Online Appendix:

Beyond Patent Ownership: Learning About Technological Usefulness*

Jesus Gorrin† Rory Mullen‡

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Abstract

Technology is central to economics, but current technology datasets fail to meet the needs of economists because they lack some combination of desirable characteristics: scale, scope, span, and specificity. We apply natural language processing and positive and unlabeled machine learning to patent descriptions and business descriptions from U.S. public firms over three decades to produce a firm-level technology dataset that offers an unrivaled combination of desirable characteristics. In this appendix, we document our procedures for text preprocessing, vectorization, and similarity measurement; provide detailed summary statistics that characterize firm technology sets across industries, time, and firm types, and provide additional results for the technological momentum and spillover applications in our paper.

JEL: O32, G12, C55, O34, C81
Keywords: technology use, positive-unlabeled learning, textual analysis, knowledge spillovers, technology momentum, non-patenting firms, firm heterogeneity

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†Warwick Business School, University of Warwick, Jesus.Gorrin@wbs.ac.uk
‡Warwick Business School, University of Warwick, Rory.Mullen@wbs.ac.uk

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A Methodological Appendix

A.1 Document Vectorization

In this section, we describe our methodology for measuring the textual similarity between business descriptions and patent descriptions. Specifically, we describe our procedures for vectorizing textual descriptions using traditional and modern techniques and our procedure for computing cosine similarity scores between the vector representations.

Word Frequency Vectorization. We begin by representing textual descriptions as numeric vectors using traditional term frequency (TF) and term frequency-inverse document frequency (TF-IDF) representations of text. These representations characterize texts by the frequency of words that appear within and across texts within collections of documents, called corpora. For our analysis, we study two corpora—namely, the collection of business descriptions that we extract from SEC annual report filings and the collection of patent descriptions provided by the USPTO.

For the traditional representations, we begin by tokenizing, lemmatizing, and removing standard English-language stop words from the descriptions. Tokenization is the process of splitting the text into individual words or tokens. Lemmatization involves reducing words to their base or dictionary form. Stop words, such as 'the', 'is', and 'and', are also removed. We use WordNet's lemmatizer and a standard English stopword list in this step.

Following the initial text preparation, we create a joint vocabulary from the processed business and patent descriptions, including only words that appear more than a minimum frequency and that appear in both corpora. In our baseline model, we set the minimum frequency to one, meaning that all words appearing only once in either corpus are dropped from the vocabulary. This approach reduces noise caused by infrequent terms and ensures the vocabulary used to create the TF and TF-IDF representations consists of words that are relevant to both businesses and patents.

We then transform the text into TF and TF-IDF forms suitable for mathematical analysis. TF measures how frequently a term occurs in a document. TF-IDF, on the

other hand, additionally downscales words that appear frequently across many documents, capturing both the term's frequency within a document and its rarity across documents.

The TF and TF-IDF techniques were created in the mid-20th century, with TF predating TF-IDF. TF, which counts a term's occurrence in a document, stems from the early years of information retrieval. The approach assumes that a term's importance corresponds directly to its frequency. However, TF's drawback lies in its failure to consider a term's relevance in the broader document collection, thus often overemphasizing common, less informative words. To address this, IDF was introduced, measuring the weight of terms appearing frequently across all documents. By the 1970s, the two were combined into TF-IDF, which multiplies term frequencies in a document by inverse document frequencies, as the name suggest. Aizawa (2003) provides a brief history of these developments and a theoretical discussion of TF-IDF.

While TF and TF-IDF have proven effective for various information retrieval and text mining tasks, and still find use in modern text analysis applications in economics and finance, they primarily operate on word frequency without capturing semantic and contextual information, and are therefore outperformed in some tasks by more advanced models capable of better semantic understanding.

For the TF and TF-IDF representations, the vectorized text of each document is stored in a sparse matrix, one for each corpus, where rows correspond to documents and columns correspond to vocabulary words. Each element of the matrix holds the TF or TF-IDF value of the corresponding word for the corresponding document.

We repeat this process for each year in our sample, producing vectorized descriptions stored in annual sparse matrices for each corpus. This process is computationally intensive and the runtime depends on the size of the data and the computational resources available. However, using cloud computing, and splitting the computation across multiple cloud computing machines, the vectorization can be completed in reasonable time. The results provide the groundwork for one part of our subsequent analysis of the relationship between business descriptions and patent ownership.

SBERT Vctorization. In addition to the traditional TF and TF-IDF vectorization techniques, which emphasize word frequencies, we also transform business and patent descriptions into mathematical representations known as embeddings. Embeddings are high-dimensional numerical representations of text that capture various aspects of text meanings and usages. The basic idea behind embeddings is to map discrete, categorical language data into continuous, high-dimensional vector spaces.

Our study uses an approach based on sentence embeddings, specifically the Sentence-BERT (SBERT) model. See Reimers and Gurevych (2019) for a detailed description of the model. SBERT is a modified version of the well-known BERT model that is designed to produce sentence-level embeddings, simplifying the task of identifying semantic similarities between different text documents. SBERT is an example of a transformer model. In transformer models, embeddings typically form the input layer of the model and are typically initialized with pre-trained word embeddings such as Word2Vec or GloVe. These initial embeddings are then further refined and updated during training through the transformer's attention mechanism. This allows the model to learn context-dependent representations, wherein the same word can have different embeddings based on its context, reflecting different potential meanings.

We use SBERT, specifically the MiniLM model (all-MiniLM-L6-v2), to capture semantic meaning in business and patent descriptions. This model can understand sentence-level semantics even when documents use different terminology to describe similar concepts—an important capability given the diverse language used across patent technical descriptions and business disclosures. MiniLM provides an efficient implementation of SBERT that balances computational speed with semantic accuracy.

Transformer models, including SBERT, have dramatically improved the quality of natural language processing, thanks to their ability to capture the complex context and semantics of text. However, they do come with one notable limitation: a maximum token limit, typically set at 512 tokens. This limit is primarily a result of the quadratic time complexity of the self-attention mechanism of transformer models. The self-attention mechanism computes a score for each pair of tokens, leading to a time complexity of $O(n^2)$

for n tokens. In practice, this means that processing longer sequences requires significantly more computational resources, both in terms of time and memory. Given these constraints, these models often set a practical limit of 512 tokens to keep computational requirements manageable.

In our study, we confront the token limitation in SBERT while working with extended business descriptions that typically contain thousands or tens of thousands of words. To manage the token limit while preserving document-level semantic information, we employ a chunking and sampling strategy. We divide each document into overlapping chunks of text, with chunk size dynamically calculated based on the model's token limits and the average token-to-character ratio in our corpus. We set an overlap of 25 characters between consecutive chunks to maintain continuity.

From these chunks, we filter out those that are overly numerical (more than 20% digits) or too short (fewer than 25 characters). We then sample 25% of the chunks for processing: we always include the first chunk to capture introductory content, and randomly sample additional chunks to reach our 25% target. This sampling approach allows us to process documents that exceed token limits while capturing information from throughout the text.

For each selected chunk, we compute embeddings using SBERT and then aggregate these chunk-level embeddings to create document-level representations. We employ two pooling strategies: average pooling across all chunk embeddings and max pooling followed by averaging. Both resulting embeddings are normalized to unit length. This approach ensures consistent representation regardless of document length while preserving semantic information from multiple sections of lengthy documents.

We compute embeddings for all business descriptions and patent descriptions in each year, storing the embeddings in annual matrices with documents in rows and embedding dimensions in columns. While computationally intensive, this process can be efficiently parallelized across CPU cores or GPUs, allowing us to process large corpora in reasonable time using cloud computing resources.

A.2 Cosine Similarity

Having vectorized our document corpora using TF, TF-IDF, and SBERT embeddings, we next compute similarity scores between business and patent descriptions. The cosine similarity between business description b and patent description p, denoted $s(\boldsymbol{v}_b, \boldsymbol{v}_p)$, is a standard measure of similarity commonly used in text analysis and defined as the normalized dot product of two vector representations of documents,

$$s(\boldsymbol{v}_b, \boldsymbol{v}_p) = \frac{\boldsymbol{v}_b \cdot \boldsymbol{v}_p}{\|\boldsymbol{v}_b\| \|\boldsymbol{v}_p\|} \tag{A1}$$

where $\boldsymbol{v}_b$ and $\boldsymbol{v}_p$ denote document vectors for documents b and p and where $\|\cdot\|$ denotes the Euclidean norm. The cosine similarity measures the angle between two vectors and takes higher values when the angle between vectors is smaller. Because cosine similarity is based on vector angles rather than vector lengths, cosine similarity is, in theory, robust to length differences across documents.

We compute cosine similarity scores between every possible pair of business description and patent description in our sample each year, using each of our vectorization methods (TF, TF-IDF, and SBERT embeddings). These cosine similarity scores provide a meaningful and quantifiable measure of the textual relatedness of business and patent descriptions. These scores form the basis for our subsequent investigation into the predictive power of document similarity with respect to patent ownership, and form the basis for our characterization of firm-level technology profiles.

The number of possible pairs between business descriptions and patent descriptions grows based on the product of their counts. If both the number of business descriptions and patent descriptions increase, the total pairs grow geometrically. Given the large number of firms and larger number of patents in our sample each year, the possible pairs number in the billions. The cosine similarity computations are fast and perform well at this scale.

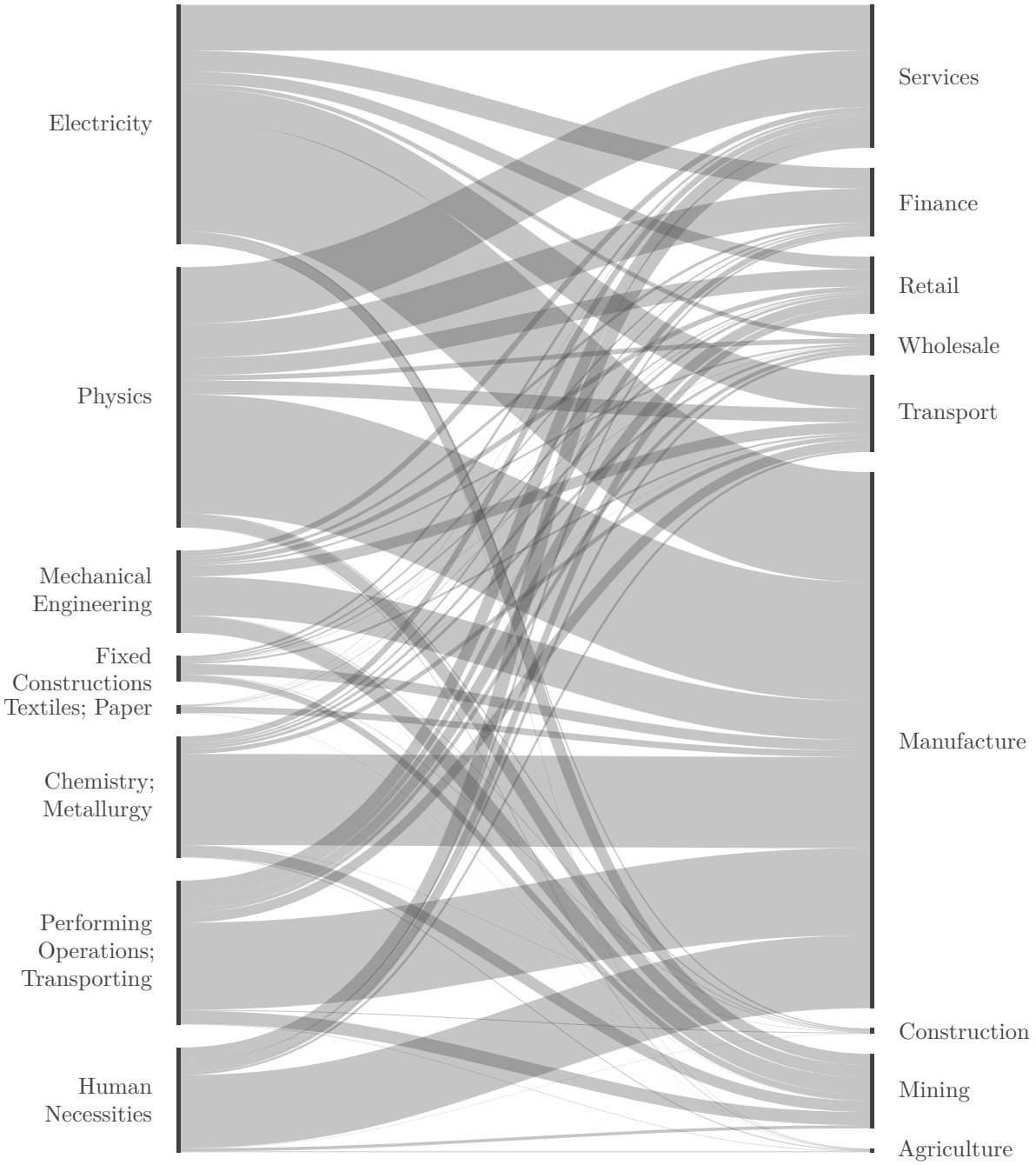
While cosine similarity provides a useful input to our analysis, raw cosine similarity scores should not be used directly to characterize technological associations. First, cosine

similarities depend heavily on the choice of document vectorization method. Different approaches to representing documents as vectors—whether based on term frequencies, TF-IDF weightings, or embeddings—can produce substantially different similarity scores for the same document pair. Second, despite the theoretical invariance of cosine similarity to document length, in practice longer documents tend to receive higher similarity scores due to increased opportunities for vocabulary overlap (Brown and Tucker, 2011). Third, and most fundamentally, cosine similarities measure textual similarity rather than technological usefulness. While greater textual similarity may predict greater technological usefulness, the relationship may be complex and non-linear. This leads to a fourth limitation: cosine similarity scores lack economically meaningful units. That is, a similarity score of 0.8 between two documents does not have an obvious economic or technological meaning, whereas a predicted probability of 0.8 that a patent is useful to a firm provides an interpretable measure that can be used in economic analysis. For these reasons, we use cosine similarities as features in our classifier rather than as direct measures of technological relationships.

