybrid procedure in place that still required a manual signature (*Firma Electronica Simples*).	An electronic system was implemented in total replacement of the manual signature (*Firma Electronica Avanzada*). It is mandatory for judges, but users can still opt for signing documents manually.
Electronic workload assignment (Virtual Tray)	System that is used to assign tasks electronically within a court.	It existed since 2015 but not all tasks were registered there.	It is the center of work within a court. Court managers use it to distribute the incoming cases or writings between court personnel to be resolved, and resolutions are also submitted in this system. The quality of the registries also improved with LTE.
Customer Service	In-person attention to court users	It existed and was widely used. People used it to view their records, make inquiries and file new cases or writing related to open cases.	It was greatly reduced. There are no physical files to consult nor can you file cases and writings in person.

4 Data and Methodology

4.1 Data

We use high-frequency data on civil cases filed in every tribunal between January 2015 and October 2019 to analyze the impacts of LTE. The data contains over 5 million filed non-massive civil cases, of which over around 3 million are closed. We retrieved the data through a collaboration with the Institutional Development Department (DDI) of Chile's Administrative Corporation of the Judicial Branch (CAPJ).

The DDI databases contain detailed information on: 1) civil cases, 2) courts' human resources and 3) courts' location. The data on civil cases contains variables such as date of filing, court and jurisdiction, case identifiers, matter types and procedure types. With this data, we analyzed several measures to understand how LTE affects courts, such as the number of incoming and closed cases, the duration of incoming and closed cases, as well as the number of writings per case.

To analyze the impacts of the LTE on incoming cases, we specifically use the case flow data, the information on each case's admission date and its category (massive or non-massive). With respect to the effect of LTE on the duration of cases, we utilize information on the number of terms per day and on the duration of civil cases. Similarly, to analyze the impact of LTE on the number of writings, we use aggregate data on the number of documents submitted for each non-massive case.

The data on courts' human resources contains information such as age, experience and position of the workers of a court. We use this data to analyze heterogeneous effects. For a more complex analysis of heterogeneous effects, it would be necessary to combine this information with variables such as type of cause, duration, number of hearings and number of procedures. However, information on number of hearings and number of procedures is not yet available.

Finally, we use the information on courts' locations along with Googlemap API, to locate both courts and firms[1] and build a distance matrix between them. The shortest distance from a firm to its nearest (civil/mixed) court is then used as a measure of how difficult it is for the firm to physically access the justice system.

Besides the DDI databases, we use publicly available data from the Internal Revenue

[1]The address information of firms are retrieved from Orbis.

Service. This database contains information on 2 million firms which filed cases between 2015 and 2019: before and after the introduction of the LTE. From this vast data, we utilize four main variables (the number of employees, sales rank, profit and economic activity) to examine whether LTE improves firms' operational performance and increases the access to the justice system for potential claimants. This analysis could be complemented by assessing the LTE effects on courts' productivity. However, indicators such as the number of writings resolved by officials per day, the number of judges' resolutions per day, the average response time to a request and measures of deadline-compliance are not yet available. Similarly, the study could be complemented by understanding how LTE affects individual outcomes. However, information on the plaintiffs' gender, age and economic situation is not available.

4.2 Empirical Strategy and Specification/Methodology

Analyses of the effect of technology on courts' productivity and efficiency face a key challenge: unobserved heterogeneity. Wealthier and more dynamic areas are able to afford and may demand better justice systems (Lichand and Soares, 2014). Similarly, the effect of the LTE could be confounded by any other event that affected courts across time, such as economic cycles, the implementation of other laws and political events.

We use an event study to estimate the impacts of LTE within the 12-month period before and after its introduction. An 18-month time window is considered as a robustness check. An event study allows us to isolate the effect of the LTE from any unobserved heterogeneity. By comparing LTE and non-LTE courts, we are able isolate the effect of the LTE from courts' individual heterogeneity. By comparing courts before and after the introduction of the reform we are able to isolate the LTE effect from any other general event that affected all courts across time. An event study strategy also allows us to compare the evolution of the indicators around the date of implementation of the LTE in all tribunals, regardless of the date on which they implemented the law.

An event study tests the hypothesis that there are not any time-varying events that affected some courts in particular. If this condition is met, the evolution of an indicator before the LTE reform perfectly reflects what would have happened to a court with LTE if it had not implemented the law. A particular challenge for the use of this methodology in the case of LTE is the fact that the effects may not have been immediately apparent

after the adoption of law. The further the LTE implementation date is, the harder it is to attribute a change observed in an indicator of interest to the implementation of the LTE.

To understand the causal relationship between LTE and outcomes, we use the following specification:

$$Y_{i,t} = \alpha_1 + \alpha_2 T_{i,t} + \xi_i + \zeta_t + \epsilon_{i,t}$$

where $Y_{i,t}$ represents the outcome of interest for unit (tribunal or firm) i in month t. Court and firm outcomes that are lopsided with outliers are introduced in their log form. $T_{i,t}$ is a categorical variable, indicating the number of months before and after the "treatment", that is, the introduction of LTE for unit i in month t (normalized to -1 for the month right before the introduction). α_2 is the coefficient of interest. It measures how much a specific outcome Y changes in a given month with respect to the month before the introduction of LTE. ξ_i and ζ_t stand for individual fixed effects and calendar month fixed effects respectively. These allow us to control for omitted heterogeneity and seasonality.

Apart from the event studies, we took advantage of the distance matrix between firms (claimants) and their nearest tribunals to analyze whether the introduction of LTE has provided firms with easier access to the justice system. We run a series of regressions following:

$$Y_{i,t} = \beta_1 + \beta_2 \mathbf{1}_{i,t} + \beta_3 \mathbf{1}_{i,t} \times Distance_i + \xi_i + \zeta_t + \varepsilon_{i,t}$$

Y indicates a set of filing-related variables, including number of cases filed by a firm and whether a firm has filed any cases in a given month relative to the introduction of LTE. We also consider two variations for these outcomes: the cases with a procedure type different from *Executive* and cases with a procedure type different from *Preparatory Proceedings*. $Distance_i$ represents the distance of a firm to its nearest tribunal. The coefficient of interest is β_3: ff $\beta_3 > 0$, then the introduction of LTE had a greater effect on firms' filing for those firms further away from their court.

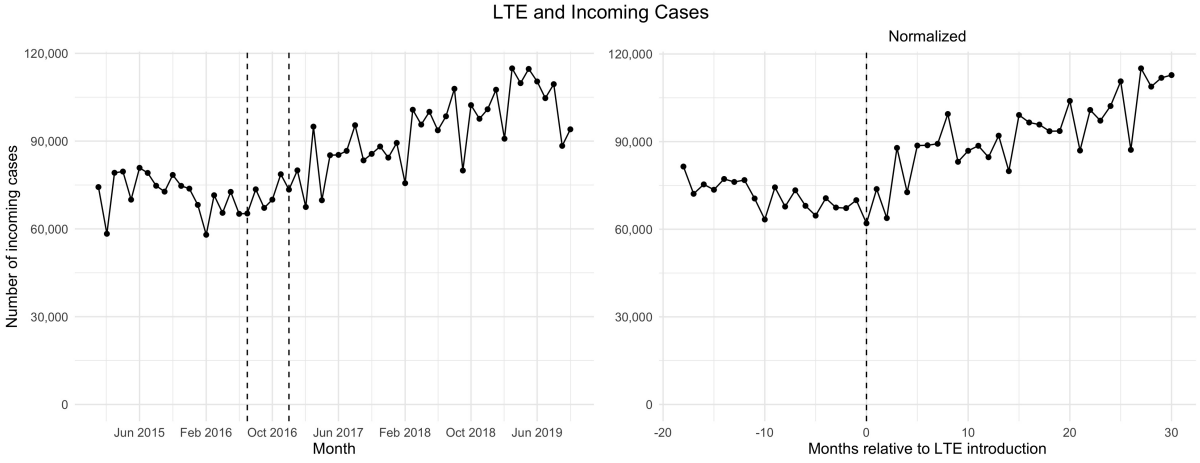
5 Results

We first evaluate the impacts of LTE on several measures of courts: total number of cases filed and resolved, the duration of incoming and closed cases, and the number of writings per case. Second, we assess the impacts of LTE on firm outcomes.

