USPTO Section 10 Fee Setting— Description of Elasticity Estimates

This appendix describes the statistical modeling and estimation of the United States Patent and Trademark Office (USPTO) patent fee elasticities. These estimates help the Agency gauge the impact of patent fee changes on the demand for USPTO services. The first section defines the concept of elasticity and discusses how elasticities relate to revenue. This is followed by an overview of the elasticity findings in nine broad patent fee categories: filing/search/examination fees, excess independent claims fees, excess total claims fees, application size (excess page) fees, issue fees, request for continued examination (RCE) fees, appeal fees, America Invents Act (AIA) trial fees, and maintenance fees. The final section summarizes the data and statistical approaches used to estimate the elasticity values for each category.

# Elasticities: Definition and Revenue Implications

In economics, the price elasticity of demand (elasticity) is a measurement of how sensitive consumers are to changes in the price of a product or service. For the USPTO, patent fee elasticities help the Agency gauge the sensitivity (or reactivity) of stakeholders to potential fee changes. The elasticity (of demand) for a USPTO service is defined as the percentage change in the quantity of the service demanded by stakeholders divided by the percentage change in the fee for that service. To make this example concrete, let represent the elasticity value for a particular fee category (for instance, the filing/exam/search fee category). This elasticity is calculated as:

Where is the change in the quantity demanded by stakeholders, with representing the quantity demanded under the new fee and representing the quantity demanded under the original fee. By dividing the change in quantity demanded by , one gets the proportionate change relative to the original quantity demanded. The proportionate change in USPTO fees, the denominator of equation (1), is calculated similarly. The resulting elasticity values are negative, because USPTO stakeholders tend to decrease the quantity demanded as fees increase and increase the quantity demanded as fees fall.

For normal services such as USPTO fees, elasticity values generally fall into one of two ranges. First, when the elasticity is less than zero but greater than -1, (), demand is described as *inelastic*. Under inelastic demand, stakeholders are relatively insensitive to fee changes. For instance, a fee increase of 10% will result in stakeholders reducing the quantity of the USPTO service demanded; but this reduction will be smaller than the fee change (less than 10%). In practical terms, inelastic demand for a USPTO service means an increase in the fee for that service results in more revenue to the USPTO. The second range () is described as *elastic*. Under elastic demand, stakeholders are relatively sensitive to fee changes. As before, a fee increase of 10% will result in stakeholders reducing the quantity of the USPTO service demanded, but with elastic demand, this reduction in quantity demanded will be larger than the fee change (greater than 10%). With elastic demand, an increase in the fee for a USPTO service will result in less revenue for the Agency.

With an elasticity value, one can determine the impact of a fee change on revenues. For example, assume the elasticity for a USPTO service is -0.5 (inelastic), then a 10% increase in fees for that service will lead to a 5% decrease in quantity. Since revenue is defined as the fee, , multiplied by the quantity of services demanded, , total revenue *before* the fee increase is . After the fee increase the new revenue can be represented as . The following shows that revenue after the fee increase is greater than revenue before the fee increase, .

That is, at an elasticity of -0.5, a 10% fee increase leads to an increase in revenue of 4.5%.

To demonstrate, take the case where a fee, , is initially $100, but increases to $110, , and the elasticity of demand remains -0.5 for that particular service. Also assume that the increase in the fee causes the quantity demanded for this service to fall from 100, , to 95, . In this scenario, revenue has increased from $10,000 to $10,450 after the 10% increase in the fee rate despite the 5% decrease in the quantity demanded as shown below:

# Elasticity Findings for the Nine Fee Categories

Table 1 presents the elasticity estimates for nine USPTO fee categories as well as the 95% confidence intervals associated with the point estimates. For all point estimates and confidence intervals, the USPTO fee categories are inelastic, ().