B Statistical Appendix

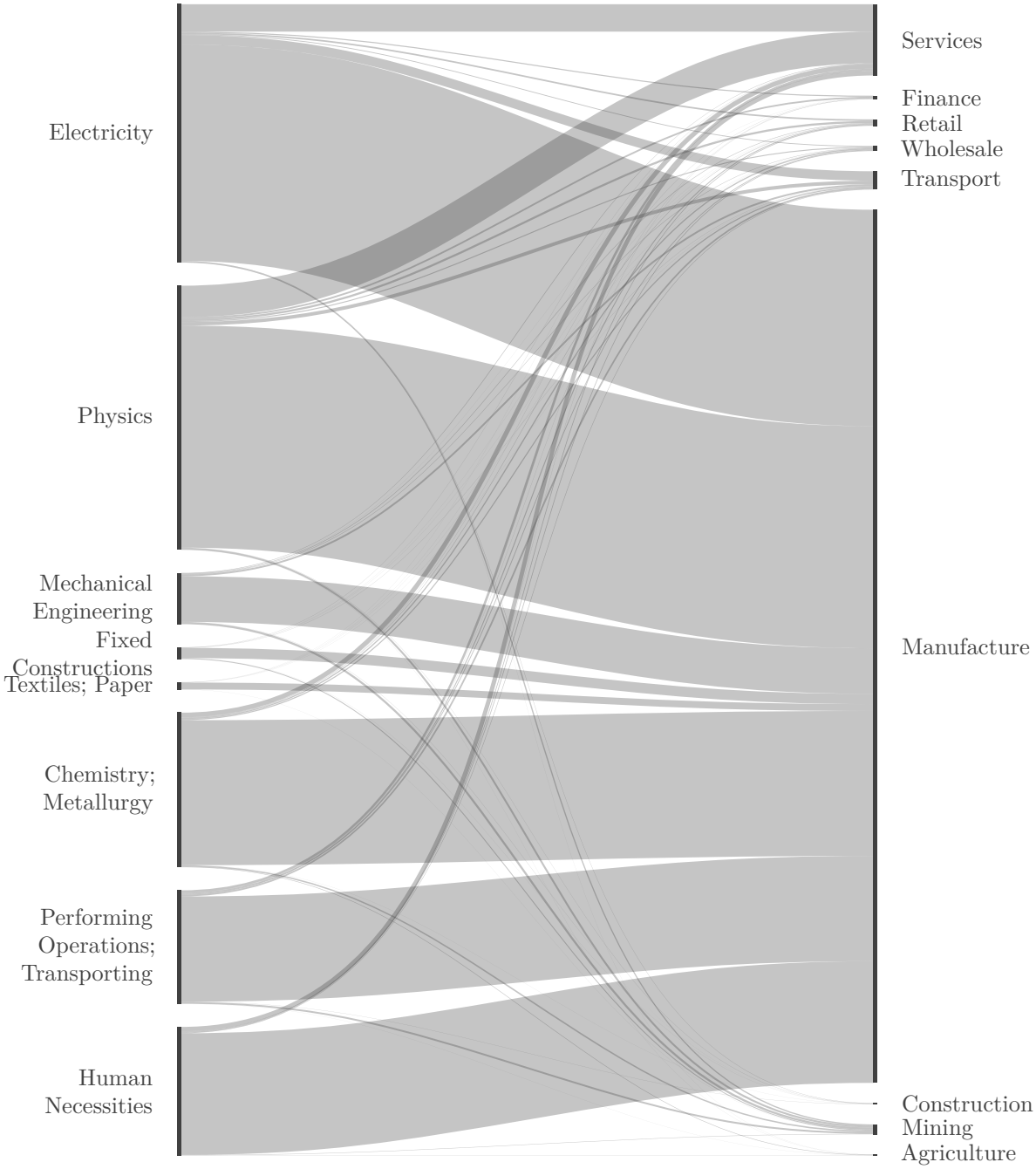
B.1 Sankey Diagrams

Figure B1: CPC-SIC Sankey Diagram: Frequency-Based, Non-Patenting Firms



Notes. The figure shows a Sankey diagram of associations between CPC Sections (left) and SIC Divisions (right). Flows represent frequencies of association, defined as the number of associated firm-patent pairs for a given CPC-SIC combination, aggregated over all sample years. CPC Sections: Human Necessities (A), Performing Operations; Transporting (B), Chemistry; Metallurgy (C), Textiles; Paper (D), Fixed Constructions (E), Mechanical Engineering; Lighting; Heating; Weapons; Blasting (F), Physics (G), and Electricity (H). SIC Divisions: Agriculture, Forestry, and Fishing (0100–0999), Mining (1000–1499), Construction (1500–1799), Manufacturing (2000–3999), Transportation, Communications, Electric, Gas and Sanitary Service (4000–4999), Wholesale Trade (5000–5199), Retail Trade (5200–5999), Finance and Insurance (6000–6799, excl 6500–6599 and 6700–6799), and Services (7000–8999). Some CPC and SIC names have been shortened for the figure.

Figure B2: CPC-SIC Sankey Diagram: Frequency-Based, Patenting Firms



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B.2 Technological Breadth and Depth

Table B1: Count Metrics by Industry: CPC Section, in Counts and Fractions

(a) Count Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Count			Median Count		
	NP	P	Diff	NP	P	Diff
Finance	0.22	0.50	−0.28	0.00	0.00	0.00
	(0.61)	(1.03)	(0.00)	(0.00)	(1.00)	(1.00)
Service	1.34	1.48	−0.14	1.00	2.00	−1.00
	(1.34)	(1.03)	(0.00)	(2.00)	(1.00)	(0.00)
Resource	2.69	2.67	0.02	3.00	3.00	0.00
	(1.59)	(1.54)	(0.66)	(3.00)	(2.00)	(1.00)
Manufacture	4.06	3.57	0.48	4.00	3.00	1.00
	(1.96)	(1.82)	(0.00)	(4.00)	(3.00)	(0.00)

(b) Fraction Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Fraction			Median Fraction		
	NP	P	Diff	NP	P	Diff
Finance	0.03	0.06	−0.03	0.00	0.00	0.00
	(0.08)	(0.13)	(0.00)	(0.00)	(0.12)	(1.00)
Service	0.17	0.18	−0.02	0.12	0.25	−0.12
	(0.17)	(0.13)	(0.00)	(0.25)	(0.12)	(0.00)
Resource	0.34	0.33	0.00	0.38	0.38	0.00
	(0.20)	(0.19)	(0.68)	(0.38)	(0.25)	(1.00)
Manufacture	0.51	0.45	0.06	0.50	0.38	0.12
	(0.24)	(0.23)	(0.00)	(0.50)	(0.38)	(0.00)

Notes. The table summarizes count metrics, reported as counts and fractions by industry group at the CPC Section level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Panels B1a and B1b report count and fraction statistics, respectively. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that values for both firm types are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as $(c+1)/(n+1)$, where c is the count of iterations where the absolute resampled difference exceeds or equals the observed value, and n is the total number of valid bootstrap samples.

Table B2: Count Metrics by Industry: CPC Class, in Counts and Fractions

(a) Count Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Count			Median Count		
	NP	P	Diff	NP	P	Diff
Finance	2.66	3.70	−1.05	2.00	2.00	0.00
	(4.05)	(7.54)	(0.00)	(2.00)	(2.00)	(1.00)
Service	10.27	7.16	3.11	6.00	5.00	1.00
	(12.67)	(8.73)	(0.00)	(9.00)	(5.00)	(0.01)
Resource	28.49	27.89	0.60	28.00	26.00	2.00
	(16.15)	(16.25)	(0.25)	(22.00)	(24.00)	(0.02)
Manufacture	37.86	30.77	7.09	35.00	23.00	12.00
	(23.51)	(21.41)	(0.00)	(40.00)	(31.00)	(0.00)

(b) Fraction Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Fraction			Median Fraction		
	NP	P	Diff	NP	P	Diff
Finance	0.02	0.03	−0.01	0.02	0.02	−0.00
	(0.03)	(0.06)	(0.00)	(0.02)	(0.02)	(0.24)
Service	0.08	0.06	0.03	0.05	0.04	0.01
	(0.10)	(0.07)	(0.00)	(0.08)	(0.04)	(0.00)
Resource	0.24	0.23	0.01	0.23	0.21	0.02
	(0.13)	(0.13)	(0.22)	(0.18)	(0.20)	(0.01)
Manufacture	0.31	0.25	0.06	0.29	0.19	0.10
	(0.19)	(0.18)	(0.00)	(0.33)	(0.25)	(0.00)

Notes. The table summarizes count metrics, reported as counts and fractions by industry group at the CPC Class level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Panels B2a and B2b report count and fraction statistics, respectively. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that values for both firm types are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as $(c+1)/(n+1)$, where c is the count of iterations where the absolute resampled difference exceeds or equals the observed value, and n is the total number of valid bootstrap samples.

Table B3: Count Metrics by Industry: CPC Subclass, in Counts and Fractions

(a) Count Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Count			Median Count		
	NP	P	Diff	NP	P	Diff
Finance	8.99	11.63	−2.64	5.00	5.00	0.00
	(12.65)	(23.37)	(0.00)	(7.00)	(8.00)	(1.00)
Service	32.82	23.46	9.36	21.00	16.00	5.00
	(39.09)	(26.82)	(0.00)	(29.00)	(18.00)	(0.00)
Resource	80.20	79.14	1.05	79.00	74.00	5.00
	(44.57)	(44.57)	(0.45)	(59.00)	(64.00)	(0.01)
Manufacture	114.32	96.15	18.17	102.00	78.00	24.00
	(68.98)	(62.61)	(0.00)	(106.00)	(81.00)	(0.00)

(b) Fraction Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Fraction			Median Fraction		
	NP	P	Diff	NP	P	Diff
Finance	0.02	0.02	−0.00	0.01	0.01	−0.00
	(0.02)	(0.04)	(0.00)	(0.01)	(0.01)	(0.39)
Service	0.06	0.04	0.02	0.04	0.03	0.01
	(0.07)	(0.05)	(0.00)	(0.05)	(0.03)	(0.00)
Resource	0.14	0.14	0.00	0.14	0.13	0.01
	(0.08)	(0.08)	(0.42)	(0.10)	(0.11)	(0.01)
Manufacture	0.20	0.17	0.03	0.18	0.13	0.04
	(0.12)	(0.11)	(0.00)	(0.18)	(0.14)	(0.00)

Notes. The table summarizes count metrics, reported as counts and fractions by industry group at the CPC Subclass level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Panels B3a and B3b report count and fraction statistics, respectively. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that values for both firm types are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as $(c+1)/(n+1)$, where c is the count of iterations where the absolute resampled difference exceeds or equals the observed value, and n is the total number of valid bootstrap samples.