5.1 LTE and the Number of Cases Filed and Resolved

As Figure 1 shows, by October 2019 (approximately three years after the introduction of LTE) the total number of cases filed per month increased by 28%. By looking at the incoming cases characteristics, we see that 92.35% of them were non-massive contentious cases, 65% of them were of executive procedure and 57.86% of them had as matter type *Collection of Payments*. This shows that the LTE mainly increased the number of cases that can be resolved almost automatically, i.e., that do not require a long or complicated decision-making process.

Figure 1: Total Number of Incoming Cases per Month



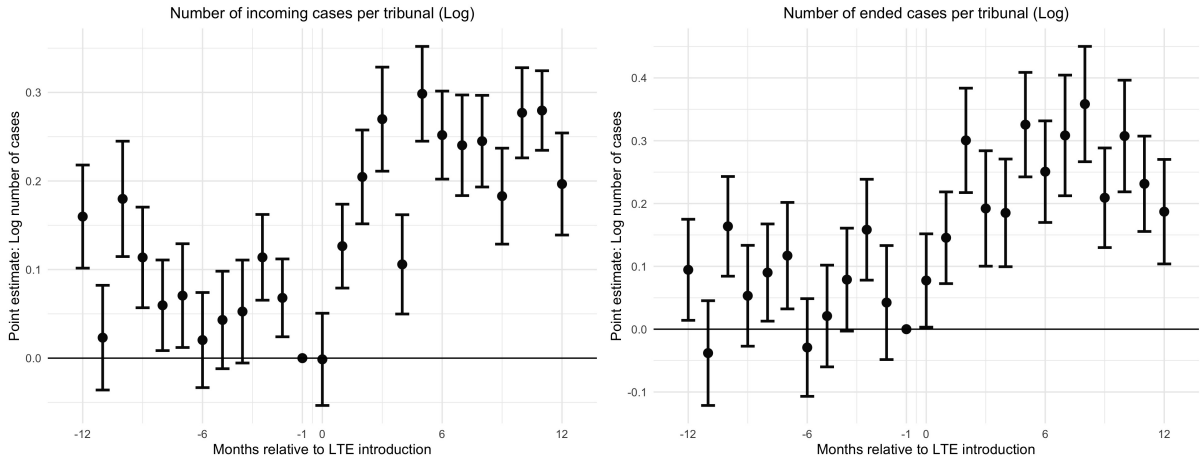
The majority of cases (63.15%) filed during this time belonged to the three largest jurisdictions that implemented LTE in the second stage: 47.62% were filed in Santiago, 7.77% in San Miguel and 7.76% in Valparaiso. As the upward trend in incoming cases could be solely driven by these major jurisdictions, we also estimate the impact of LTE on the average number of incoming and closed cases per tribunal in a given month. As shown in Figure 2, the increase in incoming and closed cases is not limited to the three major jurisdictions: after the introduction of LTE, the tribunal-by-month average increases by 22.3% for incoming cases and by 25% for closed cases. However, Figure 2 shows that, compared to the trend observed prior to LTE, the total number of incoming and closed cases experienced a steady decline after 6 and 9 months (respectively) of the law's introduction.

It is also important to mention that the change in cases filed and closed is mainly driven by spurious cases. Hereafter, we define "spurious cases" as cases that ended in type *Consider the lawsuit not filled* unless specified otherwise. As recalled, most of these

cases are massive, which means that the plaintiff has previously stated its intention not to give it a progressive course, which is why all of them are considered not submitted. The number of non-spurious cases filled and ended remains unchanged throughout 12 months of implementing LTE.

The increase in the number of incoming cases might indicate that LTE positively affects the accessibility of courts: by eliminating in-person filings, LTE makes this process easier, cheaper and more convenient. The fact that the number of closed cases also increases and that both trends are mainly driven by spurious cases strengthens the hypothesis that most of the effect of LTE is concentrated among cases that are almost automatically solved. To further understand the effects of LTE on the access to courts, the following sections analyze the characteristics of firm claimants.

Figure 2: Event Study: Incoming and Ended Cases

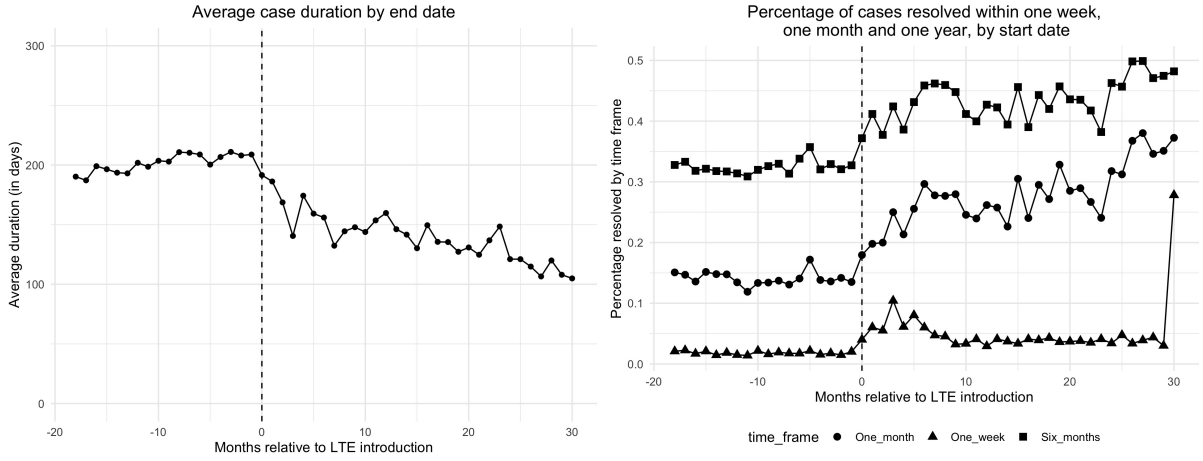


5.2 LTE and the Duration of Cases

The raw data show that the duration of incoming cases becomes shorter following the introduction of LTE (see left panel of Figure 3). Two mechanisms could drive this relationship: a composition effect, meaning more spurious or "simple" cases are filed, driving the median duration shorter, and where the LTE increases court efficiency. The number of cases resolved in a week, a month, and a year also increases significantly following LTE (see right panel of Figure 3). That said, one needs to be careful interpreting this finding since it might indicate that judges wish to resolve cases faster due to increasing inflows of cases.

To isolate the effect driven by LTE from individual and temporal effects, we ran an

Figure 3: Median Case Duration by End Date and Percentage of Cases Resolved

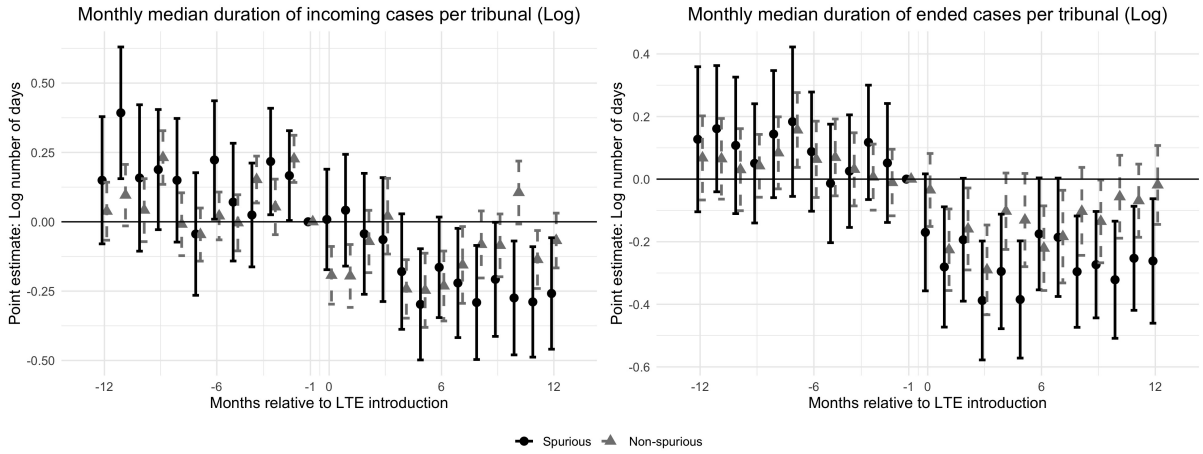


event study for the median duration of incoming and closed cases following LTE. We find that the median duration decreases by an average of 25% for incoming cases and in 26% for closed cases (see Figure 4). Moreover, the decrease in duration is driven by both spurious and non-spurious cases. In fact, the median duration decreases by 11.6% for non-spurious incoming cases and by 13.3% for non-spurious closed cases.

