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What is the Probability of Receiving a US Patent?*

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Abstract

We follow the prosecution histories of the 2.15 million new patent applications filed at the US Patent and Trademark Office between 1996 and 2005 to calculate patent allowance rates. 55.8% of the applications emerged as patents without using continuation procedures to spawn related applications. The success rate of applications decreased substantially from 1996 to 2005, particularly for applications in the "Drugs and Medical Instruments" and "Computers and Communications" fields. Applications filed by large firms are more likely to emerge as patents than those filed by small firms. We discuss the implications of our findings for inventors, policy makers, and social scientists who use successful patent applications as indicators of innovation.

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1 Introduction

Inventors choose among different appropriability mechanisms, such as patents, copyrights, trademarks, and trade-secrecy, to protect their inventions based on their relative costs and benefits (Cohen, *et al* 2000). A key element of the inventors' cost-benefit calculus is the expectation that their patent application will succeed. However, little information exists on the historical rates at which patent applications are granted in the US. This paucity of information about the probability of getting patents impairs inventors' decisions regarding their choice of appropriability mechanisms; it also afflicts policy debates on the rigor of patent examination and abuses of the US patent system (see National Academy of Sciences 2001, Jaffe and Lerner 2004, Bessen and Meurer 2008). For example, writing with economist Gary Becker, Judge Posner recently opined that "the problem of patent trolls is a function in part of the promiscuity with which the patent office has issued patents..." (Posner 2013).

The calculation of patent allowance rates, while simple on the surface, is complicated by several aspects of the patent examination process. First, US patent applications that are rejected after examination by the patent office can spawn closely related but "new" applications (called "continuations") that are hard to track but may finally emerge as patents. Second, the US patent office publishes information on the outcomes of examination only for the applications that are published (after patent grant for applications filed before November 29, 2000 and after 18-months from application date for applications filed on or after November 29, 2000 that are still pending at 18 months with some exceptions, See 35 USC 122). Third, applicants alter and narrow the claims of their applications during the examination process. Thus, the allowance of some patentable claims within an application is not the same as the allowance of an application as it was filed, and should be taken into account in any discussion of allowance rates.

What is the probability that a patent application filed at the US Patent and Trademark Office (PTO, "the agency," or "the office") emerges as a patent? Our objective here is to establish some facts related to this question by analyzing unique application-level data available internally at the PTO. The data tracks each of the 2.15 million new utility patent applications filed at the PTO between 1996 and 2005. These applications represent the population of "progenitor applications," that is, applications unrelated to any previously filed US applications. We track the applications from the date they entered the Office through June 30, 2013, by which time 99.8% of the progenitor applications had exited the system as a patent or were abandoned. This allows us to link each progenitor application to its children applications (subsequent applications spawned by the progenitor applications through the use of various continuation procedures) and to accurately estimate the probability of allowance without the limitations of previous studies based on

partial samples of published applications (*e.g.*, Lemley and Sampat 2008) or exit cohorts (*e.g.*, Quillen and Webster 2001, 2009).[1,2]

In order to capture the complexity of the examination process, we calculate three measures of patent allowance rates: (i) *first action allowance rate*, or the proportion of progenitor applications that are allowed without further examination; (ii) *progenitor allowance rate* (or simply, allowance rate), or the proportion of progenitor applications that are allowed and patented without using any continuation procedure, and (iii) *family allowance rate*, or the proportion of progenitor applications that produce at least one patent, including the outcomes of applications that emerge from the progenitors through the use of continuation procedures.

2 The US patent examination process

We simplify our description of the patent examination procedures and rules, and discuss only the most salient events relevant to our objective.[3] Accordingly, Figure 1 presents a stylized version of the US patent examination process, using data for the 1996-2005 filing cohorts of progenitor applications. Each application is queued for examination when the application is docketed to an examiner. Applications that are incomplete or not accompanied by the appropriate fees within the grace period are considered abandoned and not docketed to an examiner. The first significant correspondence that an applicant receives from the office is called a "first action on the merits" (or simply "first action"). The first action includes a search report with a listing of relevant prior art that supports the examiner's decision of either allowance or non-final rejection. The office allowed 11.4% of the progenitor applications at first action and delivered a non-final rejection decision for 86.4% of the applications, with the remaining 2.3% being abandoned prior to first action. 36.1% of the progenitor applications were allowed after one or more rounds of amendments and negotiations with the examiner, but prior to a final rejection. 14.5% abandoned between non-final rejection and final rejection. 38.7% received a final rejection.

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[1] Data on unpublished applications are not made available to the public to protect the intellectual property of patent applicants who may choose to abandon their applications prior to 18-month publication date. If unpublished applications are more likely to be abandoned, allowance rates calculated based on publicly available data (i.e., published applications) will be biased upwards. However, we will make available on request, detailed instructions on how to obtain data on published patent applications.

[2] The careful work of Lemley and Sampat (2008) attempts to overcome some of these problems by tracking a sample of applications through the Patent Application Information Retrieval (PAIR) system, but their analysis is based on a sample of published applications. The small sample of 9,960 applications filed in January 2001 they examine also limits their study's scope.

[3] The USPTO's official patent application filing guide provides a more comprehensive description of the rules and procedures. See http://www.uspto.gov/patents/resources/types/utility.jsp

Figure 1 here

For most applications, prosecution at the office ends with patent allowance (and patent issue) or with abandonment. Applications are considered abandoned if the applicant does not respond to the examiner's decision within the stipulated deadlines, or if the applicant expressly requests abandonment. Hence, there is no formally decisive rejection from the Office—only abandonments that result from applicants' actions and non-actions. Applicants can continue to submit amended applications with additional material to persuade the examiner even after receiving a final rejection. 9.3% of applications received a final rejection and were allowed after the applicant responded with after final amendments and supporting material. Further, applicants can formally appeal a final rejection by submitting an appeal to the erstwhile Board of Patent Appeals and Interferences.7.5% (2.9/38.7) of the final rejections were subject to appeals and 41.4% (1.2/2.9) of the appeals resulted in allowances. 2.7% of applications were abandoned after allowance; thus, overall, 55.8% of progenitor applications emerged as patents without the use of continuation procedures.