Table B4: Count Metrics by Industry: CPC Group, in Counts and Fractions

(a) Count Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Count			Median Count		
	NP	P	Diff	NP	P	Diff
Finance	27.04	38.70	−11.66	17.00	21.00	−4.00
	(35.04)	(66.44)	(0.00)	(21.00)	(25.00)	(0.00)
Service	98.14	84.36	13.78	71.00	64.00	7.00
	(110.68)	(83.58)	(0.00)	(83.00)	(61.00)	(0.00)
Resource	204.45	212.85	−8.40	197.00	188.50	8.50
	(119.60)	(128.25)	(0.02)	(165.00)	(186.25)	(0.08)
Manufacture	353.45	319.24	34.21	323.00	281.00	42.00
	(200.09)	(183.20)	(0.00)	(288.00)	(235.00)	(0.00)

(b) Fraction Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Fraction			Median Fraction		
	NP	P	Diff	NP	P	Diff
Finance	0.01	0.01	−0.00	0.00	0.01	−0.00
	(0.01)	(0.02)	(0.00)	(0.01)	(0.01)	(0.00)
Service	0.03	0.02	0.00	0.02	0.02	0.00
	(0.03)	(0.02)	(0.00)	(0.02)	(0.02)	(0.00)
Resource	0.05	0.05	−0.00	0.05	0.05	0.00
	(0.03)	(0.03)	(0.04)	(0.04)	(0.05)	(0.43)
Manufacture	0.09	0.08	0.01	0.08	0.07	0.01
	(0.05)	(0.04)	(0.00)	(0.07)	(0.06)	(0.00)

Notes. The table summarizes count metrics, reported as counts and fractions by industry group at the CPC Group level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Panels B4a and B4b report count and fraction statistics, respectively. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that values for both firm types are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as $(c+1)/(n+1)$, where c is the count of iterations where the absolute resampled difference exceeds or equals the observed value, and n is the total number of valid bootstrap samples.

Table B5: Count Metrics by Industry: CPC Patent, in Counts and Fractions

(a) Count Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Count			Median Count		
	NP	P	Diff	NP	P	Diff
Finance	845.85	1114.37	−268.53	725.00	851.00	−126.00
	(522.19)	(913.81)	(0.00)	(493.00)	(677.00)	(0.00)
Service	1902.85	2229.30	−326.45	1615.00	2028.00	−413.00
	(1488.97)	(1364.19)	(0.00)	(1422.00)	(1669.00)	(0.00)
Resource	2452.30	2577.32	−125.02	2349.00	2414.50	−65.50
	(1257.68)	(1312.03)	(0.00)	(1580.00)	(1721.75)	(0.21)
Manufacture	4888.13	5342.60	−454.47	5050.00	5497.50	−447.50
	(2122.68)	(2111.09)	(0.00)	(2927.00)	(2774.00)	(0.00)

(b) Fraction Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Fraction			Median Fraction		
	NP	P	Diff	NP	P	Diff
Finance	0.02	0.02	−0.01	0.01	0.02	−0.00
	(0.01)	(0.02)	(0.00)	(0.01)	(0.01)	(0.00)
Service	0.04	0.05	−0.01	0.03	0.04	−0.01
	(0.03)	(0.03)	(0.00)	(0.03)	(0.03)	(0.00)
Resource	0.05	0.05	−0.00	0.05	0.05	−0.00
	(0.03)	(0.03)	(0.00)	(0.03)	(0.03)	(0.46)
Manufacture	0.10	0.11	−0.01	0.10	0.11	−0.01
	(0.04)	(0.04)	(0.00)	(0.06)	(0.05)	(0.00)

Notes. The table summarizes count metrics, reported as counts and fractions by industry group at the CPC Patent level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Panels B5a and B5b report count and fraction statistics, respectively. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that values for both firm types are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as $(c+1)/(n+1)$, where c is the count of iterations where the absolute resampled difference exceeds or equals the observed value, and n is the total number of valid bootstrap samples.

Table B6: Count Metrics by Industry and Size: CPC Section, in Counts

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	0.24	0.35	−0.12	0.00	0.00	0.00
		(0.67)	(0.94)	(0.02)	(0.00)	(0.00)	(1.00)
	Mid	0.22	0.39	−0.17	0.00	0.00	0.00
		(0.58)	(0.59)	(0.03)	(0.00)	(1.00)	(1.00)
	Small	0.18	0.59	−0.40	0.00	0.00	0.00
		(0.52)	(0.90)	(0.00)	(0.00)	(1.00)	(1.00)
	Private	0.27	1.00	−0.73	0.00	0.00	0.00
		(0.71)	(1.53)	(0.00)	(0.00)	(2.00)	(1.00)
Service	Large	1.30	1.45	−0.15	1.00	2.00	−1.00
		(1.34)	(1.04)	(0.00)	(2.00)	(1.00)	(0.00)
	Mid	1.28	1.34	−0.06	1.00	1.00	0.00
		(1.29)	(0.91)	(0.18)	(2.00)	(1.00)	(1.00)
	Small	1.28	1.54	−0.25	1.00	2.00	−1.00
		(1.29)	(1.01)	(0.00)	(2.00)	(1.00)	(0.00)
	Private	1.41	1.51	−0.09	1.00	1.00	0.00
		(1.40)	(1.16)	(0.04)	(2.00)	(1.00)	(1.00)
Resource	Large	2.80	2.70	0.11	3.00	3.00	0.00
		(1.47)	(1.44)	(0.37)	(2.00)	(2.00)	(1.00)
	Mid	2.41	2.71	−0.30	2.00	3.00	−1.00
		(1.51)	(1.40)	(0.01)	(3.00)	(1.00)	(0.44)
	Small	2.72	2.84	−0.13	3.00	3.00	0.00
		(1.62)	(1.64)	(0.17)	(3.00)	(2.00)	(1.00)
	Private	2.71	2.38	0.33	3.00	2.00	1.00
		(1.59)	(1.53)	(0.00)	(2.00)	(2.00)	(0.19)
Manufacture	Large	4.14	3.54	0.60	4.00	3.00	1.00
		(2.01)	(1.85)	(0.00)	(3.00)	(3.00)	(0.06)
	Mid	4.33	3.64	0.69	4.00	3.00	1.00
		(1.94)	(1.91)	(0.00)	(3.00)	(3.00)	(0.00)
	Small	3.99	3.45	0.54	4.00	3.00	1.00
		(1.94)	(1.76)	(0.00)	(3.00)	(3.00)	(0.17)
	Private	4.07	3.99	0.08	4.00	4.00	0.00
		(1.97)	(1.85)	(0.04)	(4.00)	(3.00)	(1.00)

Notes. The table summarizes count metrics, reported as counts by industry group and size class at the CPC Section level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

Table B7: Count Metrics by Industry and Size: CPC Class, in Counts

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	2.70	3.26	−0.56	2.00	2.00	0.00
		(5.07)	(8.33)	(0.15)	(2.00)	(2.00)	(1.00)
	Mid	2.27	2.46	−0.20	2.00	2.00	0.00
		(3.65)	(2.96)	(0.63)	(2.00)	(2.00)	(1.00)
	Small	2.39	3.04	−0.65	2.00	2.00	0.00
		(3.16)	(3.96)	(0.05)	(2.00)	(2.00)	(1.00)
	Private	3.11	7.23	−4.12	2.00	2.50	−0.50
		(4.85)	(9.74)	(0.00)	(2.00)	(10.00)	(0.30)
Service	Large	9.85	6.73	3.12	6.00	4.00	2.00
		(12.62)	(9.45)	(0.00)	(9.00)	(4.00)	(0.00)
	Mid	9.76	5.44	4.32	6.00	4.00	2.00
		(11.93)	(6.56)	(0.00)	(9.00)	(4.00)	(0.00)
	Small	9.65	7.36	2.29	5.00	5.00	0.00
		(12.08)	(8.41)	(0.00)	(9.00)	(5.00)	(1.00)
	Private	11.04	8.98	2.06	6.00	5.00	1.00
		(13.38)	(10.34)	(0.00)	(11.00)	(7.00)	(0.25)
Resource	Large	30.44	29.06	1.39	31.00	27.00	4.00
		(13.91)	(16.16)	(0.21)	(18.00)	(24.00)	(0.02)
	Mid	26.32	28.64	−2.32	26.00	28.00	−2.00
		(16.02)	(16.12)	(0.06)	(24.00)	(24.00)	(0.31)
	Small	28.38	28.14	0.25	29.00	26.00	3.00
		(16.53)	(17.54)	(0.80)	(24.00)	(29.00)	(0.05)
	Private	28.73	26.23	2.50	28.00	26.00	2.00
		(16.15)	(14.52)	(0.01)	(22.00)	(18.00)	(0.27)
Manufacture	Large	40.18	32.01	8.17	41.00	25.00	16.00
		(22.53)	(21.81)	(0.00)	(38.00)	(34.25)	(0.00)
	Mid	42.76	32.68	10.08	43.00	25.00	18.00
		(23.08)	(22.72)	(0.00)	(38.00)	(36.00)	(0.00)
	Small	37.13	28.74	8.39	33.00	22.00	11.00
		(23.81)	(20.22)	(0.00)	(41.00)	(25.00)	(0.00)
	Private	37.35	34.49	2.86	34.00	27.00	7.00
		(23.21)	(22.62)	(0.00)	(39.00)	(36.00)	(0.00)

Notes. The table summarizes count metrics, reported as counts by industry group and size class at the CPC Class level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

Table B8: Count Metrics by Industry and Size: CPC Subclass, in Counts

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	9.08	10.18	−1.10	5.00	5.00	0.00
		(15.63)	(26.19)	(0.35)	(8.00)	(6.50)	(1.00)
	Mid	7.81	7.07	0.74	5.00	4.50	0.50
		(11.63)	(7.76)	(0.59)	(6.00)	(6.00)	(0.58)
	Small	7.94	10.85	−2.91	5.00	5.00	0.00
		(10.10)	(15.75)	(0.02)	(6.00)	(8.75)	(1.00)
	Private	10.64	21.78	−11.14	6.00	8.00	−2.00
		(14.93)	(27.34)	(0.00)	(9.00)	(30.50)	(0.07)
Service	Large	32.93	22.47	10.46	23.00	15.00	8.00
		(41.38)	(30.80)	(0.00)	(26.00)	(16.25)	(0.00)
	Mid	31.93	18.15	13.78	20.00	13.00	7.00
		(38.41)	(20.94)	(0.00)	(28.25)	(14.00)	(0.00)
	Small	30.99	23.91	7.08	19.00	17.00	2.00
		(38.29)	(25.54)	(0.00)	(27.00)	(18.00)	(0.00)
	Private	34.81	29.13	5.68	23.00	20.00	3.00
		(39.69)	(30.05)	(0.00)	(32.00)	(25.00)	(0.01)
Resource	Large	87.48	82.18	5.30	89.00	76.00	13.00
		(38.94)	(45.45)	(0.10)	(50.00)	(62.00)	(0.00)
	Mid	75.49	79.90	−4.40	74.00	77.00	−3.00
		(44.63)	(45.36)	(0.21)	(63.00)	(66.00)	(0.54)
	Small	78.20	78.75	−0.56	78.00	73.00	5.00
		(45.17)	(46.47)	(0.83)	(64.00)	(72.00)	(0.19)
	Private	81.19	77.04	4.15	79.00	73.00	6.00
		(44.62)	(40.82)	(0.12)	(59.00)	(52.00)	(0.10)
Manufacture	Large	118.17	98.68	19.50	116.00	81.00	35.00
		(65.48)	(64.29)	(0.00)	(99.00)	(97.00)	(0.00)
	Mid	126.42	101.33	25.10	122.00	81.00	41.00
		(68.47)	(66.92)	(0.00)	(105.75)	(95.00)	(0.00)
	Small	113.46	90.80	22.66	99.00	74.00	25.00
		(70.22)	(59.45)	(0.00)	(110.00)	(68.00)	(0.00)
	Private	112.15	106.49	5.66	100.00	86.00	14.00
		(67.67)	(64.41)	(0.00)	(103.00)	(91.00)	(0.00)

Notes. The table summarizes count metrics, reported as counts by industry group and size class at the CPC Subclass level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