However, in analyzing these trends by the cases' characteristics, we find that only the median duration for cases ending in type *Consider the lawsuit not filled* and *The lawsuit does not proceed* decreased after the introduction of LTE (See Figure 15 in the appendix). This means that the reduction in duration for non-spurious cases could be driven by cases ending in type *The lawsuit does not proceed* which is similar to the type used for spurious cases. This aligns with the hypothesis that a composition effect is responsible for the duration of cases being shorter. In fact, as Figure 16 in the appendix shows, from the top-4 matter types, only *Collection of Payments* cases (which do not require an extensive decision making process) experienced a shortening of duration following the introduction of LTE.

Although similar on average, the trends for incoming and closed cases differ substantially from one another. As Figure 4 shows, there is no significant change in the duration of incoming cases until the fourth month, when it starts to decrease steadily. In contrast, the duration for closed cases decrease immediately after the introduction of LTE, but reverses after six months, when it starts to increase again. This upward trend is especially prevalent for non-spurious cases.

Figure 4: Event Study: Monthly Median Duration of Incoming and Closed Cases



5.3 LTE and the Number of Writings

We now proceed to the analysis of a more granular filing measure: the number of writings per case. The writing records are collected by the DDI and merged with case level data. Due to limitations on data availability, we limit our analysis to non-massive civil cases filed from 2015 to 2017. After merging the data, the sample used for writing level analysis consists of 2,108,828 distinct cases and 8,264,063 requests. After excluding outliers (requests with more than 10 writings), 2,108,800 cases and 8,254,975 requests were kept.

We first focus on the average number of requests per case across tribunal-by-month cohorts. In the data set, the average number of requests per case is 3.915 (with a 3.181 standard error). Since LTE affects the number of incoming cases positively, we expected it to alter the number of writings per case in a similar direction. However, the average number of writings per case in a month per tribunal decreases after the introduction of LTE. The decrease is especially prevalent in jurisdictions which implemented LTE at the first stage. In the remaining jurisdictions, this downward trend in the number of writings per cases reverses after five months of the introduction of LTE (see Figure 5).

To isolate the effect driven by LTE, we again conducted an event study on the average number of writings per case. As shown in Figure 6, the number of writings per incoming case decreases significantly (6.5% on average) within 12 months after LTE introduction. In fact, the number of writings per case decreases steadily after LTE introduction and prevails in a lower trend than the one observed prior to LTE.

As before with incoming and closed cases, we explored two sources of heterogeneity:

Figure 5: Average Number of Writings per Case: by LTE wave

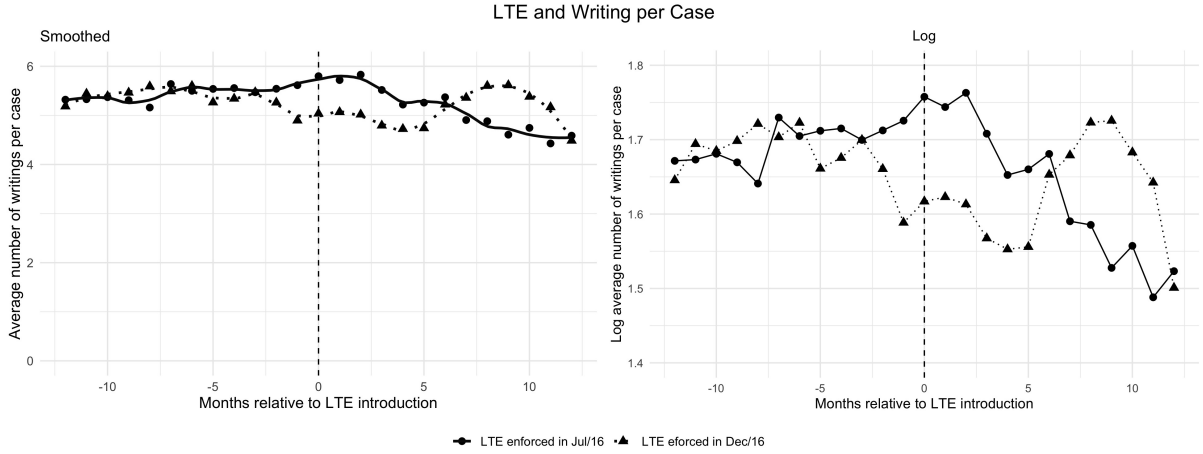
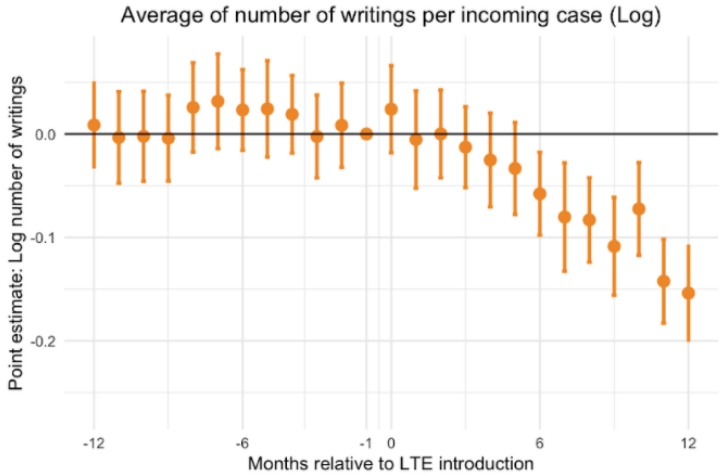


Figure 6: Event Study: Average Number of Writings per Case



procedure and matter types. On procedure types, we find that from the top six types, *Voluntary* cases experience the most significant decrease in the number of writings per case (see Figure 17 in the appendix). *Voluntary* cases are those in which there is no contentious litigation between parties, but a request from a legal entity to examine, certify, qualify or attest situations. Therefore, reduction in the number of writings per case could signify a simplification of these procedures for both the legal entity and the judge. For matter types, we focus on the five most common types. The lower two sub-figures of Figure 17 in the appendix show none of them seem to be affected in the number of writings after the introduction of the LTE.

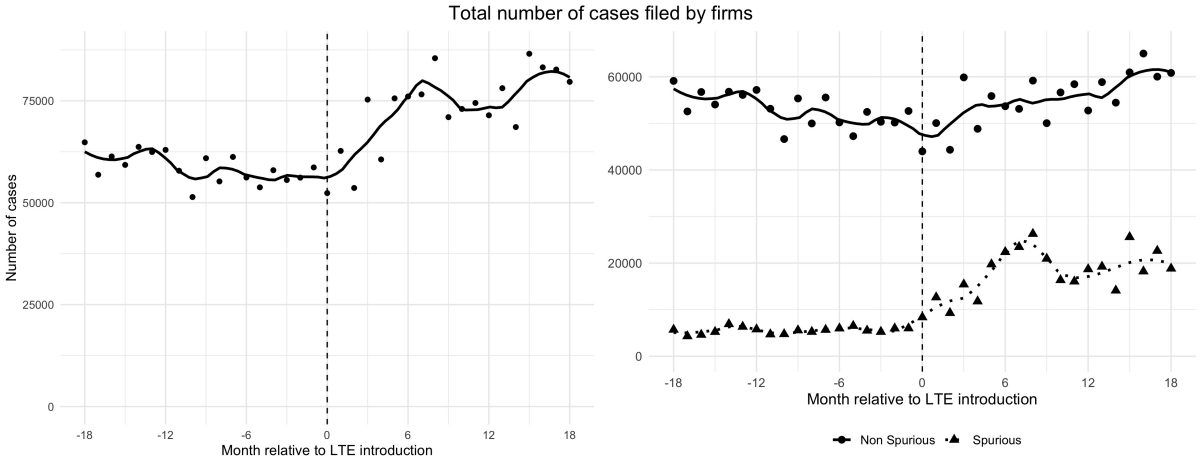
To summarize the impact on courts' measures, we found that the introduction of LTE has a significant impact on the filing of cases in general. Both the number of cases filed and resolved have increased significantly. After examining the median duration of

cases within a tribunal in a given month (pre- and post- LTE), we found a marginally significant fall in duration of cases. When looking at a more granular measure of the filings, the average number of writings per case, we found a similar declining trend. The results suggest that although LTE has a positive impact on case filing in general, cases that tend to be resolved in a shorter period of time and that have a lower number of writings are more likely to be affected by technological advances.