Continuation procedures

Applicants can continue prosecution after receiving a final rejection (or even after they receive an allowance), by using various continuation procedures at the PTO. Some scholars have blamed the procedures for several abuses of the patent system including submarine patents, long pending patent applications, and low-quality patents (*e.g.*, Lemley and Moore 2004), while others have pointed out that they may help applicants revise their applications to reflect the developments to their inventions while the applications are under examination (Hegde, *et al*, 2009).

31% of the progenitor applications utilized some form of continuation procedure. These continuation procedures at the office can be of two broad types: non-serialized continuations and serialized continuations.[4] Non-serialized continuations do not receive a new serial number and are immediately docketed to the same examiner that prosecuted the progenitor (the progenitor application is counted as abandoned in many official statistics and examiner production metrics). Requests for Continued Examination (RCEs, instituted in 1999) are by far the most common type of non-serialized continuations and applicants may file an RCE multiple times during prosecution.[5] 19.5% of the progenitors

[4] Serialized continuations can be exercised at any point during patent examination. Non-serialized continuations may only be used after particular events in prosecution—typically after final rejection.

[5] There have been several incarnations of non-serialized continuations, including Continued Prosecution Applications (CPAs), Rule 129 continuations (R129s), and File Wrapper Continuations (FWCs). The most recent incarnation (and by far the most prevalent) is the Request for Continued Examination (RCEs). Throughout this section, we refer collectively to all these non-serialized continuations as RCEs. Until

filed at least one RCE. Of the applications that moved from non-final rejection to final rejection, 38.7% filed an RCE. Thus, if one includes allowances of the non-serialized continuation applications that emerged from the progenitors, the allowance rate jumps from 55.8% to 69.2%.

In contrast to non-serialized continuations, serialized continuations are treated as new applications; they receive a new serial number and are docketed to examiners based on the classification of the new application. There are three types of serialized continuations. Applicants may file for a simple continuation (CON) of a parent application to receive the benefit of the parent's priority date so long as the CON limits itself to the specification described in the parent. Applicants can use the "Continuation-In-Part" (CIP) to introduce new subject matter to an existing application. Alternatively, if two or more independent and distinct inventions are claimed in one application, the Office may require the application to be restricted to one of the inventions, and the applicant may file a divisional (DIV) application. Serialized continuations receive the priority date of the progenitor, with the exception of new matter added in CIPs, so long as the progenitor is pending when the serialized continuation is filed. The progenitor does not have to be abandoned following a serialized continuation. The parent and child may proceed through the examination process in parallel, and a single progenitor can produce a chain of several serialized continuations resulting in multiple patents, thus complicating the calculation of allowance rates for progenitors. 15.8% of the progenitor applications gave birth to at least one serialized continuation as of June 30, 2013.Overall, 71.2% of progenitor applications resulted in the issue of at least one patent after counting the allowances of applications emerging from (serialized and non-serialized) continuation procedures.

Figure 2 here

Figure 2 plots the three allowance rates by the entry year of the progenitors. The figure shows that the probability of allowance is substantially lower for the recent cohort of applications. The striking decline in first action allowance rates and progenitor allowance rates is unlikely to be due to censoring since the mean first-action pendency for applications filed during the period was 21.1 months and total pendency was 29.1 months (first-action pendency refers to the time between application date and first-action date; total pendency refers to the time between application date and disposal date; Hegde 2012 reports pendency statistics at the PTO between 1991 and 2010). Although less than 1% of the progenitor applications in our study were pending to date, a larger proportion

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November 2009, RCEs were put on the "amended docket," which meant that the examiner had to respond within two months. Since that time, RCEs have gone on the "special new docket," meaning that the examiner has more discretion as to when to respond (similar to newly docketed applications).

of abandoned progenitors have continuation applications that are still pending, thus potentially biasing our family allowance rates downward for the later years. We account for this by calculating the maximum possible family allowance rate that would occur if all pending applications were to eventually issue. This upper bound is represented by dashed lines in Figure 2. This correction demonstrates that for the 1996-2005 cohorts, the average family allowance rate could at most be 72.3% (as compared to the rate of 71.2% based on disposals observed to date) and the decline in allowance rates between 1996 and 2005 is quite robust.[6]

Our interviews with patent experts at the USPTO suggested at least three possible explanations for the decline. First, the financial market bust in March 2000 and the following period of tighter financial constraints may have forced some inventors to abandon their patent applications. Second, the PTO introduced several procedures in 2000 to augment the quality of patent prosecution (e.g., the "second pair of eyes" system which subjected certain applications to mandatory assessment by more than one examiner before being allowed), which may have decreased the probability of patent allowance. Finally, the number of pending applications, first-action pendency, and total pendency all steadily increased during the period of our study. Longer pendencies have been shown to be correlated with more abandonments, thus lowering the observed allowance rates (Mitra-Kahn, Marco *et al* 2013).[7] Of course, establishing the causal effects of these and other potential influences on allowance rates is difficult, and requires separating out the effects of changes in the USPTO from changes in the propensity of applicants to abandon their applications. We thus defer a careful examination of the determinants of allowance rates for future research.

3 Allowance rates across technology fields

It is well known that patent value varies across industries (Cohen *et al* 2000). Inventors in discrete-product industries, such as chemicals and pharmaceuticals, tend to use patents to preclude imitation by rivals, while those in complex product industries such as electronics and computers amass patents to enhance their bargaining power in cross-

[6] The effect of censoring is more pronounced for more recent cohorts, increasing sharply after 2005, thus validating our choice of 2005 as the cut-off year for our study. Figure A1 of the Supplementary Appendix presents the lower and upper bounds for each of the three allowance rates for 1991 to 2010. As the window between filing and observation shrinks, the observed allowance rates will fall to 0% and the hypothetical maximum for each allowance rate will approach 100%.