Table B9: Count Metrics by Industry and Size: CPC Group, in Counts

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	28.65	32.53	−3.88	19.00	20.00	−1.00
		(43.11)	(71.42)	(0.24)	(26.00)	(20.00)	(0.71)
	Mid	24.06	29.59	−5.53	16.00	21.00	−5.00
		(32.13)	(34.20)	(0.14)	(20.00)	(24.25)	(0.03)
	Small	23.69	40.26	−16.57	16.00	20.00	−4.00
		(28.35)	(55.80)	(0.00)	(17.00)	(28.00)	(0.02)
	Private	31.87	66.53	−34.67	18.00	31.50	−13.50
		(41.01)	(75.25)	(0.00)	(26.00)	(94.00)	(0.00)
Service	Large	100.12	78.11	22.01	71.50	58.50	13.00
		(124.46)	(95.02)	(0.00)	(78.00)	(51.00)	(0.00)
	Mid	95.73	66.48	29.25	68.00	53.00	15.00
		(111.60)	(66.06)	(0.00)	(79.00)	(47.00)	(0.00)
	Small	93.93	88.39	5.54	66.00	69.00	−3.00
		(110.70)	(81.24)	(0.02)	(75.00)	(62.00)	(0.09)
	Private	102.62	100.01	2.61	76.00	78.00	−2.00
		(108.70)	(90.17)	(0.45)	(91.00)	(77.50)	(0.57)
Resource	Large	224.97	210.72	14.25	226.00	189.00	37.00
		(108.36)	(126.36)	(0.11)	(151.00)	(181.50)	(0.00)
	Mid	193.36	211.12	−17.76	181.00	196.50	−15.50
		(121.27)	(124.84)	(0.05)	(171.00)	(196.75)	(0.24)
	Small	200.11	223.18	−23.06	195.00	195.00	0.00
		(121.62)	(140.21)	(0.00)	(175.00)	(216.00)	(1.00)
	Private	206.41	201.96	4.45	197.00	182.50	14.50
		(119.10)	(114.34)	(0.53)	(161.00)	(145.75)	(0.13)
Manufacture	Large	363.42	320.57	42.85	364.00	284.50	79.50
		(198.46)	(191.98)	(0.00)	(307.00)	(278.25)	(0.00)
	Mid	382.24	330.74	51.50	366.00	289.00	77.00
		(202.80)	(198.70)	(0.00)	(295.00)	(273.00)	(0.00)
	Small	356.50	304.08	52.43	324.00	269.00	55.00
		(202.85)	(172.65)	(0.00)	(296.00)	(204.00)	(0.00)
	Private	342.64	358.21	−15.57	313.00	317.00	−4.00
		(195.66)	(184.11)	(0.00)	(275.00)	(246.00)	(0.43)

Notes. The table summarizes count metrics, reported as counts by industry group and size class at the CPC Group level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

Table B10: Count Metrics by Industry and Size: CPC Patent, in Counts

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	885.47	986.96	−101.49	771.00	842.50	−71.50
		(584.69)	(769.41)	(0.02)	(594.00)	(552.50)	(0.05)
	Mid	812.42	1104.97	−292.55	704.00	876.50	−172.50
		(500.51)	(775.96)	(0.00)	(503.00)	(1000.25)	(0.01)
	Small	796.16	1239.93	−443.77	697.00	879.00	−182.00
		(457.35)	(1032.54)	(0.00)	(442.00)	(909.00)	(0.00)
	Private	912.91	1416.53	−503.62	763.00	832.50	−69.50
		(584.23)	(1218.82)	(0.00)	(551.25)	(1202.75)	(0.24)
Service	Large	1931.83	2121.27	−189.44	1593.00	1910.50	−317.50
		(1688.86)	(1539.23)	(0.00)	(1384.25)	(1601.50)	(0.00)
	Mid	1793.12	1992.75	−199.64	1517.00	1853.00	−336.00
		(1476.25)	(1215.96)	(0.00)	(1255.00)	(1589.25)	(0.00)
	Small	1821.14	2312.02	−490.88	1550.00	2112.00	−562.00
		(1460.78)	(1332.06)	(0.00)	(1297.00)	(1673.75)	(0.00)
	Private	2010.15	2400.20	−390.04	1724.00	2198.00	−474.00
		(1489.94)	(1366.85)	(0.00)	(1604.00)	(1845.00)	(0.00)
Resource	Large	2537.09	2474.19	62.90	2581.50	2282.00	299.50
		(1125.00)	(1233.00)	(0.49)	(1527.25)	(1698.25)	(0.03)
	Mid	2219.40	2470.21	−250.81	2127.50	2431.00	−303.50
		(1190.28)	(1198.42)	(0.01)	(1550.50)	(1554.25)	(0.01)
	Small	2300.86	2705.93	−405.07	2230.00	2479.00	−249.00
		(1245.55)	(1492.05)	(0.00)	(1655.50)	(1976.50)	(0.00)
	Private	2543.56	2554.20	−10.64	2413.50	2355.00	58.50
		(1272.10)	(1172.25)	(0.89)	(1570.00)	(1517.00)	(0.56)
Manufacture	Large	4588.20	5041.97	−453.77	4777.00	5205.00	−428.00
		(2315.14)	(2194.99)	(0.00)	(3286.50)	(2935.00)	(0.00)
	Mid	4746.07	5338.81	−592.74	4866.00	5567.00	−701.00
		(2185.16)	(2232.43)	(0.00)	(3034.00)	(3035.75)	(0.00)
	Small	4913.42	5309.39	−395.97	5103.50	5447.00	−343.50
		(2164.54)	(2112.04)	(0.00)	(2993.00)	(2803.50)	(0.00)
	Private	4916.14	5761.54	−845.40	5060.00	5799.00	−739.00
		(2040.19)	(1767.13)	(0.00)	(2814.00)	(2298.00)	(0.00)

Notes. The table summarizes count metrics, reported as counts by industry group and size class at the CPC Patent level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

Table B11: Count Metrics by Industry and Size: CPC Section, in Fractions

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	0.03	0.04	−0.01	0.00	0.00	0.00
		(0.08)	(0.12)	(0.02)	(0.00)	(0.00)	(1.00)
	Mid	0.03	0.05	−0.02	0.00	0.00	0.00
		(0.07)	(0.07)	(0.02)	(0.00)	(0.12)	(1.00)
	Small	0.02	0.07	−0.05	0.00	0.00	0.00
		(0.07)	(0.11)	(0.00)	(0.00)	(0.12)	(1.00)
	Private	0.03	0.12	−0.09	0.00	0.00	0.00
		(0.09)	(0.19)	(0.00)	(0.00)	(0.25)	(1.00)
Service	Large	0.16	0.18	−0.02	0.12	0.25	−0.12
		(0.17)	(0.13)	(0.00)	(0.25)	(0.12)	(0.00)
	Mid	0.16	0.17	−0.01	0.12	0.12	0.00
		(0.16)	(0.11)	(0.14)	(0.25)	(0.12)	(1.00)
	Small	0.16	0.19	−0.03	0.12	0.25	−0.12
		(0.16)	(0.13)	(0.00)	(0.25)	(0.12)	(0.00)
	Private	0.18	0.19	−0.01	0.12	0.12	0.00
		(0.18)	(0.14)	(0.04)	(0.25)	(0.12)	(1.00)
Resource	Large	0.35	0.34	0.01	0.38	0.38	0.00
		(0.18)	(0.18)	(0.35)	(0.25)	(0.25)	(1.00)
	Mid	0.30	0.34	−0.04	0.25	0.38	−0.12
		(0.19)	(0.18)	(0.01)	(0.38)	(0.12)	(0.48)
	Small	0.34	0.36	−0.02	0.38	0.38	0.00
		(0.20)	(0.20)	(0.15)	(0.38)	(0.25)	(1.00)
	Private	0.34	0.30	0.04	0.38	0.25	0.12
		(0.20)	(0.19)	(0.00)	(0.25)	(0.25)	(0.18)
Manufacture	Large	0.52	0.44	0.07	0.50	0.38	0.12
		(0.25)	(0.23)	(0.00)	(0.38)	(0.38)	(0.07)
	Mid	0.54	0.45	0.09	0.50	0.38	0.12
		(0.24)	(0.24)	(0.00)	(0.38)	(0.38)	(0.00)
	Small	0.50	0.43	0.07	0.50	0.38	0.12
		(0.24)	(0.22)	(0.00)	(0.38)	(0.38)	(0.17)
	Private	0.51	0.50	0.01	0.50	0.50	0.00
		(0.25)	(0.23)	(0.04)	(0.50)	(0.38)	(1.00)

Notes. The table summarizes count metrics, reported as fractions by industry group and size class at the CPC Section level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

Table B12: Count Metrics by Industry and Size: CPC Class, in Fractions

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	0.02	0.03	−0.00	0.02	0.02	−0.00
		(0.04)	(0.07)	(0.14)	(0.02)	(0.02)	(0.47)
	Mid	0.02	0.02	−0.00	0.02	0.02	−0.00
		(0.03)	(0.02)	(0.64)	(0.02)	(0.02)	(0.61)
	Small	0.02	0.03	−0.01	0.02	0.02	−0.00
		(0.03)	(0.03)	(0.05)	(0.02)	(0.02)	(0.55)
	Private	0.03	0.06	−0.03	0.02	0.02	−0.00
		(0.04)	(0.08)	(0.00)	(0.02)	(0.08)	(0.20)
Service	Large	0.08	0.06	0.03	0.05	0.03	0.02
		(0.10)	(0.08)	(0.00)	(0.07)	(0.03)	(0.00)
	Mid	0.08	0.04	0.04	0.05	0.03	0.02
		(0.10)	(0.05)	(0.00)	(0.07)	(0.03)	(0.00)
	Small	0.08	0.06	0.02	0.04	0.04	0.00
		(0.10)	(0.07)	(0.00)	(0.07)	(0.04)	(0.23)
	Private	0.09	0.07	0.02	0.05	0.04	0.01
		(0.11)	(0.09)	(0.00)	(0.09)	(0.06)	(0.00)
Resource	Large	0.25	0.24	0.01	0.26	0.22	0.03
		(0.11)	(0.13)	(0.23)	(0.15)	(0.20)	(0.01)
	Mid	0.22	0.24	−0.02	0.21	0.23	−0.02
		(0.13)	(0.13)	(0.07)	(0.20)	(0.20)	(0.14)
	Small	0.23	0.23	0.00	0.24	0.21	0.02
		(0.14)	(0.14)	(0.78)	(0.20)	(0.24)	(0.02)
	Private	0.24	0.22	0.02	0.23	0.21	0.02
		(0.13)	(0.12)	(0.01)	(0.18)	(0.15)	(0.10)
Manufacture	Large	0.33	0.26	0.07	0.34	0.21	0.14
		(0.19)	(0.18)	(0.00)	(0.31)	(0.28)	(0.00)
	Mid	0.35	0.27	0.08	0.36	0.20	0.15
		(0.19)	(0.19)	(0.00)	(0.31)	(0.30)	(0.00)
	Small	0.31	0.24	0.07	0.27	0.18	0.09
		(0.20)	(0.17)	(0.00)	(0.34)	(0.21)	(0.00)
	Private	0.31	0.28	0.02	0.28	0.22	0.06
		(0.19)	(0.19)	(0.00)	(0.32)	(0.30)	(0.00)

Notes. The table summarizes count metrics, reported as fractions by industry group and size class at the CPC Class level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