5.4 LTE and Firm Claimants

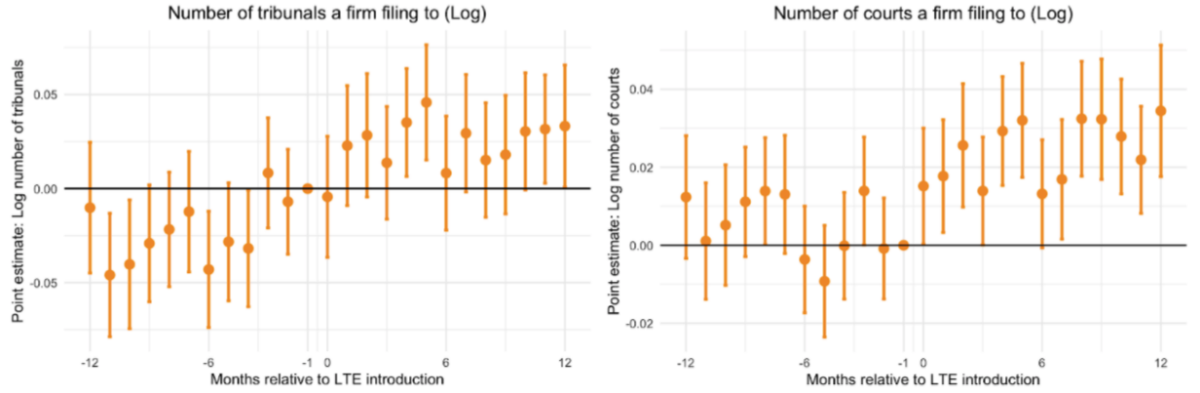
Following the analysis of the effects of LTE on courts, in this section, we analyze the effects of LTE on firms. During the time window of interest, over 60% of all cases were filed by firms. As we can see in the left panel of Figure 7, the raw data shows that the number of cases filed by firms increased after the introduction of LTE. However, the right panel of the same figure shows that this increase was predominately driven by spurious cases.

Figure 7: Total Number of Cases Filed by Firms



To isolate the effect of LTE we ran an event study on the number of tribunals and courts that firms file cases in. Figure 8 shows that besides firms filing more cases, they also started filing to more tribunals and to more courts. One possible interpretation of this result is that LTE increased the access to courts and tribunals by making geographic locations and branch structures less limiting for plaintiffs. More detailed firm-level data is needed to further explore this proposition.

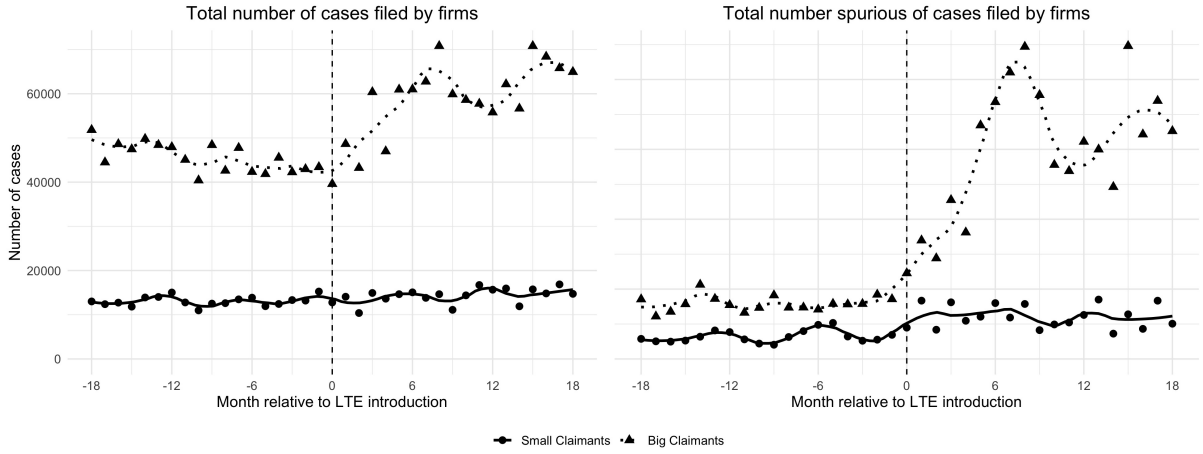
Figure 8: Number of Distinct Tribunals and Courts Firms Filing To



To understand the nature of firms' filing of cases and their characteristics, we examined the industrial heterogeneity of firms. Specifically we analyzed trends by firms' sectors, volume of filing and profit levels. Starting with sectors, Figure 18 in the appendix shows that the number of cases filed increases after the introduction of LTE in all sectors except *U- Extraterritorial bodies and organisations activities*. In fact, firms from the sector *T - Activities of households as employers; undifferentiated household activities* only started filing cases after the introduction of LTE.

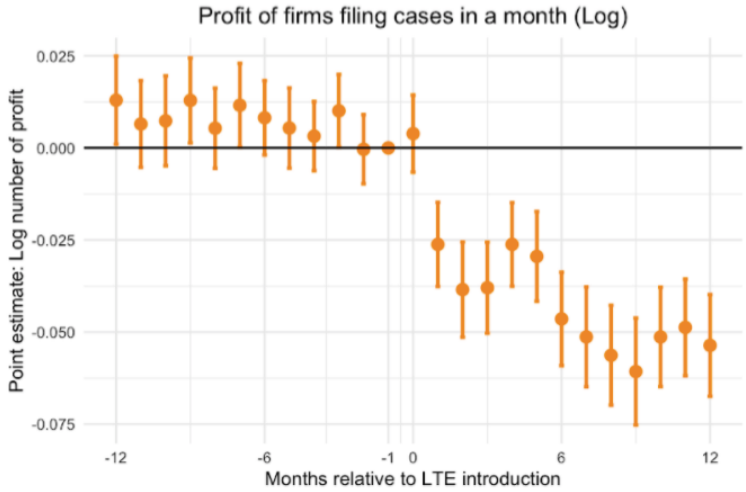
On the volume of filing, Figure 9 shows that firms that filed large numbers of cases before LTE (a.k.a. "big claimants") filed even more cases following LTE. We define "big claimants" as those firms that filed more than 10,000 cases in the time window of interest. As shown, the gap between the number of filings from "big claimants" and the remaining firms widened after the introduction of the LTE. As before, note that this trend is driven specifically by the filing of spurious cases.

Figure 9: Number of Cases Filed by Firms: Big versus Small Filers



Finally, we examined how the filing of cases changed across firms with different profit levels. The data provided by the Chilean government divides firms' profit into 13 categories. Figure 19 in the appendix shows an increase in the number of cases filed for firms in all 13 profit categories. By conducting an event study on the profit of firms that filed at least one case per month, we find that after the introduction of LTE, more lower-profit firms started to file cases (see Figure 10.) This suggests that LTE made the justice system more accessible by decreasing the cost of procedures.

Figure 10: Event Study: Log Average Profit Category of Filing Firms



5.5 LTE and Firms: Geographic Study

In this subsection, we examine whether the introduction of LTE changed the firm claimants' access to the justice system. We began by examining the number of cases filed by firm claimants. As shown in Columns (1)-(3) of Table 2 in Appendix B, the introduction of LTE increases the number of cases filed by firms. This effect is especially salient for firms physically close to a court. However, even if the general increase persists after taking the log form of the number of cases filed, the differentiated effect for firms physically further away from a court is no longer significant.

We now examine if the number of firms that filed a case in a given month increases after the introduction of the LTE. The results are documented in Table 3 in Appendix B. Columns (1)-(3) shows that LTE has a positive effect on a firms' possibility of filing a case. The effect is even larger for firms physically further from tribunals located in areas where the LTE was introduced in the first wave. This differentiated geographic effect is no longer significant after the second LTE wave. A possible interpretation of this result is that firms are able to take advantage of the first LTE wave in spite of their geographic location. This result echoes the observation of practitioners in the Chilean justice system. When considering the natural log of distance, we get similar results. However, the geographic difference for the first LTE wave is no longer significant.

Next, we focus on cases where the procedure type is neither *Executive* nor *Preparatory Proceedings* (GP for its acronym in Spanish). The results on number of cases filed are presented in Columns (1)-(3) of Table 4 in Appendix B. In the first LTE wave, firm

claimants filed less non-Executive and non-GP cases. The opposite is true for the second LTE wave, when firm claimants filed more of these cases. It is also important to notice that the LTE effect is smaller for firms located further away from a court. These results, though hard to interpret, may reflect an interesting dynamic of firm claimants' legal resource allocation. The same results hold when analyzing the natural log number of non-Executive and non-GP cases (see Columns (4)-(6) of Table 2) in Appendix B.