# Table 1: USPTO Fee Elasticity Estimates

|  | | | 95% Confidence Interval | |
| --- | --- | --- | --- | --- |
| Fee Elasticity Category | **Entity Size (Large/ Small)** | **Elasticity Estimate** | **Lower Bound** | **Upper Bound** |
| Filing/Search/Examination | Large | -0.16 | -0.27 | -0.06 |
|  | Small | No diff. | No diff. | No diff. |
| Excess Independent Claim Fees | n/a | -0.62 | -0.79 | -0.44 |
| Excess Total Claim Fees | n/a | -0.23 | -0.35 | -0.11 |
| Excess Page Fees | n/a | -0.54 | -0.95 | -0.14 |
| Issue Fees | n/a | -0.006 | -0.01 | -0.001 |
| RCE Fees | Large | -0.08 | -0.11 | -0.04 |
|  | Small | No diff. | No diff. | No diff. |
| Appeal Fees | Large | -0.15 | -0.27 | -0.04 |
|  | Small | -0.33 | -0.52 | -0.13 |
| AIA Trial Fees | n/a | -0.15 | -0.25 | -0.06 |
| 1st Stage Maintenance Fee | Large | -0.06 | -0.07 | -0.05 |
|  | Small | No diff. | No diff. | No diff. |
| 2nd Stage Maintenance Fee | Large | -0.10 | -0.13 | -0.07 |
|  | Small | No diff. | No diff. | No diff. |
| 3rd Stage Maintenance Fee | Large | -0.11 | -0.12 | -0.09 |
|  | Small | -0.13 | -0.16 | -0.09 |

# Note that all reported estimates are statistically significant at the 5% level. Not applicable (n/a) means that differences in entity size were not modeled. No difference (No diff.) means that large and small entity fee elasticities do not show statistically significant differences.

Small entity stakeholders do not react differently than large entity stakeholders except in two categories, appeals and the 3rd stage maintenance decisions. Small entities are more sensitive to fee changes in these two categories, particularly with respect to appeals. The elasticity estimates for excess independent claims, excess total claims, and excess pages are noticeably larger in absolute value relative to fees such as filing/search/examination. This fits with economic intuition that suggests stakeholders will be more sensitive to fee changes (more elastic) when they have more flexibility when making choices such as whether or not to incur fees for excess claims or pages.

# Data and Model Summaries for the Nine Fee Categories

Filing/Search/Examination (FSE) Fees

The USPTO postulates that stakeholder decisions to apply for a new patent depend on – among other factors – the fees they expect to pay the USPTO. In the literature, researchers have treated the definition of expected fees in a variety of ways, with some researchers including attorney/agent fees and others including post-grant fees such as those required to maintain a patent to full term. The definition used by the Office, which is similar the work by de Rossenfosse and van Pottelsberghe de la Potterie (2012), is narrower. Expected fees are defined as those payments needed to complete the first full round of prosecution (i.e., a USPTO “balanced disposal” – the period from initial application through a patent’s first final rejection or allowance). To account for variation across technology areas, the Office calculates expected fees based on historical data for each USPTO Technology Center (TC).

The Office constructed a longitudinal database by TC and quarter. In most specifications, observed quarters are for the years 2001 through 2018. The econometric model took the following form:

Where is the log number of serialized patent filings in TC i and quarter t and is a one quarter lag of new filings. is the real expected fee (i.e., adjusted for inflation) facing potential applicants before filing in TC i for the prior quarter (t-1). **X** is a matrix of other factors and includes the natural log of average patent pendency in the TC for the prior quarter (t-1), share of new applications (i.e., those with no parent application) in the TC for the prior quarter (t-1), share of applications with foreign priority in the TC for the prior quarter (t-1), and the share of applications from small entities in the TC for the prior quarter (t-1). represents a full set of quarterly time dummy variables to capture common influences across TCs due to the passage of time. is a TC-specific variable that accounts for time constant characteristics of that individual TC.

This is a dynamic model with panel data that utilizes the Arellano-Bond estimator, which is a generalized method of moments estimator used to estimate dynamic panel data models. The coefficient on expected fee, , estimates the elasticity of serialized patent filings per quarter – the percentage change in new serialized filings in response to a 1% change in expected fees. To ensure the results did not depend critically on the definition of expected fees, the Office ran alternative models using expected fees through issuance. Also, to investigate the possibility that small entities have a different FSE elasticity, an interaction term was included between expected fees and the lagged share of small entity applications. These models did not find a statistically significant difference in the elasticities across entity size. As shown in Table 1, the results indicate an FSE fee elasticity of -0.16, which means a 10% aggregate increase in the FSE fees can be expected to result in a 1.6% reduction in application filings. The 95% confidence interval for this elasticity ranges from -0.27 to -0.06.

Excess Independent Claim, Excess Total Claim and Excess Page Fees

To estimate fee elasticities for excess independent claim, excess total claim, and excess page fees, the Office analyzed stakeholder responses to the 15% fee increases introduced in the AIA (76 Fed Reg 59115 Sep 23 2011) for excess independent claims ($220 to $250), excess total claims ($52 to $60), and excess pages ($270 to $310). To compare patent applications filed before the fee change with those filed after the fee change, the Office constructed a patent application-level dataset with applications filed six months to three months before the 2011 fee change and patent applications filed three months to six months after the fee change. The six months surrounding the fee change were not included in the sample because applicants could choose to file an application before the fee change and this would confound the estimates with strategic behavior.