Table B13: Count Metrics by Industry and Size: CPC Subclass, in Fractions

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	0.02	0.02	−0.00	0.01	0.01	0.00
		(0.03)	(0.05)	(0.29)	(0.01)	(0.01)	(0.66)
	Mid	0.01	0.01	0.00	0.01	0.01	0.00
		(0.02)	(0.01)	(0.57)	(0.01)	(0.01)	(0.56)
	Small	0.01	0.02	−0.01	0.01	0.01	−0.00
		(0.02)	(0.03)	(0.02)	(0.01)	(0.02)	(0.84)
	Private	0.02	0.04	−0.02	0.01	0.01	−0.00
		(0.03)	(0.05)	(0.00)	(0.01)	(0.05)	(0.01)
Service	Large	0.06	0.04	0.02	0.04	0.03	0.01
		(0.07)	(0.05)	(0.00)	(0.04)	(0.03)	(0.00)
	Mid	0.06	0.03	0.02	0.04	0.02	0.01
		(0.07)	(0.04)	(0.00)	(0.05)	(0.02)	(0.00)
	Small	0.05	0.04	0.01	0.03	0.03	0.00
		(0.07)	(0.04)	(0.00)	(0.05)	(0.03)	(0.00)
	Private	0.06	0.05	0.01	0.04	0.03	0.01
		(0.07)	(0.05)	(0.00)	(0.05)	(0.04)	(0.00)
Resource	Large	0.15	0.14	0.01	0.15	0.13	0.02
		(0.07)	(0.08)	(0.12)	(0.09)	(0.11)	(0.00)
	Mid	0.13	0.14	−0.01	0.13	0.13	−0.00
		(0.08)	(0.08)	(0.23)	(0.11)	(0.11)	(0.80)
	Small	0.14	0.14	−0.00	0.14	0.13	0.01
		(0.08)	(0.08)	(0.72)	(0.11)	(0.12)	(0.15)
	Private	0.14	0.13	0.01	0.14	0.13	0.01
		(0.08)	(0.07)	(0.09)	(0.10)	(0.09)	(0.07)
Manufacture	Large	0.20	0.17	0.03	0.20	0.14	0.06
		(0.11)	(0.11)	(0.00)	(0.17)	(0.17)	(0.00)
	Mid	0.22	0.17	0.04	0.21	0.14	0.07
		(0.12)	(0.11)	(0.00)	(0.18)	(0.16)	(0.00)
	Small	0.19	0.16	0.04	0.17	0.13	0.04
		(0.12)	(0.10)	(0.00)	(0.19)	(0.12)	(0.00)
	Private	0.19	0.18	0.01	0.17	0.15	0.02
		(0.12)	(0.11)	(0.00)	(0.18)	(0.15)	(0.00)

Notes. The table summarizes count metrics, reported as fractions by industry group and size class at the CPC Subclass level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

Table B14: Count Metrics by Industry and Size: CPC Group, in Fractions

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	0.01	0.01	−0.00	0.00	0.01	−0.00
		(0.01)	(0.02)	(0.09)	(0.01)	(0.01)	(0.19)
	Mid	0.01	0.01	−0.00	0.00	0.01	−0.00
		(0.01)	(0.01)	(0.17)	(0.01)	(0.01)	(0.02)
	Small	0.01	0.01	−0.00	0.00	0.01	−0.00
		(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.00)
	Private	0.01	0.02	−0.01	0.00	0.01	−0.00
		(0.01)	(0.02)	(0.00)	(0.01)	(0.02)	(0.00)
Service	Large	0.03	0.02	0.01	0.02	0.02	0.00
		(0.03)	(0.03)	(0.00)	(0.02)	(0.01)	(0.00)
	Mid	0.02	0.02	0.01	0.02	0.01	0.00
		(0.03)	(0.02)	(0.00)	(0.02)	(0.01)	(0.00)
	Small	0.02	0.02	0.00	0.02	0.02	−0.00
		(0.03)	(0.02)	(0.05)	(0.02)	(0.02)	(0.02)
	Private	0.03	0.03	0.00	0.02	0.02	−0.00
		(0.03)	(0.02)	(0.27)	(0.02)	(0.02)	(0.54)
Resource	Large	0.06	0.05	0.00	0.06	0.05	0.01
		(0.03)	(0.03)	(0.22)	(0.04)	(0.05)	(0.00)
	Mid	0.05	0.05	−0.00	0.05	0.05	−0.00
		(0.03)	(0.03)	(0.08)	(0.04)	(0.05)	(0.40)
	Small	0.05	0.06	−0.01	0.05	0.05	−0.00
		(0.03)	(0.04)	(0.00)	(0.04)	(0.06)	(0.52)
	Private	0.05	0.05	0.00	0.05	0.05	0.00
		(0.03)	(0.03)	(0.23)	(0.04)	(0.04)	(0.14)
Manufacture	Large	0.09	0.08	0.01	0.09	0.07	0.02
		(0.05)	(0.05)	(0.00)	(0.07)	(0.07)	(0.00)
	Mid	0.10	0.08	0.01	0.09	0.07	0.02
		(0.05)	(0.05)	(0.00)	(0.07)	(0.07)	(0.00)
	Small	0.09	0.08	0.01	0.08	0.07	0.01
		(0.05)	(0.04)	(0.00)	(0.07)	(0.05)	(0.00)
	Private	0.09	0.09	−0.00	0.08	0.08	0.00
		(0.05)	(0.04)	(0.00)	(0.07)	(0.06)	(0.47)

Notes. The table summarizes count metrics, reported as fractions by industry group and size class at the CPC Group level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

Table B15: Count Metrics by Industry and Size: CPC Patent, in Fractions

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	0.02	0.02	−0.00	0.02	0.02	−0.00
		(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)
	Mid	0.02	0.02	−0.01	0.01	0.02	−0.00
		(0.01)	(0.02)	(0.00)	(0.01)	(0.02)	(0.01)
	Small	0.02	0.03	−0.01	0.01	0.02	−0.00
		(0.01)	(0.02)	(0.00)	(0.01)	(0.02)	(0.00)
	Private	0.02	0.03	−0.01	0.02	0.02	−0.00
		(0.01)	(0.02)	(0.00)	(0.01)	(0.02)	(0.11)
Service	Large	0.04	0.04	−0.00	0.03	0.04	−0.01
		(0.03)	(0.03)	(0.00)	(0.03)	(0.03)	(0.00)
	Mid	0.04	0.04	−0.00	0.03	0.04	−0.01
		(0.03)	(0.02)	(0.00)	(0.02)	(0.03)	(0.00)
	Small	0.04	0.05	−0.01	0.03	0.04	−0.01
		(0.03)	(0.03)	(0.00)	(0.03)	(0.03)	(0.00)
	Private	0.04	0.05	−0.01	0.04	0.04	−0.01
		(0.03)	(0.03)	(0.00)	(0.03)	(0.04)	(0.00)
Resource	Large	0.05	0.05	0.00	0.05	0.05	0.01
		(0.02)	(0.02)	(0.31)	(0.03)	(0.03)	(0.01)
	Mid	0.05	0.05	−0.00	0.04	0.05	−0.01
		(0.02)	(0.02)	(0.01)	(0.03)	(0.03)	(0.02)
	Small	0.05	0.05	−0.01	0.05	0.05	−0.00
		(0.03)	(0.03)	(0.00)	(0.03)	(0.04)	(0.01)
	Private	0.05	0.05	−0.00	0.05	0.05	0.00
		(0.03)	(0.03)	(0.74)	(0.03)	(0.03)	(0.58)
Manufacture	Large	0.09	0.10	−0.01	0.10	0.10	−0.01
		(0.04)	(0.04)	(0.00)	(0.06)	(0.06)	(0.00)
	Mid	0.10	0.11	−0.01	0.10	0.11	−0.01
		(0.04)	(0.04)	(0.00)	(0.06)	(0.06)	(0.00)
	Small	0.10	0.11	−0.01	0.10	0.11	−0.01
		(0.04)	(0.04)	(0.00)	(0.06)	(0.05)	(0.00)
	Private	0.10	0.12	−0.02	0.10	0.12	−0.01
		(0.04)	(0.03)	(0.00)	(0.06)	(0.05)	(0.00)

Notes. The table summarizes count metrics, reported as fractions by industry group and size class at the CPC Patent level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

B.3 Technological Instability

Table B16: Churn Metrics by Industry: CPC Section, in Add Rates and Drop Rates

(a) Add Rate Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Add Rate			Median Add Rate		
	NP	P	Diff	NP	P	Diff
Finance	12.38	16.36	−3.98	0.00	0.00	0.00
	(33.02)	(37.59)	(0.02)	(0.00)	(0.00)	(1.00)
Service	29.52	20.63	8.89	0.00	0.00	0.00
	(45.04)	(38.73)	(0.00)	(66.67)	(0.00)	(1.00)
Resource	25.29	21.87	3.42	0.00	0.00	0.00
	(40.03)	(37.61)	(0.01)	(40.00)	(40.00)	(1.00)
Manufacture	14.04	9.23	4.81	0.00	0.00	0.00
	(28.54)	(20.53)	(0.00)	(18.18)	(0.00)	(1.00)

(b) Drop Rate Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Drop Rate			Median Drop Rate		
	NP	P	Diff	NP	P	Diff
Finance	11.63	15.75	−4.13	0.00	0.00	0.00
	(32.09)	(36.26)	(0.01)	(0.00)	(0.00)	(1.00)
Service	28.97	21.28	7.69	0.00	0.00	0.00
	(44.75)	(39.71)	(0.00)	(66.67)	(0.00)	(1.00)
Resource	21.31	21.16	0.15	0.00	0.00	0.00
	(37.23)	(36.48)	(0.90)	(28.57)	(40.00)	(1.00)
Manufacture	13.29	10.30	2.99	0.00	0.00	0.00
	(26.44)	(22.39)	(0.00)	(18.18)	(13.33)	(1.00)

Notes. The table summarizes churn metrics, reported as add rates and drop rates by industry group at the CPC Section level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Panels B16a and B16b report add rate and drop rate statistics, respectively. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that values for both firm types are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as $(c + 1)/(n + 1)$, where c is the count of iterations where the absolute resampled difference exceeds or equals the observed value, and n is the total number of valid bootstrap samples.

Table B17: Churn Metrics by Industry: CPC Class, in Add Rates and Drop Rates

(a) Add Rate Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Add Rate			Median Add Rate		
	NP	P	Diff	NP	P	Diff
Finance	41.62	38.27	3.35	25.00	14.29	10.71
	(47.06)	(45.93)	(0.13)	(80.00)	(66.67)	(0.15)
Service	34.34	23.70	10.65	20.00	10.53	9.47
	(41.69)	(33.09)	(0.00)	(50.00)	(38.25)	(0.00)
Resource	32.35	27.59	4.76	19.67	16.13	3.54
	(37.71)	(32.43)	(0.00)	(33.07)	(28.56)	(0.00)
Manufacture	23.76	18.09	5.67	15.38	13.64	1.75
	(28.70)	(19.06)	(0.00)	(19.66)	(16.75)	(0.00)

(b) Drop Rate Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Drop Rate			Median Drop Rate		
	NP	P	Diff	NP	P	Diff
Finance	38.25	36.63	1.62	5.88	9.55	−3.66
	(46.86)	(46.63)	(0.49)	(66.67)	(66.67)	(0.74)
Service	35.05	26.58	8.48	20.69	14.29	6.40
	(42.01)	(35.25)	(0.00)	(52.83)	(40.00)	(0.00)
Resource	29.02	27.38	1.64	17.24	17.45	−0.20
	(34.21)	(30.44)	(0.15)	(31.15)	(29.45)	(0.80)
Manufacture	23.50	20.47	3.02	15.38	14.75	0.64
	(26.61)	(21.63)	(0.00)	(21.12)	(18.82)	(0.00)

Notes. The table summarizes churn metrics, reported as add rates and drop rates by industry group at the CPC Class level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Panels B17a and B17b report add rate and drop rate statistics, respectively. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that values for both firm types are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as $(c + 1)/(n + 1)$, where c is the count of iterations where the absolute resampled difference exceeds or equals the observed value, and n is the total number of valid bootstrap samples.

Table B18: Churn Metrics by Industry: CPC Subclass, in Add Rates and Drop Rates

(a) Add Rate Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Add Rate			Median Add Rate		
	NP	P	Diff	NP	P	Diff
Finance	43.31	38.41	4.90	33.33	28.08	5.25
	(41.00)	(41.37)	(0.02)	(61.57)	(63.87)	(0.11)
Service	40.03	29.73	10.31	27.78	21.05	6.73
	(39.14)	(30.63)	(0.00)	(43.03)	(31.30)	(0.00)
Resource	39.37	34.89	4.47	28.57	26.09	2.48
	(35.88)	(30.83)	(0.00)	(30.78)	(27.75)	(0.01)
Manufacture	30.20	23.67	6.53	22.52	19.80	2.71
	(27.80)	(17.86)	(0.00)	(19.32)	(15.76)	(0.00)

(b) Drop Rate Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Drop Rate			Median Drop Rate		
	NP	P	Diff	NP	P	Diff
Finance	40.69	38.84	1.84	28.57	26.67	1.90
	(42.30)	(42.24)	(0.39)	(66.67)	(65.02)	(0.43)
Service	41.31	33.58	7.73	28.89	24.00	4.89
	(39.57)	(33.03)	(0.00)	(44.03)	(35.85)	(0.00)
Resource	36.09	35.09	0.99	26.04	26.39	−0.35
	(32.77)	(29.66)	(0.35)	(30.26)	(29.17)	(0.73)
Manufacture	30.19	26.37	3.82	22.83	21.28	1.56
	(25.65)	(20.19)	(0.00)	(20.43)	(17.48)	(0.00)

Notes. The table summarizes churn metrics, reported as add rates and drop rates by industry group at the CPC Subclass level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Panels B18a and B18b report add rate and drop rate statistics, respectively. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that values for both firm types are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as $(c + 1)/(n + 1)$, where c is the count of iterations where the absolute resampled difference exceeds or equals the observed value, and n is the total number of valid bootstrap samples.