The possibility of firm claimants filing non-Executive and non-GP cases is examined in Table 6 in Appendix B. It appears that the introduction of LTE has a positive effect on the number of non-Executive and non-GP cases. However, this effect is only marginally significant.

We proceeded to analyze firms that filed cases to *Civil* and *Mixed* tribunals. As their name implies, *Civil* tribunals only accept civil cases, while *Mixed* tribunals also accept other types of cases. The results are presented in Table 5 in Appendix B. Columns (1)-(3) show that the introduction of LTE positively affects the number of cases filed to Civil tribunals. Columns (4)-(6) show an opposite trend for the number of cases filed to Mixed tribunals. These results suggest that firm claimants switched from Mixed to Civil tribunals. Location is an important determinant of this trend: firms that are further away from any Civil tribunals tend to file less cases to these tribunals. The opposite trend can be observed for the filing of cases to Mixed tribunals.

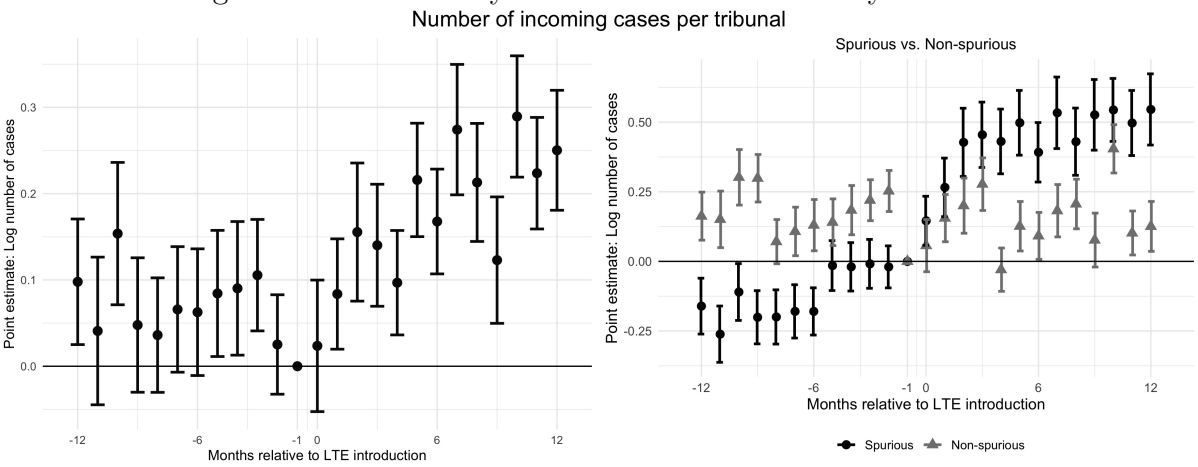
Finally, we examine whether LTE increases the spread of firms' legal resources. We focus on two proxies: the number of unique procedures and matter types for cases filed by firm claimants. Table 7 in Appendix B shows that the introduction of LTE has encouraged firms to file cases in a more diversified fashion, in terms of both procedure and matter types. This effect does not have a significant geographic heterogeneity.

5.6 LTE and Civil Claimants

In this subsection, we examine the impact of LTE on civilian claimants' filing, specifically in number of cases filed, average duration and a comparison with cases filed by firms. We define a civilian claimant as those with a RUT number less than 50,000,000. Following this classification, we identified a total of 585,007 cases that were (very likely) filed by individual claimants. The left subplot in Figure 20 in the appendix shows an increase in the amount of cases filed by civilians after the introduction of LTE. This echos the

general trend in Figure 1. When decomposing these cases by procedure types, we find that this increase is mainly driven by *Voluntary* cases (see right panel of Figure 20 in the appendix).

Figure 11: Event Study: Number of Cases Filed by Civilians



To analyze if this change is statistically significant, we conducted an event study on the number of cases filed by civilians. Results are presented in Figure 11. As shown in the left subplot in Figure 11 we can conclude that after LTE, the number of cases filed by individual claimants increased. The right subplot shows that the increase is mainly driven by spurious cases. However, after conducting an event study on the differences between the number of cases filed by firms versus the number of cases filed by civilians, we find that the increase in number of cases after the introduction of LTE is larger for firm claimants (see Figure 21 in the appendix).

Next, we analyze the duration of cases filed by civilians. The median duration of these cases decreased significantly after the introduction of LTE (Figure 12). After separating non-spurious cases from others, we find that both spurious and non-spurious cases experience a decrease in the duration. However, the shortening of cases is in a smaller and less significant scale for spurious cases.

When examining the percentage of cases that ended within 6 months (Figure 13), we found that the introduction of LTE had a positive effect on this measure. Similar to the results in Figure 12, the percentage of relatively short cases among non-spurious cases increased, but not as much as other cases.

We also examined the duration of three different types of claimants in Figure 14: civilians, high-profit firms (firms that are in the highest profit categories) and low-profit

Figure 12: Event Study: Duration of Cases Filed by Civilians

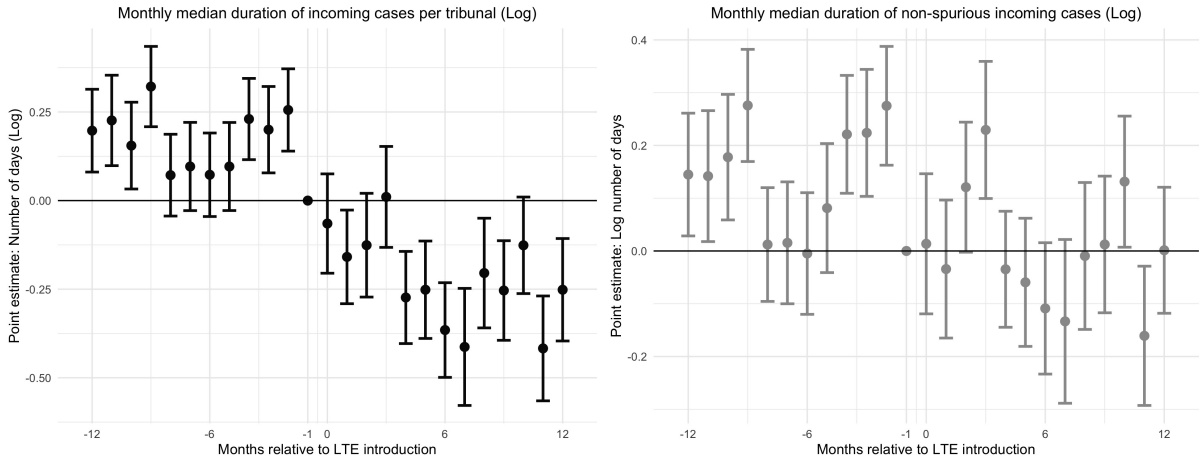
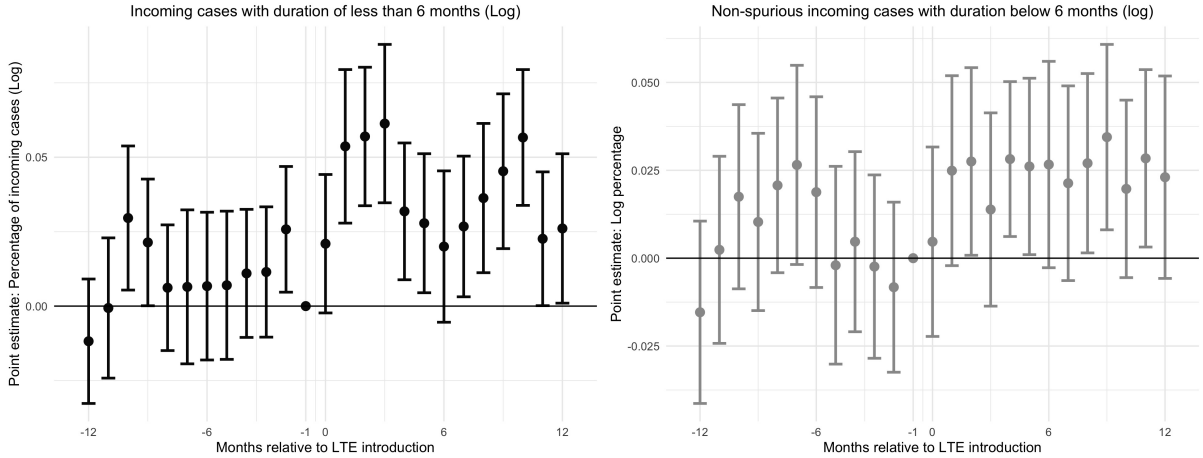