The Office estimated three linear probability models, one for each decision to pay excess independent claim fees, excess total claims fees and excess page fees. The model is expressed as:

Where is equal to 1 if the applicant paid the respective excess fee (i.e., for independent, total or page) and 0 otherwise. is a variable indicating whether the patent application was filed before the 2011 fee change (taking a value of 0) or after the fee change (taking a value of 1). The specification also accounts for technology and entity size. Based on this model, the quantity response to the fee change can be approximated using the percentage change in the predicted values. The percentage change in each fee type was calculated based on the 2011 fee change.[[1]](#footnote-2) A bootstrapping method was used to estimate the appropriate confidence intervals.

As shown in Table 1, the result for the excess independent claim fees indicates an elasticity of -0.62, which means that the Office would expect a 10% increase in the fee to lead to a 6.2% decrease in the number of times stakeholders would choose to include excess independent claims in their applications. The 95% confidence interval for this elasticity ranges from -0.79 to -0.44. The result for the excess total claim fee is an elasticity of -0.23 with a 95% confidence interval that ranges from -0.35 to -0.11. Finally, the estimated elasticity for excess pages is -0.54 with a 95% confidence interval that ranges from -0.95 to -0.14, which is a wider confidence interval than other estimates in this analysis due to the relatively larger variations in the data series.

Issue Fees

Following a Notice of Allowance, stakeholders are required to pay an issue fee before the patent becomes a granted legal right. Having reached an allowance, historical patent data indicate that most stakeholders choose to pay the issue fee. This suggests that stakeholders are likely to be insensitive to issue fee changes (i.e., demand is inelastic).

The approach used for estimating the issue fee elasticity was very similar to the approach discussed in the last section for excess claim and page fees. In this case, the Office focused on stakeholder responses to the 2013 rule Setting and Adjusting Patent Fees (78 Fed Reg 4212 Jan 18 2013) with issue fee change ($1,770 to $960) effective January, 2014. The data consists of all applications with a first allowance recorded within three months before or three months after the issue fee change. The model has the same form as in the last section except for the addition of time dummy variables to account for common filing year influences. The linear probability model is expressed as:

is a variable indicating whether the patent allowance took place before the 2014 issue fee change (taking a value of 0) or after the fee change (taking a value of 1). The issue fee for large entities was used as the basis for calculating the percentage change in 2014 issue fees and a bootstrapping method provided appropriate confidence intervals. The elasticity estimate indicates that stakeholders are very insensitive to issue fee changes. The value of -0.006 is very close to zero (see Table 1). It is statistically significant with a 95% confidence interval ranging -0.01 to -0.001.

Request for Continued Examination (RCE) Fees

To estimate the fee elasticity for RCEs, the Office again focused on the 2013 Setting and Adjusting Patent Fees rule for the RCE fee change. In March of that year, the fees for RCEs were reconstructed into a first RCE fee; and a second and subsequent RCE fee. The first RCE fee was increased from $930 to $1,200, which was an increase of 29%. For applicants who had previously filed at least one RCE, the fee increased from $930 to $1,700 or by roughly 83%. The approach is to estimate the change in the probability of filing an RCE by comparing stakeholder decisions before and after the fee change. The Office constructed a dataset consisting of all patents with final rejections in the year preceding the fee change (April 2012 – March 2013) and the year following the fee change (April 2013 - March 2014).

Similar to the approaches described above, a linear probability model was specified and estimated. The main variable of interest, , indicated an RCE was filed before the 2013 fee change (taking a value of 0) or after the fee change (taking a value of 1). The specification included additional variables to hold other influences constant. These included: (1) whether or not the applicant had filed a previous RCE; (2) the amount of time the application had been pending at the USPTO; (3) the number of independent claims in the initial application; (4) the number of words in the shortest independent claim; (5) the number of appeal cases pending at the Patent Trial and Appeal Board (PTAB); and (6) the relationship between the application and previous parent applications. To explore the influence of entity size, separate models were estimated for large and small entities; however, no statistically significant differences were found. The Office also allowed for difference coefficients for patents that had a previous RCE. The elasticities and confidence intervals were derived using the same methods as discussed for excess independent claim, excess total claim, excess page, and issue fees.