[7] Table A1 of the Supplementary Appendix presents the correlation between our allowance rate measures and the percent change in GDP from the previous year, the number of applications pending in the year of filing and the total pendency for applications disposed in the year of filing. All three allowance rates are strongly, negatively correlated with pendency and the number of pending applications and are moderately, positively correlated with the percent change in GDP.

licensing negotiations (Hall and Ziedonis 2001). Inventors in different industries also appear to pursue different strategies during the patent examination process, including in their use of CONs (Hegde, *et al* 2008), and judicial decisions (for example, the State Street decision in 1998 to validate patenting of business method patents, or the recent Myriad decision invalidating patenting of DNA segments) affect the standards of patentability for some technological fields, while leaving the standards unchanged for others.[8]

Figure 3 here

Figure 3 displays the probability of patent allowance for the patent technology categories defined by Hall, Jaffe, and Trajtenberg (2001).[9] Applications in Drugs and Medical Instruments have the lowest average allowance rates (allowance rate of 42.8%) and applications in the Electrical and Electronics sectors enjoy the highest allowance rates (allowance rate of 66.6%). In the Computers and Communication sector, which includes a large majority of the controversial software and business method patents, allowance rates are relatively lower (allowance rate of 49.8%). Applicants appear to use continuation procedures more in the sectors with lower allowance rates (44.1% of the progenitor applications used at least one of the continuation procedures in the Drugs and Medical sector; see Table A3 of the Supplementary Appendix). The decline in allowance rates is particularly striking for Drugs and Medical Instrument patents and for Computers and Communication patents (see also Graham and Vishnubhakat 2013). In these sectors, both first-action allowance rate and progenitor allowance rates declined by more than 50% (Figures A2-A4 of the Appendix compare sectoral trends for the three allowance rates).

4 Allowance rates across inventor types

Small inventors play an important role in the US innovation system and the Office seeks to lower their costs of patenting by charging discounted (50%-75%) examination fees.[10] Like small entities, foreign inventors may also find it difficult to access the legal resources required to enhance their chances of receiving patents. Does the probability of patent issue differ for different applicant types? To answer this, we identified patent

[8] See 149 F.3d 1368 (Fed. Cir. 1998) and 569 U.S. 12-398 (2013), respectively.

[9] Hall, Jaffe, and Trajtenberg (2001) create a mapping from US Patent Classification (USPC) to six technology categories for issued utility patent applications. The data were updated in 2006. We apply the 2006 mapping to all progenitor applications in our dataset in order to treat abandoned and issued applications similarly. Child applications are assigned to the same technology category as the progenitor application.

[10] USPTO fees are discounted by 50% for applicants and patentees who qualify as "Small Entities" by having fewer than 500 employees (37 CFR 1.27). For exact patent examination fees, see: http://www.uspto.gov/web/offices/ac/qs/ope/fee031913.htm

applications as belonging to foreign inventors if the primary inventor on the application was located abroad, and identified small-inventors as those that qualified for the USPTO's small-entity discounts. Large foreign inventors accounted for 39%, large U.S. inventors 31.1%, small foreign inventors 9.6%, and small U.S. inventors 20.1% of our 2.15 Million progenitor applications.

Figure 4 here

Figure 4 reveals that large foreign inventors enjoy the highest progenitor and family allowance rates (60.5% and 77% respectively), followed by large US inventors (57% and 75.2%). US small inventors have the lowest rates of patent allowance, particularly family allowance rates. Foreign applicants and small inventors are less likely to use continuation applications (Table A4 of the Supplementary Appendix reports the percentage of progenitor applications that used the different types of continuations by applicant type). The differences in allowance rates across the different applicant types appear more substantial in some fields (e.g. Computers and Communications) than others (Table A5 of the Supplementary Appendix reports the allowance rates for the different applicant types across technology fields).

These numbers should be interpreted with caution. The lower allowance rates for US small applicants could reflect either their higher propensity to abandon their applications during the examination process, or differences in the nature of inventions and subject matter covered by their applications. Similarly, large foreign inventors may enjoy higher allowance rates either because they choose to seek protection in the US for their most important inventions, or because they are more likely to have access to the legal resources required to maximize the probability of allowance.

5 Concluding thoughts

Our analysis of progenitor applications filed between 1996 and 2005 uncovers several interesting facts that counter conventional wisdom. We find that the first action allowance rate for patent applications is just 11.4%. Only 55.8% of progenitor applications eventually emerge as patents after several rounds of amendments. The family allowance rate, which accounts for the use of continuation procedures by progenitor applications, is just 71.2%. The probability of patent issue declined during the period of our study: starting at nearly 70% for the applications filed in 1996, progenitor allowance rates declined to 40% for the 2005 cohort (even accounting for censoring issues as shown in Figure A1). Applications in the "Drugs and Medical Instruments" fields are least likely to be successful and applications in the "Electrical and Electronics" fields are most likely to be successful. Allowance rates declined sharply for

applications filed between 1996 and 2005 in the "Drugs and Medical Instruments" and "Computers and Communication" fields. Allowance rates are lower across all technology sectors for small firms.

What are the implications of these findings? Many scholars have interpreted patent allowance rates, typically incorrectly calculated, as reflecting examination quality alone, and argued that the high allowance rates at the PTO indicate low examination quality (*e.g.*, Quillen and Webster 2001, 2009). Our findings challenge the conventional wisdom that the PTO allows nearly all of the applications it receives, and rubber stamps applications without scrutiny. We also find no evidence for the claims that the PTO is becoming more lenient in granting patents. To the extent that some inventors invest in preparing US patent applications, based on assumptions about the probability of being successful, our findings help correct their "priors," and thus make more informed decisions about their investments.

Scholars in economics and management widely use the number of successful patent applications as a proxy for the innovation intensity of firms, industries, and even nations. To the extent that at least some of these differences are shaped by systematic differences in the probability of patent allowance across types of inventors, technological fields, and time, as we have documented, scholars need to account for factors underpinning these differences before drawing conclusions about the rate of innovation based on simple counts of successful patent applications.