Figure 13: Percentage of Cases Closed in 6 Months Filed by Civilians

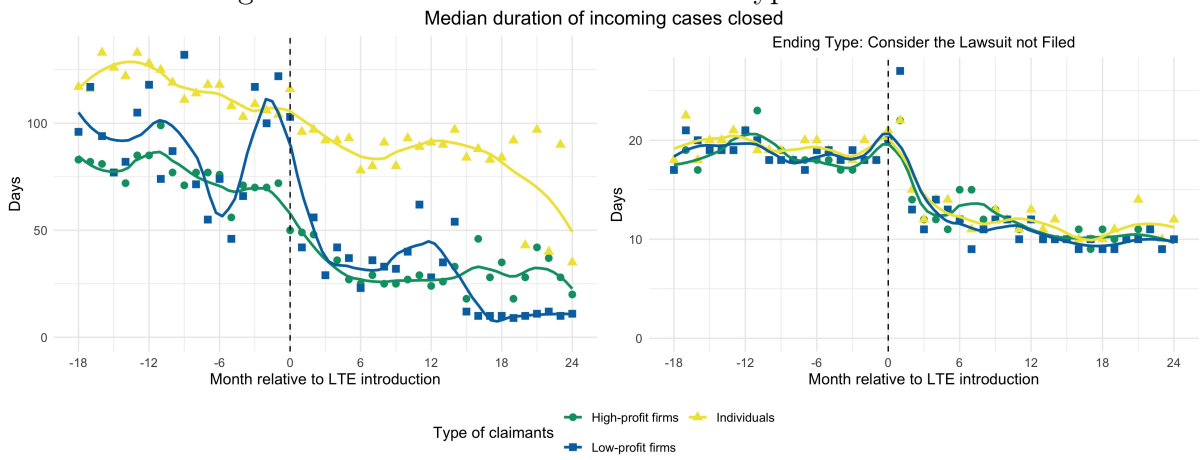


firms (other firms). Several observations draw attention: duration of cases filed by all three types of claimants decreased after the introduction of LTE. Cases filed by individuals generally last longer, while those filed by high-profit firms have the shortest duration. The duration of cases from low-profit firms were initially in between the two counterparts, but after the introduction of LTE, the duration of their cases experienced a significant decrease and converged to that of high-profit firms' cases. These observations are not driven by non-spurious cases, as all three types of claimants have filed similar spurious cases.

5.7 LTE and Appeal

TBD

Figure 14: Median Duration of Three Types of Claimants



6 Conclusion

TBD

Our study offers new perspectives on policy in two ways. First, the LTE has differentiated effects according to the procedure and matter types of the cases. LTE is especially successful in decreasing the median duration of executive cases. Among these, the lawsuits related to the collection of payments appear to have the most steady duration reduction in the long run. This suggests that there are certain types of cases where resolution is fairly simple, and electronic processing effectively automates their resolution. A policy implication is that, if resources for innovation are limited, directing them to the filing and resolution of executive cases (such as collection of payments) can have a meaningful impact on the efficiency of the justice system.

Second, the increase in the incoming and closed cases is driven especially by those with ending type "consider the lawsuit not filed". This means that the cases were dismissed due to improper filing of the lawsuit. This suggests that, while LTE can make filing of cases more accessible, it does not necessarily translate to an improved access to justice if citizens do not have the proper judicial and technological knowledge to correctly file a lawsuit. As a result, to expand the effects of the LTE, it must be accompanied by information campaigns or even training programs directed to both citizens and firms.