As seen in Table 1, the results show that stakeholders are relatively insensitive to changes in RCE fees (i.e., demand is inelastic) with an estimated elasticity of -0.08. The 95% confidence interval ranges from -0.11 to -0.04.

Appeal Fees

The approach to estimate the elasticity for appeals fees also used a before/after design that focused on the 2013 Setting and Adjusting Patent Fees rule. In March of that year, appeal fees increased and the USPTO created a new fee regime. For applicants who had not filed a prior RCE during prosecution, the fee increased from $630 to $800, which was an increase of 27%. The Office constructed a dataset consisting of all patents with final rejections in the year preceding the fee change (April 2012 – March 2013) and the year following the fee change (April 2013 - March 2014).

The model specification and estimation method were the same as discussed above for RCE fees. In this case, the variable captures whether an appeal was filed before the 2013 fee change (taking a value of 0) or after the fee change (taking a value of 1). The Office estimated separate models for large and small entities. Separate elasticities for applications with and without previous RCEs were also estimated, but their difference was not statistically significant.

The results indicate an elasticity of -0.15 for large entities, indicating relatively little sensitivity to appeal fee changes (see Table 1). The 95% confidence interval ranges from -0.27 to -0.04. The elasticity estimate for small entities is -0.33, indicating that small entities are more sensitive to changes in the appeal fee. The 95% confidence interval for small entities ranges from -0.52 to -0.13.

America Invents Act (AIA) Trial Fees

For AIA trial fees, the Office followed the approach used for filing/search/examination fees by constructing a longitudinal database by technology area and quarter. The Office specified a dynamic model of the number of petitions filed in technology areas (i.e., defined as areas covered by USPTO Technology Centers) per quarter and estimated this model using data from September 2014 through March 2018. The econometric model took the following form:

Where is the log number of petitions filed in technology area i and quarter t and and are quarterly lags of petition filings to capture time dependencies. is the real expected fee (i.e., adjusted for inflation) facing potential petitioners before filing. This was calculated based on historical data specific to each technology area. **X** is a matrix of other factors and includes the petition type (i.e., whether it was an *inter* *partes* review or not), count of the independent claims for the petitioned patent, count of the dependent claims for the petitioned patent, an indicator for whether the petitioned patent was a PCT national stage entry, and a count of the number of petitions filed on the focal patent in the preceding quarter, which captures strategic behavior by petitioning entities. represents a full set of quarterly time dummy variables to capture common influences across technology areas due to the passage of time. is a technology-specific variable that accounts for time constant characteristics of that individual technology area.

As this is a dynamic model with panel data, the Arellano-Bond estimator was used. The coefficient on expected fee, , estimates the elasticity of AIA petitions per quarter – the percentage change in new petition filings in response to a 1% change in expected fees. As shown in Table 1, the results indicate an AIA petition filing fee elasticity of -0.15 with a 95% confidence interval ranging from -0.25 to -0.06.

Maintenance Fees

The elasticity estimates for the three stages of maintenance payments were determined based on the 2013 rule Setting and Adjusting Patent Fees March 2013 fee changes. At that time, maintenance fees for the first stage renewal payment increased by 39% ($1,150 to $1,600), the second stage renewal period fee increased by 24% ($2,900 to $3,600) and the third stage renewal period fee increased by 54% ($4,810 to $7,400). The Office used a before/after design by forming a patent-level dataset using all granted patents with a maintenance fee due date within the six months prior to the March 2013 fee change and from six months to one year after the March 2013 fee change. The second window is six months later to avoid problems with early payments as patent owners have the option of the paying maintenance fee up to six months before the date in which the maintenance fee is due.

Similar to previous descriptions, in our models the Office estimated the probability that an assignee would pay each respective maintenance fee conditional on whether the maintenance fee payment was due before or after the fee change in 2013. Among the control variables were patent entity size, technology work group fixed effects, filing year fixed effects, fees paid previously related to each patent, the number of allowed claims, the number of forward citations prior to each maintenance date, and the number of inventors. Separate models for large and small entities were estimated. The Office estimated the elasticities using the same methods described above in our description of excess independent claim, excess total claim, excess page, and issue fees.

The results for large entities indicate elasticities of -0.06, -.10, and -.11 for the first, second, and third stage maintenance fees, respectively (see Table 1). For small entities, the results indicate elasticities of -0.06, -.12, and -.13 for the first, second, and third stage maintenance fees, respectively.

1. The fee change for large entities for the elasticity estimate. [↑](#footnote-ref-2)