Our study suggests that patent allowance rates should be interpreted with caution by policy makers. Allowance rates are the product of an "opt out" system for applicants: thus, the rates are driven not only by the office's rejection of applications, but applicants' willingness to continue the prosecution of their applications. Accordingly, the rates may reflect the influence of several variables including the patentability of the subject matter claimed in the applications (which varies across technological fields), the rigor of the patent examination process, the time taken for examination at the PTO, judicial decisions about valid subject matter, and applicants' access to the resources required to keep their applications alive. Some of these variables could be uncorrelated with the rigor of the examination process. Hence, economists should investigate the factors underlying the fluctuations in allowance rates, and be aware of the infeasibility of defining an "optimal" allowance rate before recommending changes to the examination system based on observed rates. Just as having a lenient process that rubber stamps applications without scrutiny can impose costs on our innovation system, an allowance rate that is "too low" may deter inventors, particularly those that cannot engage in costly negotiations with patent examiners, from seeking patents, or worse still, investing in innovation.

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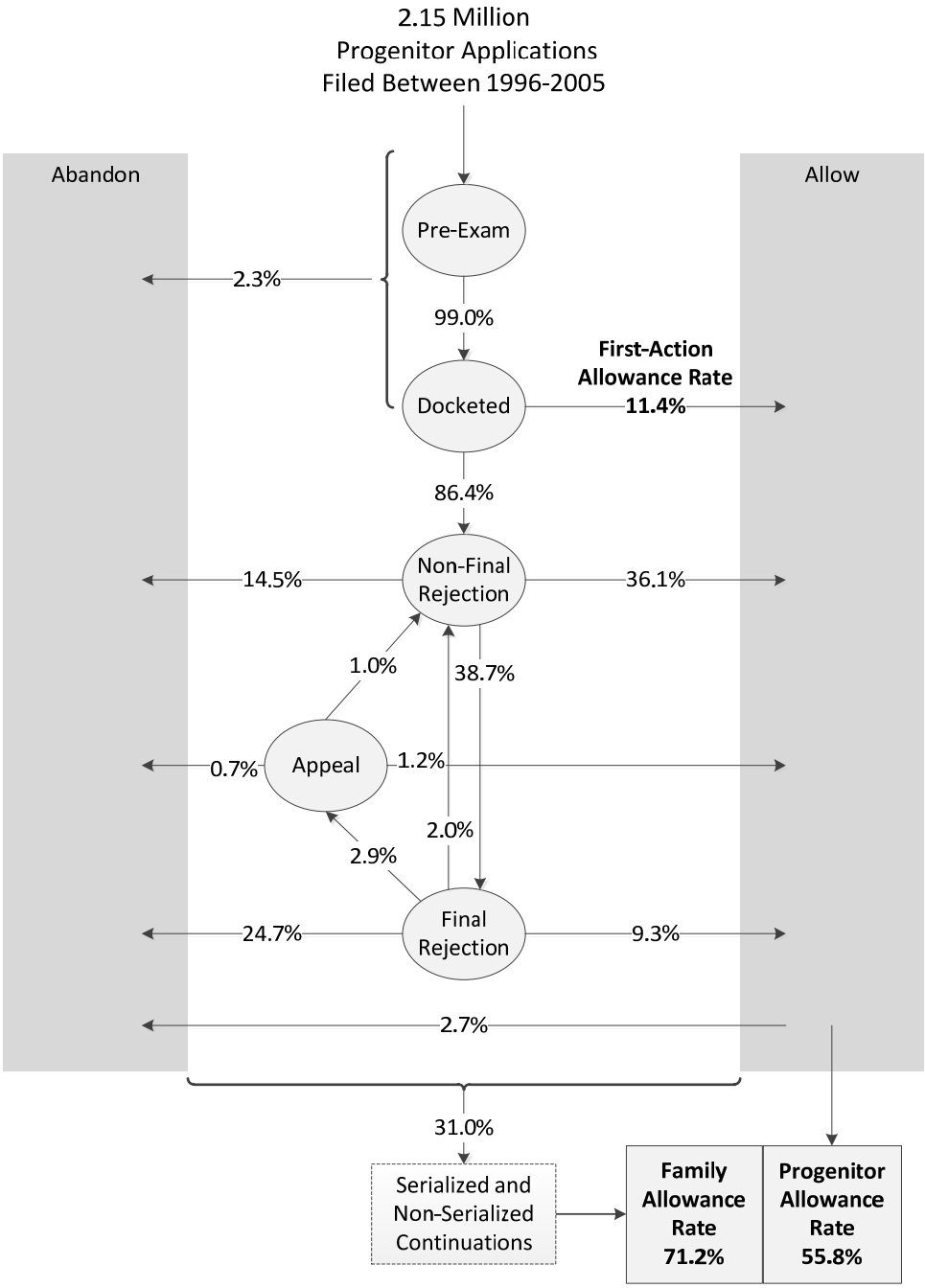
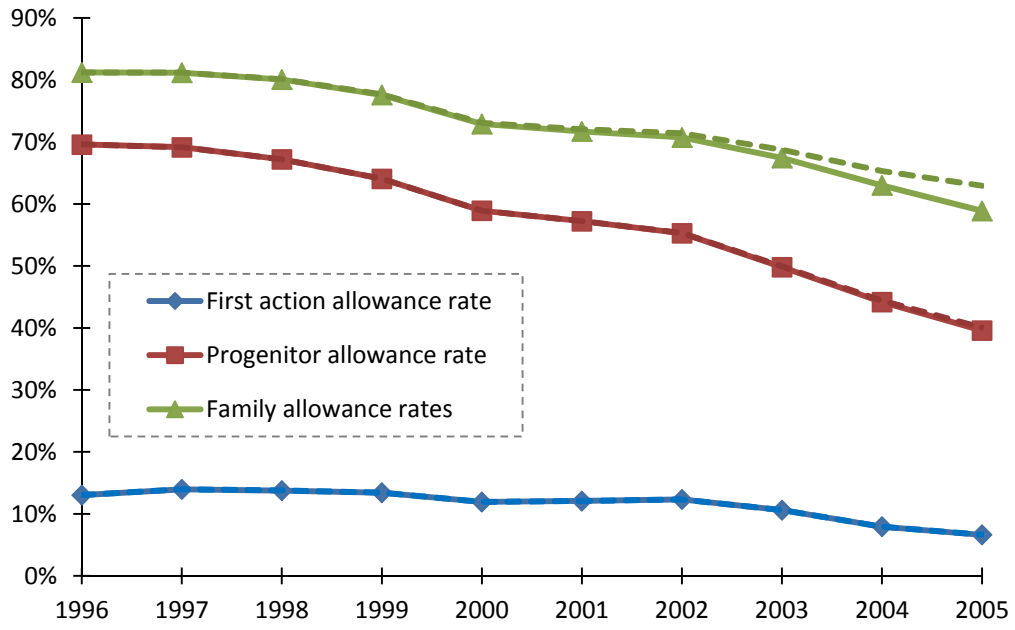
Figures and Tables