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A Appendix A

Figure 15: Median Duration of Cases: by Ending Types

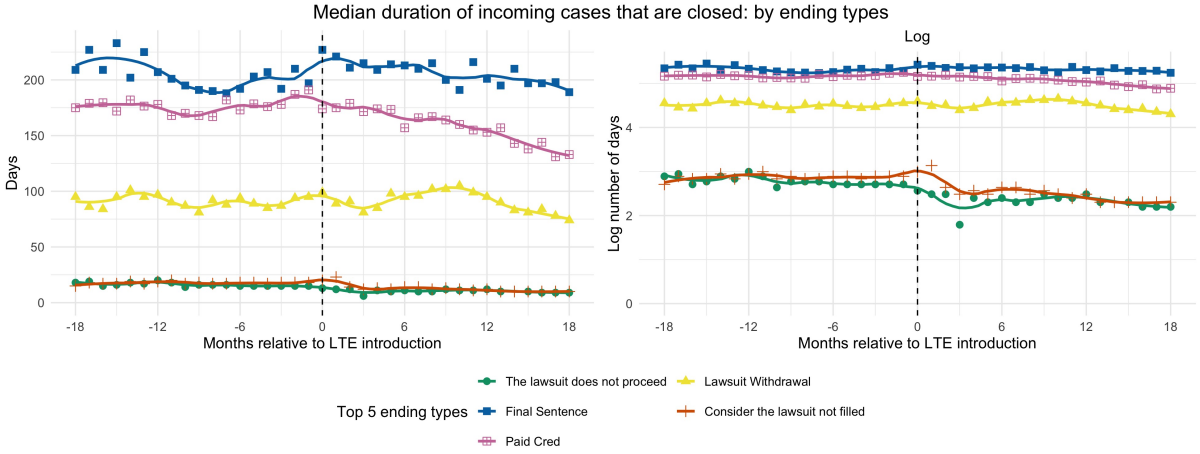


Figure 16: Median Duration of Cases: by Procedure and Matter Types

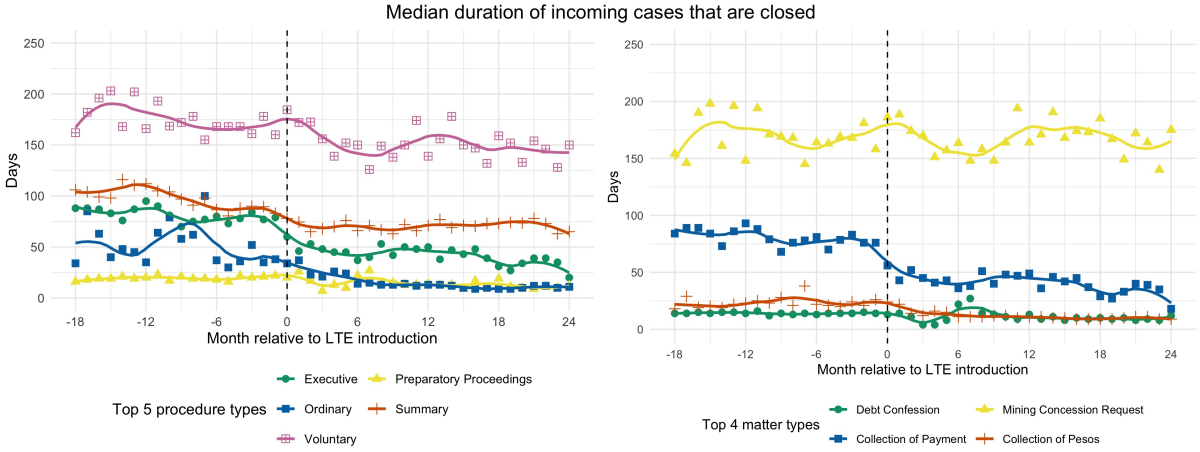
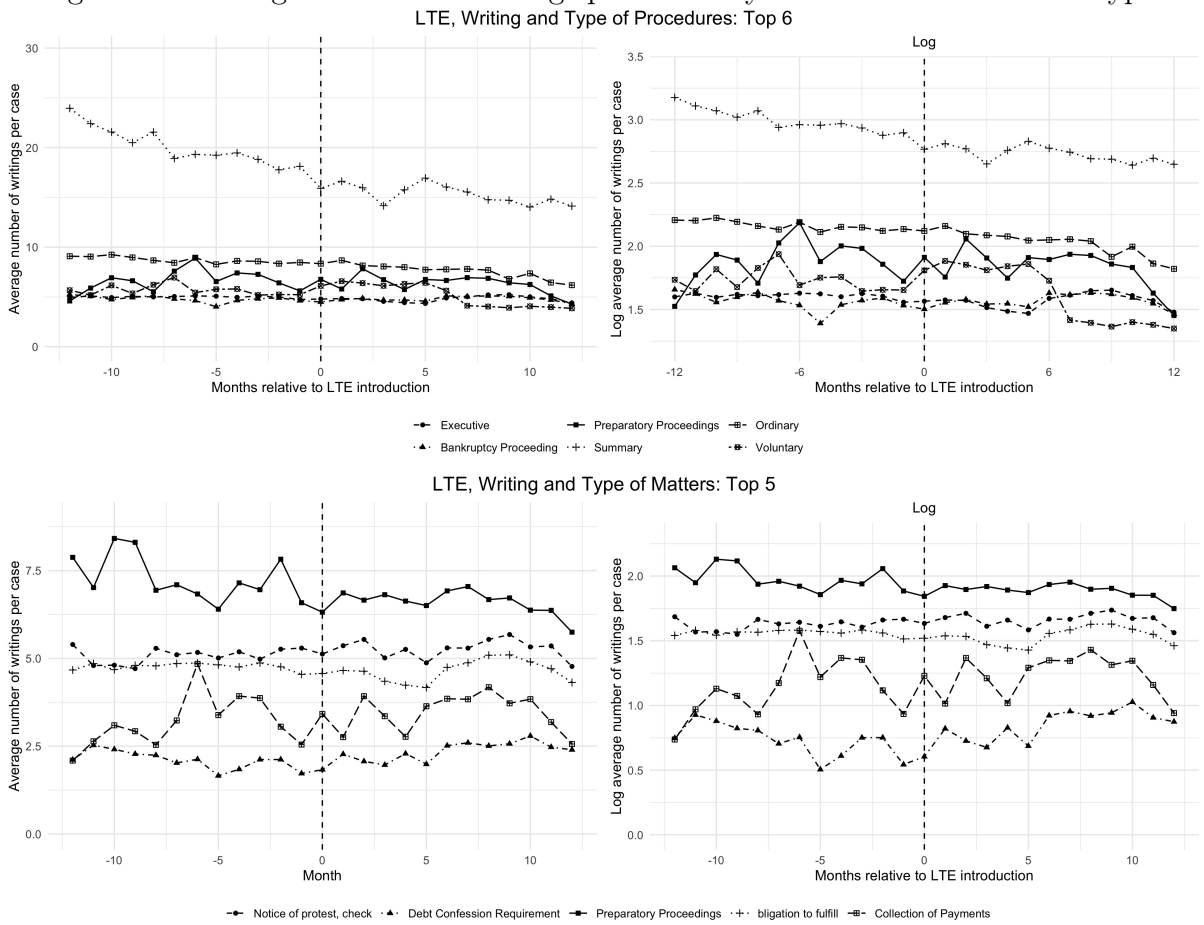