Table B19: Churn Metrics by Industry: CPC Group, in Add Rates and Drop Rates

(a) Add Rate Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Add Rate			Median Add Rate		
	NP	P	Diff	NP	P	Diff
Finance	53.67	47.03	6.65	47.62	38.87	8.75
	(36.67)	(37.55)	(0.00)	(50.68)	(47.19)	(0.00)
Service	48.86	35.19	13.66	38.33	26.75	11.58
	(37.81)	(29.30)	(0.00)	(43.75)	(29.27)	(0.00)
Resource	54.73	49.11	5.62	46.67	42.48	4.19
	(34.44)	(29.56)	(0.00)	(33.27)	(30.08)	(0.00)
Manufacture	42.75	34.40	8.34	36.07	30.69	5.38
	(27.39)	(18.30)	(0.00)	(22.20)	(17.98)	(0.00)

(b) Drop Rate Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Drop Rate			Median Drop Rate		
	NP	P	Diff	NP	P	Diff
Finance	51.07	48.32	2.75	41.75	39.35	2.39
	(38.37)	(38.79)	(0.15)	(49.21)	(43.92)	(0.28)
Service	50.23	38.89	11.34	39.93	29.98	9.95
	(38.15)	(31.17)	(0.00)	(44.41)	(32.11)	(0.00)
Resource	51.51	50.19	1.32	44.38	44.78	−0.40
	(31.99)	(29.03)	(0.21)	(31.96)	(32.09)	(0.66)
Manufacture	43.34	37.97	5.38	37.17	33.41	3.76
	(25.03)	(20.00)	(0.00)	(22.23)	(18.23)	(0.00)

Notes. The table summarizes churn metrics, reported as add rates and drop rates by industry group at the CPC Group level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Panels B19a and B19b report add rate and drop rate statistics, respectively. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that values for both firm types are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as $(c + 1)/(n + 1)$, where c is the count of iterations where the absolute resampled difference exceeds or equals the observed value, and n is the total number of valid bootstrap samples.

Table B20: Churn Metrics by Industry and Size: CPC Section, in Add Rates

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	15.21	13.90	1.31	0.00	0.00	0.00
		(36.59)	(33.95)	(0.62)	(0.00)	(0.00)	(1.00)
	Mid	12.91	17.95	−5.03	0.00	0.00	0.00
		(33.61)	(38.18)	(0.29)	(0.00)	(0.00)	(1.00)
	Small	11.01	10.65	0.36	0.00	0.00	0.00
		(31.34)	(30.94)	(0.94)	(0.00)	(0.00)	(1.00)
	Private	13.60	32.14	−18.54	0.00	0.00	0.00
		(34.35)	(52.59)	(0.00)	(0.00)	(66.67)	(1.00)
Service	Large	29.54	18.84	10.70	0.00	0.00	0.00
		(45.47)	(37.63)	(0.00)	(66.67)	(0.00)	(1.00)
	Mid	28.54	23.03	5.51	0.00	0.00	0.00
		(44.42)	(40.39)	(0.00)	(66.67)	(66.67)	(1.00)
	Small	28.43	20.02	8.41	0.00	0.00	0.00
		(44.34)	(38.20)	(0.00)	(66.67)	(0.00)	(1.00)
	Private	30.93	21.33	9.60	0.00	0.00	0.00
		(45.85)	(39.17)	(0.00)	(66.67)	(28.57)	(1.00)
Resource	Large	21.95	20.98	0.97	0.00	0.00	0.00
		(37.27)	(36.64)	(0.74)	(33.33)	(40.00)	(1.00)
	Mid	21.25	17.81	3.44	0.00	0.00	0.00
		(37.22)	(33.65)	(0.25)	(28.57)	(24.31)	(1.00)
	Small	23.14	22.92	0.22	0.00	0.00	0.00
		(37.58)	(39.10)	(0.91)	(40.00)	(34.29)	(1.00)
	Private	27.11	23.92	3.19	0.00	0.00	0.00
		(41.52)	(38.78)	(0.26)	(40.00)	(40.00)	(1.00)
Manufacture	Large	13.27	10.81	2.47	0.00	0.00	0.00
		(25.98)	(23.52)	(0.00)	(18.18)	(13.33)	(1.00)
	Mid	12.01	9.57	2.44	0.00	0.00	0.00
		(24.04)	(20.49)	(0.00)	(18.18)	(13.33)	(1.00)
	Small	11.12	8.64	2.49	0.00	0.00	0.00
		(22.98)	(19.58)	(0.00)	(16.67)	(0.00)	(1.00)
	Private	17.98	9.51	8.48	0.00	0.00	0.00
		(34.47)	(20.89)	(0.00)	(22.22)	(13.33)	(1.00)

Notes. The table summarizes churn metrics, reported as add rates by industry group and size class at the CPC Section level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

Table B21: Churn Metrics by Industry and Size: CPC Class, in Add Rates

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	41.26	36.24	5.02	22.22	0.00	22.22
		(48.51)	(44.85)	(0.16)	(80.00)	(66.67)	(0.11)
	Mid	39.94	37.43	2.51	16.67	18.01	−1.35
		(47.26)	(44.12)	(0.71)	(75.00)	(66.67)	(0.94)
	Small	40.90	36.05	4.85	28.57	21.05	7.52
		(46.03)	(39.01)	(0.36)	(66.67)	(66.67)	(0.64)
	Private	43.19	49.93	−6.73	27.27	20.02	7.25
		(48.08)	(58.35)	(0.33)	(84.59)	(100.00)	(0.70)
Service	Large	32.13	23.62	8.51	17.14	6.67	10.48
		(41.02)	(34.30)	(0.00)	(50.00)	(36.36)	(0.00)
	Mid	31.70	24.45	7.24	17.98	4.26	13.72
		(39.03)	(34.41)	(0.00)	(50.00)	(40.00)	(0.00)
	Small	31.07	21.72	9.35	16.67	8.70	7.97
		(39.08)	(31.12)	(0.00)	(48.24)	(33.33)	(0.00)
	Private	38.75	27.92	10.83	23.53	16.67	6.86
		(44.62)	(34.79)	(0.00)	(59.87)	(40.00)	(0.00)
Resource	Large	23.50	27.55	−4.05	14.87	16.67	−1.80
		(28.17)	(32.25)	(0.10)	(24.17)	(29.74)	(0.30)
	Mid	29.25	27.37	1.88	16.67	14.34	2.32
		(36.10)	(33.07)	(0.53)	(29.62)	(34.32)	(0.25)
	Small	30.27	28.81	1.46	19.05	17.70	1.35
		(34.93)	(32.28)	(0.46)	(32.73)	(31.45)	(0.31)
	Private	34.41	26.10	8.30	20.90	15.27	5.63
		(39.47)	(32.42)	(0.00)	(35.12)	(23.20)	(0.00)
Manufacture	Large	21.74	18.72	3.01	15.38	13.81	1.57
		(23.46)	(19.37)	(0.00)	(17.95)	(17.56)	(0.01)
	Mid	20.43	17.70	2.73	14.63	13.55	1.09
		(22.05)	(18.75)	(0.00)	(17.13)	(16.95)	(0.00)
	Small	20.35	17.68	2.68	14.81	13.33	1.48
		(22.20)	(18.43)	(0.00)	(17.86)	(16.41)	(0.00)
	Private	28.69	19.58	9.11	16.67	14.33	2.34
		(35.64)	(21.24)	(0.00)	(23.55)	(16.98)	(0.00)

Notes. The table summarizes churn metrics, reported as add rates by industry group and size class at the CPC Class level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

Table B22: Churn Metrics by Industry and Size: CPC Subclass, in Add Rates

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	45.80	39.14	6.66	37.04	30.00	7.04
		(42.66)	(40.49)	(0.04)	(65.52)	(66.67)	(0.13)
	Mid	44.42	33.06	11.36	35.29	28.57	6.72
		(41.81)	(31.02)	(0.05)	(66.67)	(50.00)	(0.37)
	Small	40.54	27.57	12.98	32.65	12.50	20.15
		(38.49)	(32.37)	(0.01)	(66.67)	(50.00)	(0.00)
	Private	46.29	55.45	−9.16	35.90	47.21	−11.32
		(43.43)	(56.61)	(0.13)	(62.91)	(81.35)	(0.16)
Service	Large	36.80	29.41	7.40	24.62	20.00	4.62
		(37.26)	(32.00)	(0.00)	(39.19)	(32.59)	(0.00)
	Mid	37.04	30.72	6.32	25.86	22.22	3.64
		(35.96)	(32.15)	(0.00)	(38.87)	(32.97)	(0.00)
	Small	36.35	27.95	8.40	25.00	20.00	5.00
		(36.12)	(28.58)	(0.00)	(39.02)	(28.98)	(0.00)
	Private	45.08	33.44	11.63	31.25	24.12	7.13
		(42.54)	(32.16)	(0.00)	(48.57)	(34.92)	(0.00)
Resource	Large	31.12	36.69	−5.57	23.50	26.32	−2.82
		(27.34)	(30.70)	(0.02)	(23.58)	(30.50)	(0.11)
	Mid	35.72	35.55	0.17	25.35	24.50	0.85
		(34.44)	(33.27)	(0.94)	(26.79)	(34.86)	(0.65)
	Small	37.42	34.94	2.49	28.40	26.57	1.83
		(33.28)	(30.68)	(0.18)	(29.61)	(27.88)	(0.19)
	Private	41.41	33.12	8.29	29.58	26.27	3.31
		(37.49)	(29.39)	(0.00)	(33.21)	(23.98)	(0.05)
Manufacture	Large	29.83	24.91	4.92	24.35	20.85	3.49
		(23.45)	(18.39)	(0.00)	(19.59)	(16.46)	(0.00)
	Mid	27.46	23.76	3.70	22.37	19.75	2.62
		(21.15)	(18.20)	(0.00)	(18.36)	(16.49)	(0.00)
	Small	26.56	23.02	3.54	21.54	19.35	2.18
		(21.51)	(17.04)	(0.00)	(17.46)	(15.56)	(0.00)
	Private	35.13	24.81	10.32	23.69	20.25	3.44
		(34.46)	(19.67)	(0.00)	(23.25)	(15.14)	(0.00)

Notes. The table summarizes churn metrics, reported as add rates by industry group and size class at the CPC Subclass level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

Table B23: Churn Metrics by Industry and Size: CPC Group, in Add Rates

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	55.55	46.17	9.38	51.06	36.84	14.22
		(39.21)	(35.60)	(0.00)	(56.83)	(46.12)	(0.00)
	Mid	55.42	44.13	11.29	50.00	44.64	5.36
		(37.89)	(28.90)	(0.04)	(54.14)	(37.08)	(0.43)
	Small	51.45	41.78	9.67	45.90	36.67	9.23
		(34.64)	(34.06)	(0.01)	(46.66)	(41.59)	(0.08)
	Private	55.83	60.22	−4.39	49.08	56.07	−6.99
		(38.31)	(51.91)	(0.42)	(53.91)	(63.44)	(0.32)
Service	Large	46.88	34.77	12.11	36.43	25.45	10.97
		(37.35)	(31.36)	(0.00)	(43.62)	(30.54)	(0.00)
	Mid	46.58	35.31	11.27	37.01	26.32	10.69
		(35.27)	(30.38)	(0.00)	(41.50)	(30.65)	(0.00)
	Small	45.33	33.74	11.59	35.76	26.22	9.54
		(35.23)	(27.48)	(0.00)	(40.04)	(26.59)	(0.00)
	Private	53.38	39.16	14.22	42.11	30.39	11.71
		(40.58)	(30.10)	(0.00)	(48.42)	(32.19)	(0.00)
Resource	Large	47.57	50.49	−2.92	42.01	43.56	−1.55
		(26.53)	(28.21)	(0.21)	(25.45)	(31.13)	(0.46)
	Mid	51.17	50.40	0.77	43.18	42.92	0.26
		(33.54)	(34.14)	(0.76)	(30.28)	(33.86)	(0.90)
	Small	53.01	48.40	4.61	45.99	41.79	4.20
		(32.66)	(29.11)	(0.02)	(32.06)	(31.99)	(0.01)
	Private	56.59	48.21	8.37	47.95	41.97	5.98
		(35.65)	(27.68)	(0.00)	(34.46)	(24.88)	(0.00)
Manufacture	Large	43.11	35.96	7.15	38.10	32.29	5.81
		(23.89)	(19.22)	(0.00)	(21.27)	(18.88)	(0.00)
	Mid	41.39	34.83	6.56	36.97	31.32	5.64
		(21.96)	(18.61)	(0.00)	(21.03)	(18.58)	(0.00)
	Small	39.24	33.60	5.63	34.98	29.97	5.01
		(22.00)	(17.64)	(0.00)	(20.40)	(17.61)	(0.00)
	Private	47.11	35.34	11.77	37.01	31.14	5.87
		(33.24)	(19.23)	(0.00)	(25.83)	(17.10)	(0.00)