Figure 1: The US Patent Examination Process



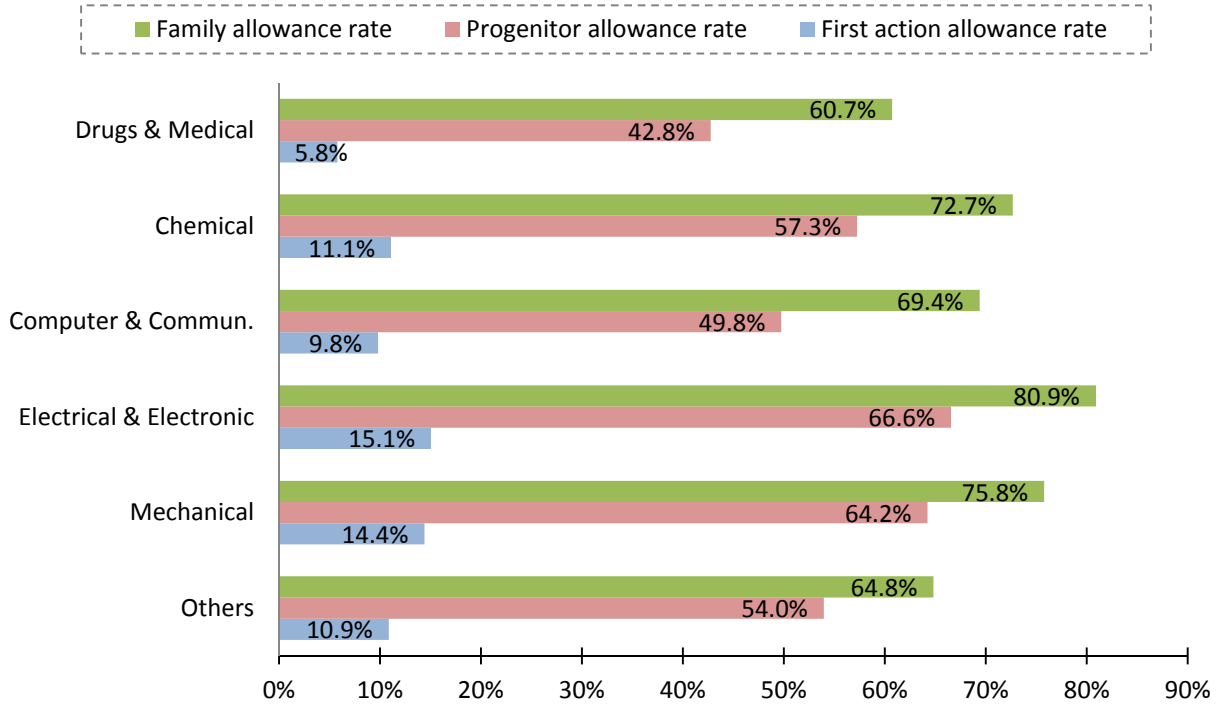
Notes: Figure is a simplified representation of the US patent examination process and shows the key intermediate and final outcomes, as of June 30, 2013, for the 2.15 million applications filed for the first time ("progenitor" applications) at the PTO between 1996 and 2005. The percentage indicated at each transition-state reflects the percentage of the total progenitor applications that reached the state. *First-action allowance rate* refers to the proportion of progenitor applications that are allowed without amendment; *Progenitor allowance rate* refers to the proportion of progenitor applications that were eventually allowed and patented without using continuation processes; *Family allowance rate* refers to the proportion of progenitor applications that produce at least one patent, including the allowances of continuation applications that emerge from the progenitors. Abandonments and allowances may not sum to 100% due to rounding.

Figure 2: Trends in allowance rates, 1996-2005



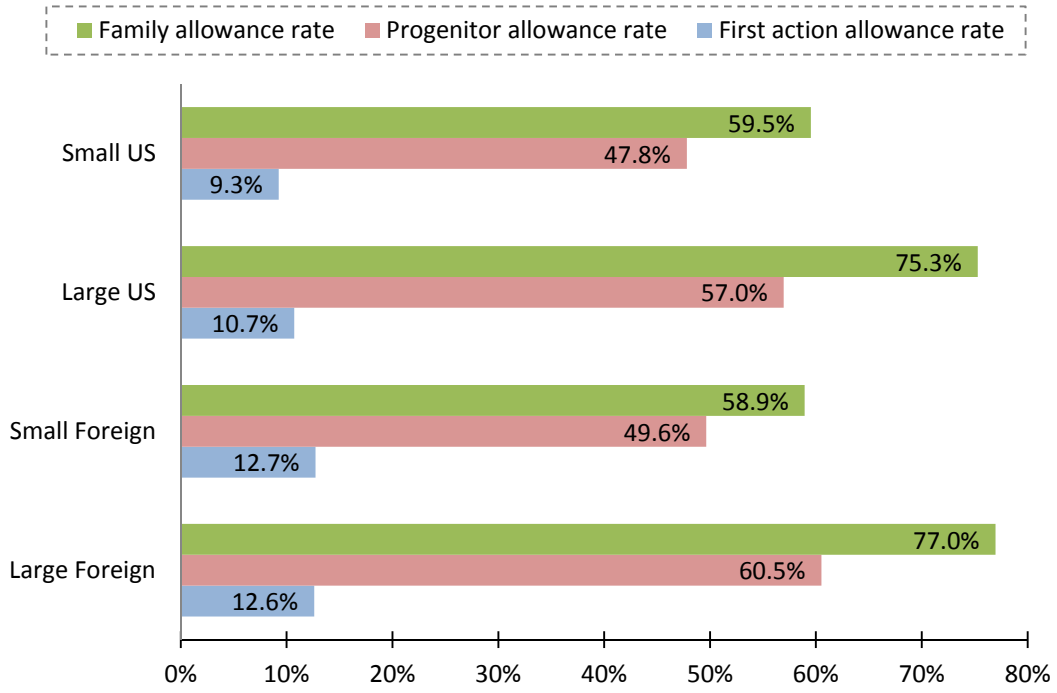
Notes: Figure shows trends in the three types of allowance rates for the 2.15 million applications filed at the PTO for the first time between 1996 and 2005. 18,270 of the 2.15 million applications were pending as of June 30, 2013 and the dotted lines (for the first-action allowance rate and progenitor allowance rate) represent the corresponding rates if all the pending applications are, in fact, allowed. Thus, they represent the theoretical upper-bound for the allowance rates. For progenitor applications that produced continuation applications which are still pending, we calculate the maximum possible family allowance rate for each progenitor cohort by assuming that every pending continuation application produced by the progenitors will eventually be allowed. This maximum possible family allowance rate is represented by the corresponding dashed line.