Figure 17: Average number of Writings per Case: by Procedure and Matter Types



A Appendix B

Figure 18: Number of Cases (in log) Filed by Firms: By Industry Sectors

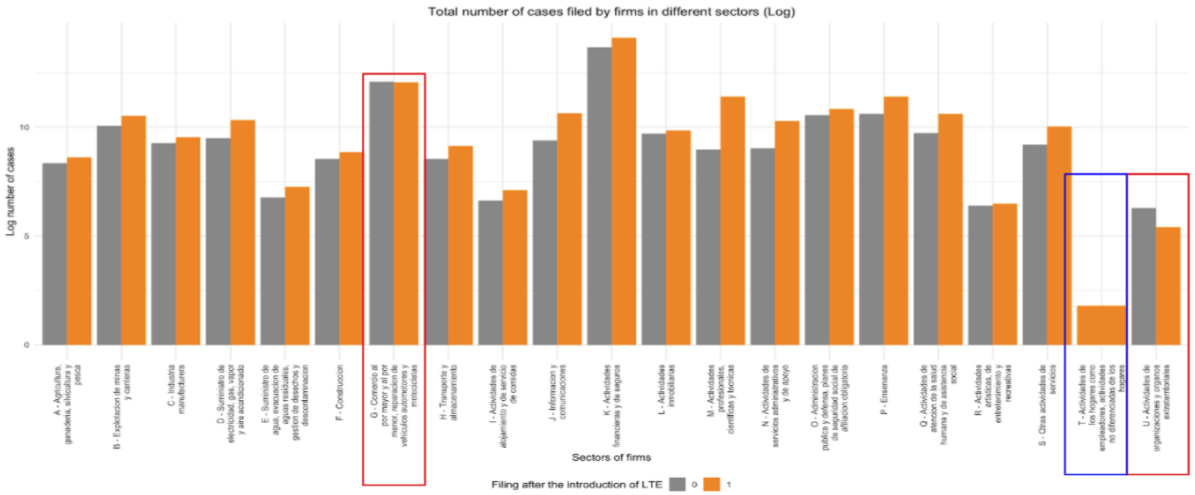


Figure 19: Number of Cases (in log) Filed by Firms: By Profit Categories

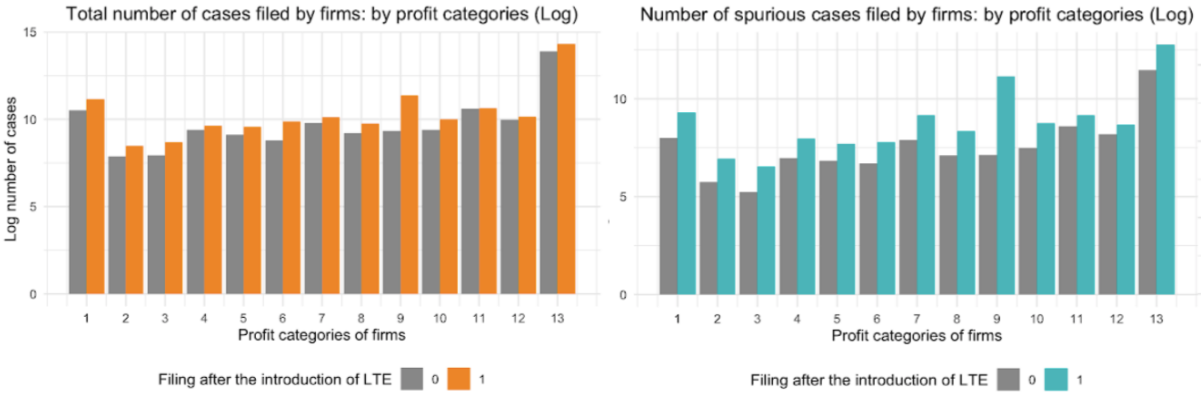


Figure 20: Number of Cases Filed by Civilians

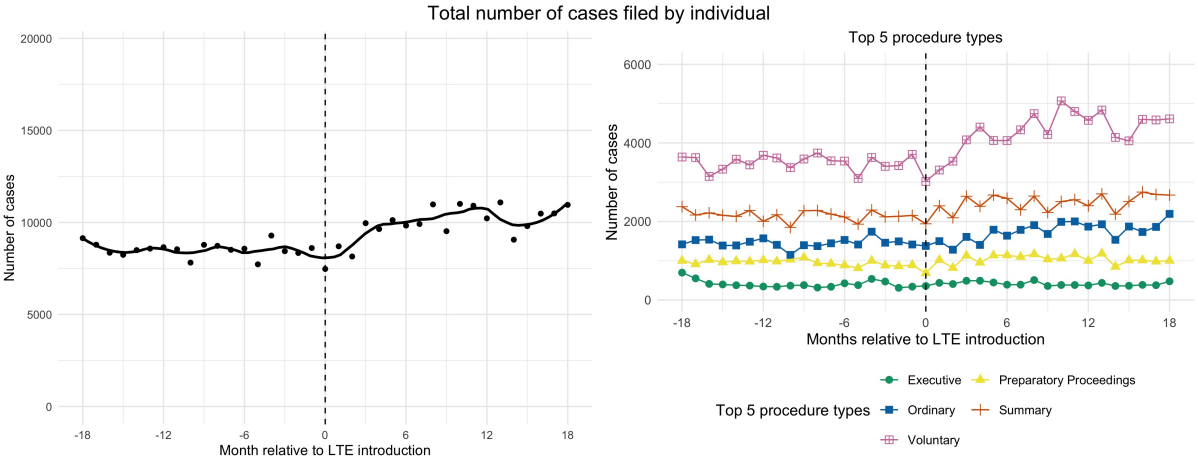


Figure 21: Number of Cases Firms Filed More Than Civilians

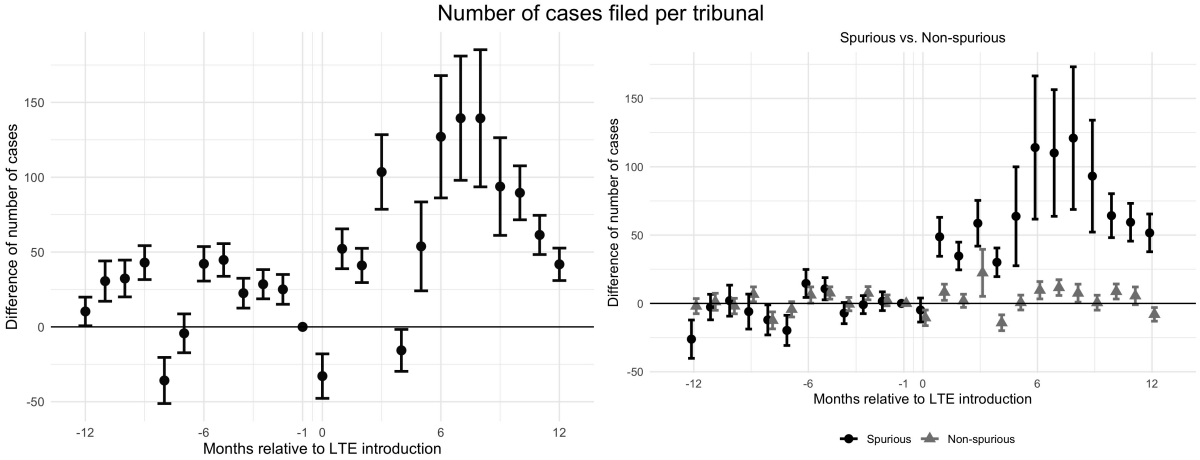


Table 2: Number of Cases Filed by Firm Claimants

Dep.Var	No. cases filed by a firm			log(No. cases filed by a firm + 1)		
Specification	All	LTE wave 1	LTE wave 2	All	LTE wave 1	LTE wave 2
	(1)	(2)	(3)	(4)	(5)	(6)
=1 if after LTE	0.0560***	−0.0238	0.0936***	0.0038***	0.0021	0.0050***
	(0.0211)	(0.0160)	(0.0007)	(0.0009)	(0.0016)	(0.0016)
Interaction	−0.0027***	0.0007	−0.0047***	-0.0002	-1.36e-05	-0.0006
	(0.0010)	(0.0007)	(0.0016)	(0.0006)	(0.0011)	(0.0007)
Constant	0.1583	0.2506	0.1187	0.0404	0.0496	0.0364
N	755,925	226,700	529,225	755,925	226,700	529,225

Note: Firm and month fixed effects are included, robust standard errors are reported in the parenthesis. For regressions (4)-(6), natural log of distance is used to generate the interaction term.

Table 3: Whether Firm Claimants Have Filed A Case

Dep.Var	=1 if a firm has filed a case			=1 if a firm has filed a case		
Specification	All	LTE wave 1	LTE wave 2	All	LTE wave 1	LTE wave 2
	(1)	(2)	(3)	(4)	(5)	(6)
=1 if after LTE	0.0029***	0.0017*	0.0036***	0.0021**	0.0010	0.0030***
	(0.0005)	(0.0009)	(0.0007)	(0.0008)	(0.0013)	(0.0011)
Interaction	-8.09e-06	0.0002*	-0.0001	0.0006	0.0012	0.0001
	(0.0001)	(0.0001)	(0.0001)	(0.0005)	(0.0009)	(0.0007)
Constant	0.0403	0.0425	0.0392	0.0403	0.0425	0.0392
N	755,925	226,700	529,225	755,925	226,700	529,225

Note: Firm and month fixed effects are included, robust standard errors are reported in the parenthesis. For regressions (4)-(6), natural log of distance is used to generate the interaction term.

Table 4: Number of Cases Filed by Firm Claimants: Not Ejecutivo or GP

Dep.Var	No. cases filed by a firm			log(No. cases filed by a firm + 1)		
Specification	All	LTE wave 1	LTE wave 2	All	LTE wave 1	LTE wave 2
	(1)	(2)	(3)	(4)	(5)	(6)
=1 if after LTE	-0.0031	-0.0312^{***}	0.0103^{***}	0.0013^{*}	0.0003	0.0020^{**}
	(0.0049)	(0.0109)	(0.0051)	(0.0007)	(0.0012)	(0.0009)
Interaction	-0.0001	0.0010^{**}	-0.0008^{**}	0.0003	0.0006	7.76e-06
	(0.0003)	(0.0004)	(0.0004)	(0.0004)	(0.0007)	(0.0005)
Constant	0.0853	0.1157	0.0722	0.0211	0.0224	0.0206
N	755,925	226,700	529,225	755,925	226,700	529,225

Note: Firm and month fixed effects are included, robust standard errors are reported in the parenthesis. For regressions (4)-(6), natural log of distance is used to generate the interaction term. Ejecutivo and estiones Preparatorias cases are excluded.

Table 5: Number of Cases Filed by Firm Claimants: To Civil/Mixtos Tribunals

Dep.Var	No. cases filed to Civil tribunals			No. cases filed to Mixtos tribunals		
Specification	All	LTE wave 1	LTE wave 2	All	LTE wave 1	LTE wave 2
	(1)	(2)	(3)	(4)	(5)	(6)
=1 if after LTE	0.0528^{***}	0.0089	0.0678^{***}	-0.0165^{*}	-0.0514^{**}	0.0055
	(0.0180)	(0.0071)	(0.0241)	(0.0091)	(0.0206)	(0.0070)
Interaction	-0.0001^{***}	$-2.81e-05^{**}$	-0.0001^{**}	0.0008^{**}	0.0014^{**}	0.0001
	(0.0000)	(1.41e-05)	(0.0001)	(0.0003)	(0.0005)	(0.0003)
Constant	0.0842	0.0491	0.0991	0.0741	0.2015	0.1963
N	755,925	226,700	529,225	755,925	226,700	529,225

Note: Firm and month fixed effects are included, robust standard errors are reported in the parenthesis. For regressions (1)-(3), the distance between a firm to its nearest Civil tribunal is used to generate the interaction term. For regressions (4)-(6), the distance between a firm to its nearest Mixtos tribunal is used.

Table 6: Whether Firm Claimants Have Filed A Case: No Ejecutivo or GP

Dep.Var	=1 if a firm has filed a case			=1 if a firm has filed a case		
Specification	All	LTE wave 1	LTE wave 2	All	LTE wave 1	LTE wave 2
	(1)	(2)	(3)	(4)	(5)	(6)
=1 if after LTE	0.0014***	0.0007	0.0018***	0.0005	0.0003	0.0008
	(0.0005)	(0.0006)	(0.0005)	(0.0006)	(0.0010)	(0.0008)
Interaction	-1.85e-05	7.97e-05	-7.54e-05	0.0006	0.0007	0.0004
	(0.0001)	(6.26e-05)	(7.77e-05)	(0.0004)	(0.0007)	(0.0005)
Constant	0.0217	0.0209	0.0220	0.0217	0.0209	0.0220
N	755,925	226,700	529,225	755,925	226,700	529,225

Note: Firm and month fixed effects are included, robust standard errors are reported in the parenthesis. For regressions (4)-(6), natural log of distance is used to generate the interaction term. Ejecutivo and estiones Preparatorias cases are excluded.

Table 7: Number of Cases Filed by Firm Claimants: To Civil/Mixtos Tribunals

Dep.Var	No. cases filed to Civil tribunals			No. cases filed to Mixtos tribunals		
Specification	All	LTE wave 1	LTE wave 2	All	LTE wave 1	LTE wave 2
	(1)	(2)	(3)	(4)	(5)	(6)
=1 if after LTE	0.0047***	0.0028***	0.0059***	0.0034***	0.0021**	0.0042***
	(0.0006)	(0.0010)	(0.0007)	(0.0006)	(0.0010)	(0.0007)
Interaction	-1.07e-05	0.0001	-0.0001	4.87e-07	0.0001	-7.87e-05
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(8.71e-05)
Constant	0.0440	0.0463	0.0429	0.0448	0.0479	0.0434
N	755,925	226,700	529,225	755,925	226,700	529,225

Note: Firm and month fixed effects are included, robust standard errors are reported in the parenthesis.