Notes. The table summarizes churn metrics, reported as add rates by industry group and size class at the CPC Group level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

Table B24: Churn Metrics by Industry and Size: CPC Section, in Drop Rates

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	14.28	14.27	0.01	0.00	0.00	0.00
		(35.35)	(35.18)	(1.00)	(0.00)	(0.00)	(1.00)
	Mid	12.12	17.95	−5.83	0.00	0.00	0.00
		(32.72)	(38.18)	(0.21)	(0.00)	(0.00)	(1.00)
	Small	10.45	8.74	1.71	0.00	0.00	0.00
		(30.49)	(27.87)	(0.64)	(0.00)	(0.00)	(1.00)
	Private	12.64	29.03	−16.39	0.00	0.00	0.00
		(33.39)	(45.08)	(0.00)	(0.00)	(54.17)	(1.00)
Service	Large	29.81	20.26	9.55	0.00	0.00	0.00
		(45.35)	(38.97)	(0.00)	(66.67)	(0.00)	(1.00)
	Mid	28.50	23.30	5.20	0.00	0.00	0.00
		(44.43)	(41.80)	(0.00)	(66.67)	(40.00)	(1.00)
	Small	28.53	20.89	7.64	0.00	0.00	0.00
		(44.77)	(39.20)	(0.00)	(66.67)	(0.00)	(1.00)
	Private	29.47	21.07	8.40	0.00	0.00	0.00
		(44.76)	(39.31)	(0.00)	(66.67)	(25.00)	(1.00)
Resource	Large	19.05	18.23	0.82	0.00	0.00	0.00
		(33.99)	(36.29)	(0.80)	(28.57)	(22.22)	(1.00)
	Mid	20.23	19.72	0.51	0.00	0.00	0.00
		(36.49)	(35.28)	(0.87)	(28.57)	(38.33)	(1.00)
	Small	20.51	21.89	−1.38	0.00	0.00	0.00
		(36.70)	(38.03)	(0.54)	(28.57)	(28.57)	(1.00)
	Private	22.00	23.23	−1.24	0.00	0.00	0.00
		(37.79)	(35.29)	(0.63)	(34.09)	(40.00)	(1.00)
Manufacture	Large	13.96	11.98	1.98	0.00	0.00	0.00
		(27.93)	(25.53)	(0.04)	(18.18)	(15.38)	(1.00)
	Mid	13.46	10.57	2.89	0.00	0.00	0.00
		(26.02)	(23.14)	(0.00)	(18.18)	(13.33)	(1.00)
	Small	11.35	10.05	1.31	0.00	0.00	0.00
		(24.03)	(22.04)	(0.00)	(15.38)	(0.00)	(1.00)
	Private	15.43	9.29	6.14	0.00	0.00	0.00
		(28.82)	(19.11)	(0.00)	(22.22)	(14.29)	(1.00)

Notes. The table summarizes churn metrics, reported as drop rates by industry group and size class at the CPC Section level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

Table B25: Churn Metrics by Industry and Size: CPC Class, in Drop Rates

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	38.01	35.38	2.64	2.41	0.00	2.41
		(47.85)	(47.53)	(0.47)	(66.67)	(66.67)	(0.65)
	Mid	36.00	34.39	1.62	0.00	0.00	0.00
		(46.35)	(44.20)	(0.81)	(66.67)	(66.67)	(1.00)
	Small	37.52	37.09	0.43	0.00	13.33	−13.33
		(46.08)	(44.51)	(0.94)	(66.67)	(66.67)	(0.40)
	Private	40.01	42.89	−2.88	16.00	22.02	−6.02
		(47.86)	(48.83)	(0.67)	(66.67)	(75.00)	(0.76)
Service	Large	33.92	26.24	7.68	20.00	15.38	4.62
		(41.34)	(34.77)	(0.00)	(50.00)	(40.00)	(0.01)
	Mid	32.92	26.62	6.30	19.05	10.53	8.52
		(40.39)	(36.77)	(0.00)	(50.00)	(40.00)	(0.00)
	Small	33.22	25.77	7.45	20.00	13.33	6.67
		(40.43)	(34.46)	(0.00)	(50.00)	(40.00)	(0.00)
	Private	37.70	28.90	8.79	22.22	16.67	5.56
		(43.95)	(35.91)	(0.00)	(57.14)	(43.55)	(0.00)
Resource	Large	24.75	27.10	−2.35	15.38	16.36	−0.98
		(29.21)	(31.86)	(0.37)	(27.02)	(28.03)	(0.61)
	Mid	29.78	29.65	0.13	17.93	21.05	−3.12
		(34.85)	(32.33)	(0.96)	(32.05)	(30.66)	(0.17)
	Small	28.82	27.50	1.32	17.14	14.81	2.33
		(33.76)	(31.71)	(0.49)	(30.60)	(30.52)	(0.11)
	Private	29.29	25.79	3.50	17.39	17.93	−0.54
		(34.61)	(26.02)	(0.11)	(31.82)	(27.26)	(0.70)
Manufacture	Large	23.95	21.86	2.09	15.58	15.38	0.20
		(26.89)	(23.02)	(0.02)	(20.64)	(20.83)	(0.73)
	Mid	22.38	20.61	1.77	15.09	14.29	0.81
		(23.93)	(23.07)	(0.00)	(19.66)	(18.82)	(0.02)
	Small	21.44	20.25	1.19	14.55	14.63	−0.09
		(23.74)	(21.36)	(0.00)	(19.31)	(18.68)	(0.73)
	Private	26.11	19.79	6.32	16.44	15.00	1.44
		(29.93)	(19.07)	(0.00)	(23.70)	(17.95)	(0.00)

Notes. The table summarizes churn metrics, reported as drop rates by industry group and size class at the CPC Class level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

Table B26: Churn Metrics by Industry and Size: CPC Subclass, in Drop Rates

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	43.41	40.43	2.98	31.58	28.57	3.01
		(44.12)	(43.42)	(0.37)	(66.67)	(64.43)	(0.49)
	Mid	40.72	34.23	6.48	28.57	24.26	4.31
		(43.24)	(35.46)	(0.28)	(66.67)	(59.52)	(0.57)
	Small	38.14	29.97	8.17	28.57	14.46	14.11
		(40.22)	(34.72)	(0.07)	(60.00)	(57.78)	(0.01)
	Private	43.68	49.25	−5.57	30.77	31.97	−1.20
		(44.17)	(50.26)	(0.35)	(60.54)	(84.49)	(0.89)
Service	Large	39.61	33.44	6.17	28.57	23.53	5.04
		(38.41)	(33.85)	(0.00)	(43.26)	(37.09)	(0.00)
	Mid	39.10	34.95	4.15	27.62	25.00	2.62
		(37.93)	(34.99)	(0.00)	(41.21)	(40.00)	(0.04)
	Small	39.48	32.43	7.04	28.57	23.53	5.04
		(37.69)	(31.87)	(0.00)	(42.05)	(33.63)	(0.00)
	Private	44.05	35.11	8.93	30.77	25.00	5.77
		(41.84)	(32.76)	(0.00)	(46.95)	(36.71)	(0.00)
Resource	Large	33.11	36.04	−2.92	25.12	26.95	−1.83
		(29.16)	(31.13)	(0.25)	(27.70)	(28.93)	(0.37)
	Mid	36.74	37.90	−1.17	27.05	28.42	−1.38
		(33.46)	(32.95)	(0.66)	(28.72)	(30.31)	(0.45)
	Small	36.09	34.34	1.75	26.34	23.64	2.70
		(32.50)	(30.01)	(0.34)	(29.80)	(30.57)	(0.08)
	Private	36.20	33.48	2.72	25.81	28.77	−2.96
		(33.01)	(25.40)	(0.19)	(31.00)	(24.24)	(0.08)
Manufacture	Large	32.18	28.39	3.79	23.84	22.64	1.20
		(26.70)	(21.97)	(0.00)	(22.47)	(19.39)	(0.05)
	Mid	29.82	26.86	2.95	23.64	21.18	2.46
		(22.79)	(21.50)	(0.00)	(19.85)	(17.60)	(0.00)
	Small	27.94	25.98	1.95	21.92	21.05	0.87
		(22.56)	(19.92)	(0.00)	(18.33)	(17.29)	(0.00)
	Private	32.73	25.22	7.51	23.93	21.28	2.66
		(29.10)	(17.31)	(0.00)	(23.25)	(16.05)	(0.00)

Notes. The table summarizes churn metrics, reported as drop rates by industry group and size class at the CPC Subclass level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

Table B27: Churn Metrics by Industry and Size: CPC Group, in Drop Rates

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	53.10	48.39	4.71	43.90	40.00	3.90
		(40.37)	(39.92)	(0.12)	(51.10)	(38.71)	(0.33)
	Mid	51.71	45.31	6.40	42.11	36.50	5.61
		(39.67)	(36.02)	(0.22)	(50.51)	(51.72)	(0.38)
	Small	49.04	44.96	4.08	40.00	38.10	1.90
		(36.41)	(34.65)	(0.31)	(46.40)	(46.11)	(0.70)
	Private	53.27	55.50	−2.22	43.48	44.44	−0.97
		(40.02)	(42.15)	(0.69)	(51.06)	(67.28)	(0.88)
Service	Large	49.57	38.60	10.98	39.20	30.86	8.34
		(38.25)	(31.59)	(0.00)	(44.69)	(32.69)	(0.00)
	Mid	48.88	39.39	9.50	39.43	29.37	10.06
		(36.85)	(33.07)	(0.00)	(42.48)	(34.80)	(0.00)
	Small	48.49	37.98	10.52	38.67	29.24	9.43
		(36.50)	(30.29)	(0.00)	(42.79)	(29.94)	(0.00)
	Private	52.49	40.92	11.57	41.38	32.61	8.77
		(40.02)	(30.74)	(0.00)	(46.78)	(33.55)	(0.00)
Resource	Large	50.45	51.33	−0.88	45.21	45.42	−0.21
		(27.98)	(29.38)	(0.70)	(27.46)	(31.69)	(0.90)
	Mid	53.09	52.97	0.12	45.47	45.92	−0.45
		(32.91)	(33.25)	(0.96)	(30.93)	(36.07)	(0.83)
	Small	52.03	48.06	3.97	44.63	39.94	4.69
		(31.92)	(29.24)	(0.03)	(32.20)	(31.76)	(0.01)
	Private	51.11	50.36	0.75	44.04	47.45	−3.40
		(32.13)	(24.99)	(0.72)	(32.46)	(29.89)	(0.05)
Manufacture	Large	46.61	40.33	6.28	38.95	35.34	3.61
		(26.64)	(21.64)	(0.00)	(23.49)	(20.11)	(0.00)
	Mid	44.81	38.64	6.18	39.13	33.55	5.58
		(23.20)	(21.24)	(0.00)	(22.42)	(18.58)	(0.00)
	Small	41.59	37.43	4.16	36.21	33.00	3.21
		(22.51)	(19.69)	(0.00)	(20.21)	(18.07)	(0.00)
	Private	44.74	36.81	7.94	37.76	33.21	4.56
		(27.81)	(17.48)	(0.00)	(24.53)	(16.87)	(0.00)