Figure 3: Allowance rates by patent technology fields (for patent applications filed between 1996 and 2005)



Notes: Figure shows the three types of allowance rates for applications filed at the PTO for the first time between 1996 and 2005, across the six NBER patent technology fields.

Figure 4: Allowance rates by inventor type (for patent applications filed between 1996 and 2005)



Notes: Figure shows the three types of allowance rates for applications filed at the USPTO for the first time between 1996 and 2005, across the four inventor types.

Appendix. Supplementary statistics

Table A1: Correlations between allowance rates and environmental covariates, 1996-2005

	(A)	(B)	(C)	(D)	(E)
(A) First Action Allowance Rate					
(B) Progenitor Allowance Rate	0.949				
(C) Family Allowance Rate	0.950	0.998			
(D)Percent Change in Real GDP	0.352	0.482	0.515		
(E)Total Pending Applications	-0.925	-0.994	-0.992	-0.505	
(F)Total Pendency	-0.925	-0.967	-0.963	-0.349	0.971

Note: Table shows contemporaneous correlations between allowance rates and potential environmental determinants of allowance rates (all variables are measured annually, for each year between 1996 and 2005). Total pending applications refer to the stock of patent applications filed, and in the examination process for the given year. Total pendency refers to the average time, in months, between patent application date and patent disposal date during the entry year of the progenitor applications in our study.

Table A2: Progenitor applications and related continuation applications, 1996-2005

Year	Applications	Serialized Continuations				Non-serialized Continuations (RCEs)	Either Continuation
		CON	CIP	DIV	Any		
1996	146,260	6.9%	5.6%	6.5%	17.7%	11.2%	24.9%
1997	166,232	5.8%	5.3%	6.7%	16.5%	12.1%	25.6%
1998	182,717	6.3%	5.0%	6.8%	16.9%	13.4%	26.9%
1999	197,704	6.9%	5.0%	6.9%	17.5%	14.5%	28.3%
2000	222,480	7.1%	4.8%	6.5%	17.2%	15.7%	29.0%
2001	232,668	7.1%	4.4%	6.5%	16.9%	17.4%	30.3%
2002	233,246	6.7%	4.4%	6.1%	16.1%	19.7%	31.5%
2003	235,861	6.3%	4.1%	5.1%	14.6%	24.1%	33.7%
2004	250,338	6.3%	3.4%	4.9%	13.7%	27.3%	35.6%
2005	278,160	6.5%	2.7%	4.7%	13.2%	29.2%	37.1%

Note: Table shows the number of progenitor applications filed in the corresponding year, and the percentage of the applications from each cohort that produced the different types of continuations.

Table A3: The use of Continuation applications across technology fields, 1996-2005

Technology Field	Applications	Serialized Continuations				Non-serialized Continuations (RCEs)	Either Continuation
		CON	CIP	DIV	Any		
Chemical	245,150	6.0%	5.3%	9.2%	19.1%	18.2%	32.8%
Drugs & Medical	227,936	12.8%	8.2%	10.0%	28.2%	24.5%	44.1%
Computers & Comm.	611,046	8.3%	3.2%	3.6%	14.1%	26.7%	36.0%
Electrical & Electronic	402,401	4.7%	3.0%	7.7%	14.5%	16.4%	27.5%
Mechanical	311,040	3.9%	3.8%	4.9%	11.9%	13.2%	22.7%
Others	348,093	4.6%	5.2%	4.2%	13.2%	13.4%	23.7%

Note: Table shows the number of progenitor applications filed in each NBER patent technology field (between 1996 and 2005), and the percentage of the applications that produced the different types of continuations.

Table A4: The use of Continuation applications across applicant types, 1996-2005

Applicant Type	Applications	Serialized Continuations				Non-serialized Continuations	Either Continuation
		CON	CIP	DIV	Any		
Large Foreign	838,210	4.4%	1.3%	5.9%	11.2%	21.1%	29.1%
Small Foreign	207,460	3.7%	3.7%	2.9%	9.7%	12.1%	19.3%
Large US	668,527	9.2%	5.2%	7.6%	20.4%	23.0%	37.6%
Small US	431,469	8.2%	9.2%	5.0%	20.5%	14.3%	30.0%

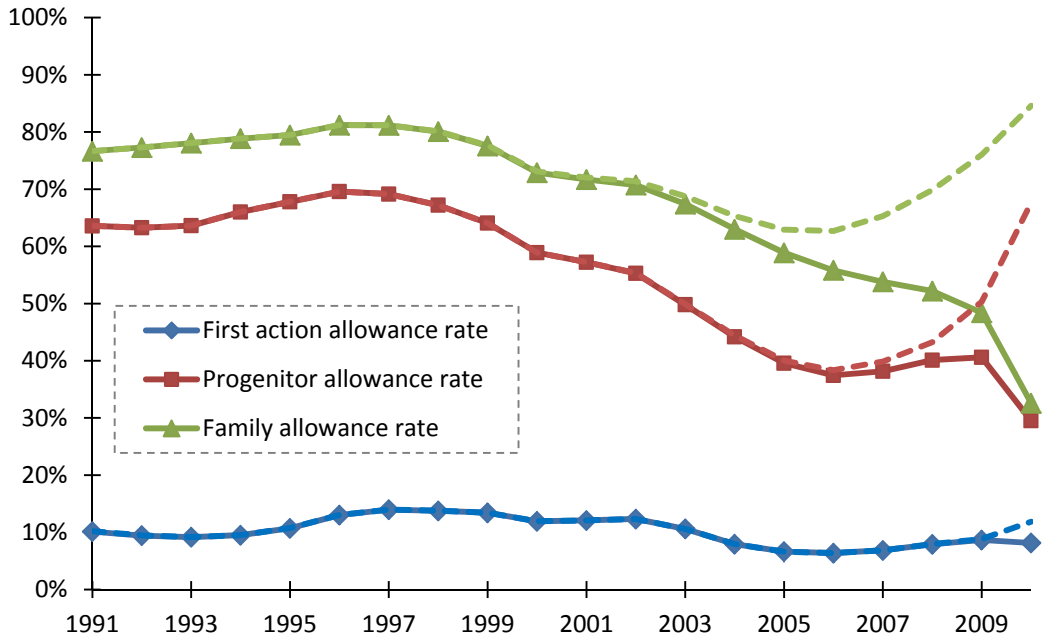
Note: Table shows the number of progenitor applications filed by each applicant type (between 1996 and 2005), and the percentage of each type's applications that produced the different types of continuations.

Table A5: Allowance Rates across applicant types and technology fields, 1996-2005

Technology Field	Applicant Type	Applications	First Action	Progenitor	Family
Chemical	Large Foreign	112,598	11.0%	59.6%	75.4%
	Large US	76,595	11.3%	57.2%	74.1%
	Small Foreign	20,245	11.6%	52.9%	64.4%
	Small US	35,712	9.7%	52.4%	65.8%
Computers & Commun.	Large Foreign	244,453	11.7%	54.5%	74.0%
	Large US	251,253	8.9%	51.8%	74.1%
	Small Foreign	32,847	9.6%	37.7%	48.9%
	Small US	82,493	6.4%	34.5%	49.6%
Drugs & Medical	Large Foreign	62,142	5.3%	45.0%	63.6%
	Large US	69,632	6.0%	43.1%	62.7%
	Small Foreign	27,372	5.7%	39.9%	55.4%
	Small US	68,790	5.6%	41.5%	58.3%
Electrical & Electronics	Large Foreign	204,125	15.5%	67.7%	83.3%
	Large US	122,529	14.2%	69.3%	84.5%
	Small Foreign	30,489	17.0%	57.7%	65.2%
	Small US	45,258	13.1%	60.0%	71.1%
Mechanical	Large Foreign	128,328	15.1%	68.8%	82.1%
	Large US	74,681	14.1%	67.2%	80.5%
	Small Foreign	40,274	15.8%	56.2%	63.7%
	Small US	67,757	12.0%	57.1%	65.9%
Others	Large Foreign	86,564	11.3%	60.7%	74.6%
	Large US	73,837	9.9%	56.5%	71.9%
	Small Foreign	56,233	13.5%	51.1%	57.7%
	Small US	131,459	9.5%	49.3%	57.4%

Note: Table shows the number of progenitor applications filed in each of the six NBER patent technology fields by each applicant type (between 1996 and 2005), and the percentage of each type's applications that produced the different types of continuations.

Figure A1: Trends in allowance rates with adjustments for censoring, 1991-2010



Notes: Figure shows trends in the three types of allowance rates for the 4.2 million applications filed at the PTO for the first time between 1991 and 2010. A significant number of applications filed after 2005 were pending as of June 30, 2013 and the dotted lines (for the first-action allowance rate and progenitor allowance rate) represent the corresponding rates if all the pending applications are, in fact, allowed. Thus, they represent the theoretical upper-bound for the allowance rates (a vast majority of the applications filed for the first time in 2010 were past the first action, but still pending at the office: if all of these pending applications were to issue, then the progenitor allowance rate for 2008 applications would be around 68%). For progenitor applications that produced continuation applications that are still pending, we calculate the maximum possible family allowance rate by assuming that every pending continuation application produced by the progenitors will eventually be allowed. This maximum possible family allowance rate is represented by the corresponding dashed line.

Figure A2: Trends in First Action Allowance Rate by Technology Field, 1996-2005

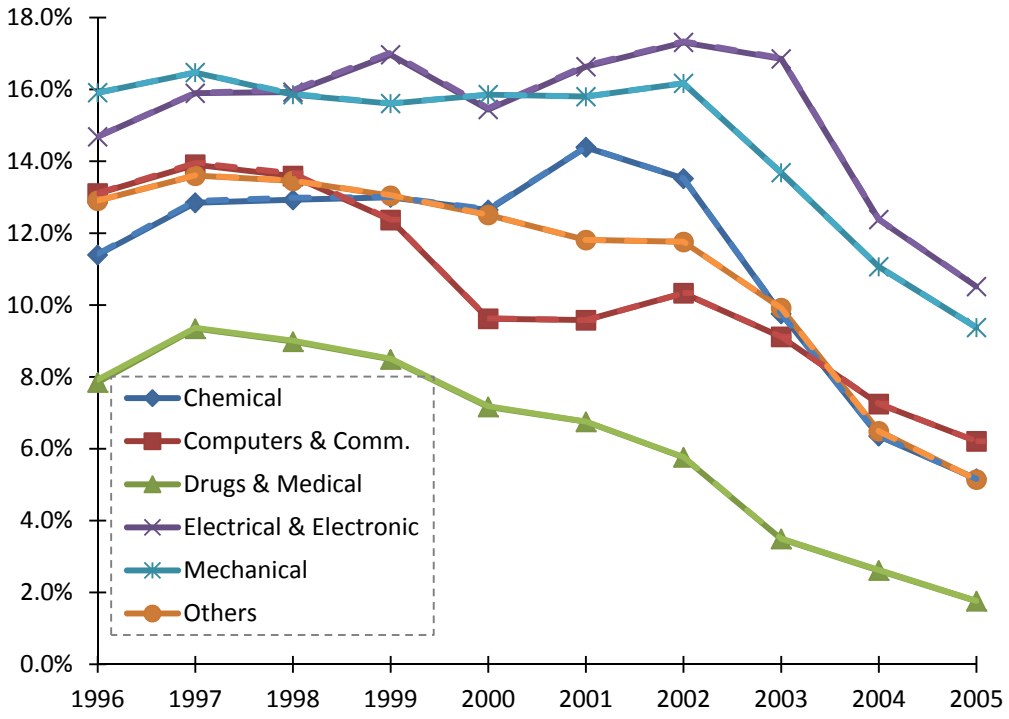


Figure A3: Trends in Progenitor Allowance Rate by Technology Field, 1996-2005

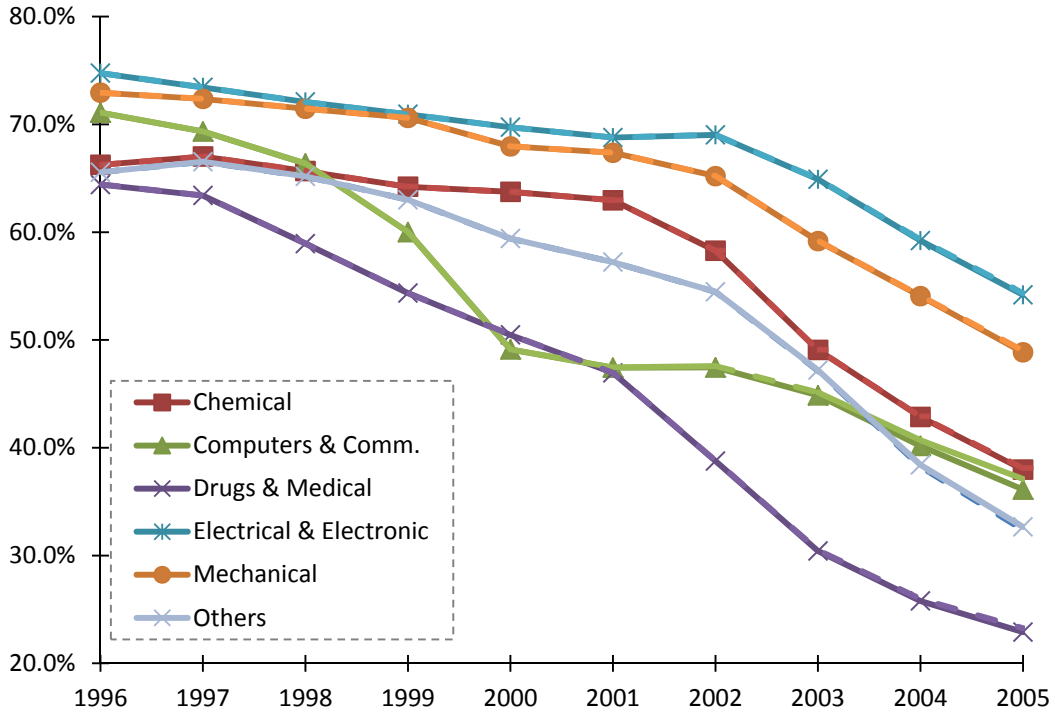
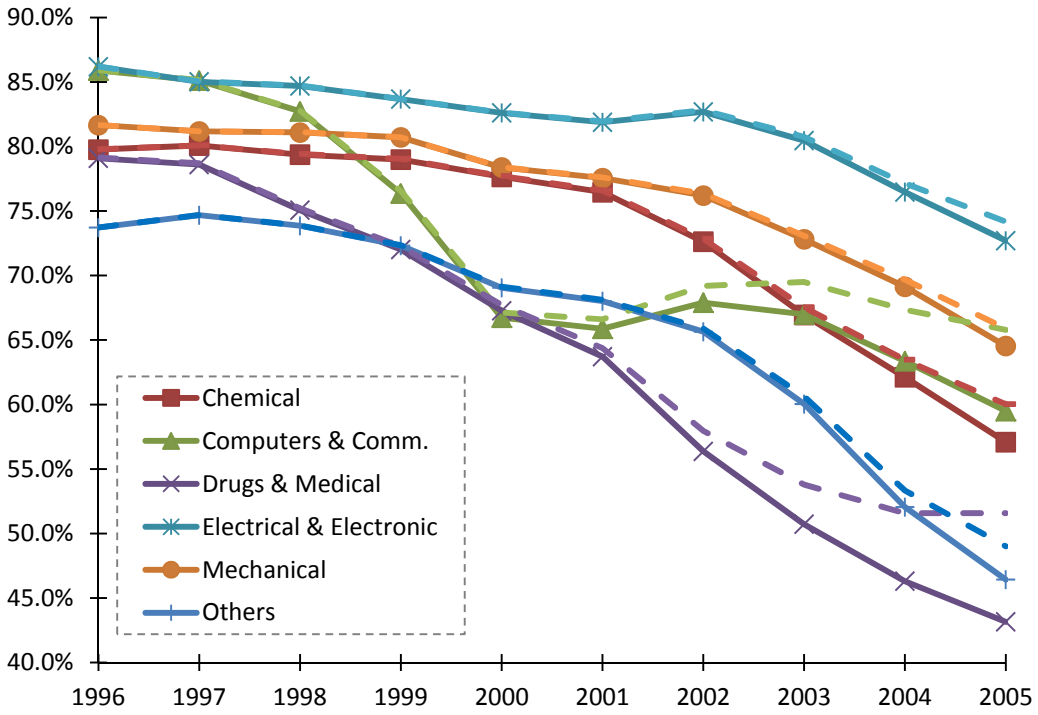



Figure A4: Trends in Family Allowance Rate by Technology Field, 1996-2005