Notes. The table summarizes churn metrics, reported as drop rates by industry group and size class at the CPC Group level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

B.4 Technological Generality

Table B28: Cross Metrics by Industry: CPC Section, in Counts and Fractions

(a) Count Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Count			Median Count		
	NP	P	Diff	NP	P	Diff
Finance	9.68	15.28	−5.60	0.00	0.00	0.00
	(23.10)	(25.75)	(0.00)	(0.00)	(32.50)	(1.00)
Service	41.56	48.70	−7.14	52.00	58.67	−6.67
	(29.81)	(24.55)	(0.00)	(65.00)	(24.67)	(0.00)
Resource	46.49	46.59	−0.10	47.00	47.33	−0.33
	(18.73)	(18.12)	(0.85)	(18.00)	(18.50)	(0.52)
Manufacture	50.76	51.01	−0.25	50.00	52.20	−2.20
	(18.44)	(16.89)	(0.08)	(24.00)	(23.89)	(0.00)

(b) Fraction Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Fraction			Median Fraction		
	NP	P	Diff	NP	P	Diff
Finance	2.32	3.66	−1.34	0.00	0.00	0.00
	(5.52)	(6.17)	(0.00)	(0.00)	(7.58)	(1.00)
Service	9.70	11.45	−1.75	12.24	13.69	−1.45
	(6.90)	(5.74)	(0.00)	(15.16)	(5.81)	(0.00)
Resource	10.85	10.89	−0.03	11.07	11.08	−0.01
	(4.23)	(4.13)	(0.81)	(3.98)	(4.01)	(0.88)
Manufacture	11.82	11.87	−0.06	11.73	12.16	−0.44
	(4.10)	(3.77)	(0.10)	(5.32)	(5.40)	(0.00)

Notes. The table summarizes cross metrics, reported as counts and fractions by industry group at the CPC Section level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Panels B28a and B28b report count and fraction statistics, respectively. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that values for both firm types are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as $(c+1)/(n+1)$, where c is the count of iterations where the absolute resampled difference exceeds or equals the observed value, and n is the total number of valid bootstrap samples.

Table B29: Cross Metrics by Industry: CPC Class, in Counts and Fractions

(a) Count Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Count			Median Count		
	NP	P	Diff	NP	P	Diff
Finance	60.75	58.74	2.01	70.00	65.94	4.06
	(33.53)	(35.80)	(0.21)	(39.94)	(47.67)	(0.03)
Service	60.61	66.94	−6.32	62.00	68.67	−6.67
	(20.97)	(18.12)	(0.00)	(28.00)	(22.38)	(0.00)
Resource	46.93	47.71	−0.78	44.80	46.20	−1.40
	(13.01)	(11.66)	(0.05)	(16.25)	(13.91)	(0.00)
Manufacture	50.74	52.44	−1.69	47.89	51.06	−3.16
	(14.93)	(14.36)	(0.00)	(22.89)	(21.68)	(0.00)

(b) Fraction Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Fraction			Median Fraction		
	NP	P	Diff	NP	P	Diff
Finance	14.14	13.88	0.26	16.38	15.47	0.91
	(7.70)	(8.42)	(0.45)	(8.35)	(11.41)	(0.01)
Service	14.10	15.69	−1.59	14.37	16.28	−1.91
	(4.74)	(4.16)	(0.00)	(6.16)	(4.93)	(0.00)
Resource	10.94	11.13	−0.19	10.46	10.77	−0.31
	(2.81)	(2.49)	(0.03)	(3.29)	(2.95)	(0.00)
Manufacture	11.81	12.20	−0.39	11.17	11.85	−0.68
	(3.19)	(3.08)	(0.00)	(4.80)	(4.63)	(0.00)

Notes. The table summarizes cross metrics, reported as counts and fractions by industry group at the CPC Class level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Panels B29a and B29b report count and fraction statistics, respectively. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that values for both firm types are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as $(c+1)/(n+1)$, where c is the count of iterations where the absolute resampled difference exceeds or equals the observed value, and n is the total number of valid bootstrap samples.

Table B30: Cross Metrics by Industry: CPC Subclass, in Counts and Fractions

(a) Count Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Count			Median Count		
	NP	P	Diff	NP	P	Diff
Finance	67.31	72.35	−5.04	65.83	69.98	−4.14
	(26.44)	(30.57)	(0.00)	(28.54)	(32.00)	(0.00)
Service	58.31	61.11	−2.80	57.60	61.75	−4.15
	(18.23)	(15.57)	(0.00)	(23.63)	(19.42)	(0.00)
Resource	48.08	48.11	−0.03	45.63	46.25	−0.62
	(13.41)	(12.42)	(0.94)	(16.39)	(12.84)	(0.12)
Manufacture	49.89	50.44	−0.55	48.64	50.25	−1.61
	(14.37)	(13.63)	(0.00)	(20.95)	(19.03)	(0.00)

(b) Fraction Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Fraction			Median Fraction		
	NP	P	Diff	NP	P	Diff
Finance	15.67	17.06	−1.39	15.27	16.37	−1.10
	(6.06)	(7.11)	(0.00)	(6.15)	(7.40)	(0.00)
Service	13.56	14.32	−0.76	13.34	14.54	−1.20
	(4.05)	(3.50)	(0.00)	(5.21)	(4.47)	(0.00)
Resource	11.20	11.20	−0.00	10.63	10.77	−0.14
	(2.85)	(2.60)	(0.96)	(3.35)	(2.67)	(0.11)
Manufacture	11.61	11.72	−0.12	11.32	11.65	−0.33
	(3.03)	(2.87)	(0.00)	(4.34)	(4.02)	(0.00)

Notes. The table summarizes cross metrics, reported as counts and fractions by industry group at the CPC Subclass level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Panels B30a and B30b report count and fraction statistics, respectively. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that values for both firm types are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as $(c+1)/(n+1)$, where c is the count of iterations where the absolute resampled difference exceeds or equals the observed value, and n is the total number of valid bootstrap samples.

Table B31: Cross Metrics by Industry: CPC Group, in Counts and Fractions

(a) Count Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Count			Median Count		
	NP	P	Diff	NP	P	Diff
Finance	54.76	60.15	−5.40	51.90	58.30	−6.40
	(16.03)	(20.14)	(0.00)	(17.74)	(25.03)	(0.00)
Service	50.59	52.78	−2.20	49.19	52.74	−3.55
	(15.40)	(13.74)	(0.00)	(20.29)	(18.07)	(0.00)
Resource	42.82	42.35	0.47	41.27	41.61	−0.33
	(10.77)	(11.11)	(0.17)	(13.11)	(13.31)	(0.40)
Manufacture	41.78	41.12	0.66	41.27	41.03	0.24
	(11.70)	(11.31)	(0.00)	(16.42)	(15.24)	(0.02)

(b) Fraction Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Fraction			Median Fraction		
	NP	P	Diff	NP	P	Diff
Finance	12.75	14.20	−1.45	12.05	13.60	−1.56
	(3.64)	(4.68)	(0.00)	(3.85)	(5.78)	(0.00)
Service	11.77	12.37	−0.60	11.39	12.42	−1.03
	(3.44)	(3.11)	(0.00)	(4.54)	(4.26)	(0.00)
Resource	9.98	9.86	0.12	9.66	9.64	0.02
	(2.28)	(2.34)	(0.10)	(2.68)	(2.80)	(0.85)
Manufacture	9.73	9.56	0.17	9.63	9.52	0.11
	(2.49)	(2.41)	(0.00)	(3.42)	(3.24)	(0.00)

Notes. The table summarizes cross metrics, reported as counts and fractions by industry group at the CPC Group level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Panels B31a and B31b report count and fraction statistics, respectively. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that values for both firm types are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as $(c+1)/(n+1)$, where c is the count of iterations where the absolute resampled difference exceeds or equals the observed value, and n is the total number of valid bootstrap samples.

Table B32: Cross Metrics by Industry: CPC Patent, in Counts and Fractions

(a) Count Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Count			Median Count		
	NP	P	Diff	NP	P	Diff
Finance	49.21	50.56	−1.35	47.36	48.54	−1.19
	(15.68)	(19.53)	(0.06)	(19.97)	(25.66)	(0.19)
Service	45.03	39.27	5.76	43.49	36.97	6.53
	(15.86)	(14.61)	(0.00)	(22.00)	(19.45)	(0.00)
Resource	46.42	44.32	2.10	46.98	44.92	2.07
	(11.23)	(12.86)	(0.00)	(14.19)	(17.59)	(0.00)
Manufacture	37.48	32.49	4.99	37.10	30.40	6.69
	(12.90)	(12.38)	(0.00)	(19.04)	(17.46)	(0.00)

(b) Fraction Statistics for Non-Patenting (NP) and Patenting (P) Firms

Industry Group	Mean Fraction			Median Fraction		
	NP	P	Diff	NP	P	Diff
Finance	11.48	11.94	−0.46	10.94	11.54	−0.59
	(3.58)	(4.50)	(0.00)	(4.37)	(5.69)	(0.00)
Service	10.49	9.20	1.29	10.14	8.76	1.39
	(3.54)	(3.28)	(0.00)	(4.78)	(4.30)	(0.00)
Resource	10.86	10.35	0.51	10.97	10.52	0.45
	(2.43)	(2.83)	(0.00)	(2.99)	(3.76)	(0.00)
Manufacture	8.77	7.58	1.19	8.70	7.08	1.61
	(2.88)	(2.77)	(0.00)	(4.32)	(3.87)	(0.00)

Notes. The table summarizes cross metrics, reported as counts and fractions by industry group at the CPC Patent level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Panels B32a and B32b report count and fraction statistics, respectively. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that values for both firm types are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as $(c+1)/(n+1)$, where c is the count of iterations where the absolute resampled difference exceeds or equals the observed value, and n is the total number of valid bootstrap samples.

Table B33: Cross Metrics by Industry and Size: CPC Section, in Counts

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	9.22	10.91	−1.69	0.00	0.00	0.00
		(22.37)	(22.51)	(0.30)	(0.00)	(0.00)	(1.00)
	Mid	10.39	21.64	−11.25	0.00	0.00	0.00
		(23.84)	(31.19)	(0.00)	(0.00)	(59.50)	(1.00)
	Small	9.09	18.21	−9.12	0.00	0.00	0.00
		(22.64)	(26.55)	(0.00)	(0.00)	(44.96)	(1.00)
	Private	10.28	21.47	−11.19	0.00	0.00	0.00
		(23.54)	(27.88)	(0.00)	(0.00)	(48.05)	(1.00)
Service	Large	42.22	48.46	−6.24	52.00	58.50	−6.50
		(30.17)	(24.86)	(0.00)	(64.50)	(24.27)	(0.00)
	Mid	41.10	48.58	−7.48	50.60	59.00	−8.40
		(30.41)	(25.30)	(0.00)	(65.00)	(24.46)	(0.00)
	Small	41.91	48.97	−7.05	52.00	58.50	−6.50
		(30.33)	(23.89)	(0.00)	(65.00)	(24.67)	(0.00)
	Private	41.29	48.41	−7.11	51.50	58.50	−7.00
		(29.09)	(25.02)	(0.00)	(64.00)	(24.94)	(0.00)
Resource	Large	50.06	46.99	3.07	49.00	47.33	1.67
		(18.17)	(17.72)	(0.03)	(19.50)	(13.80)	(0.17)
	Mid	46.04	48.02	−1.98	45.25	47.33	−2.08
		(19.63)	(17.75)	(0.20)	(19.00)	(17.50)	(0.15)
	Small	45.81	43.47	2.33	45.33	46.00	−0.67
		(19.91)	(18.32)	(0.03)	(19.50)	(18.25)	(0.69)
	Private	46.56	49.42	−2.85	47.33	51.00	−3.67
		(18.11)	(17.87)	(0.01)	(16.40)	(21.00)	(0.00)
Manufacture	Large	50.10	52.60	−2.50	46.71	53.50	−6.79
		(21.22)	(17.81)	(0.00)	(27.67)	(23.67)	(0.00)
	Mid	51.89	52.64	−0.75	49.33	54.12	−4.79
		(18.61)	(16.85)	(0.05)	(24.62)	(22.75)	(0.00)
	Small	51.32	50.30	1.02	50.50	52.00	−1.50
		(19.24)	(16.99)	(0.00)	(25.71)	(25.00)	(0.00)
	Private	49.92	49.93	−0.01	49.60	49.50	0.10
		(17.20)	(15.39)	(0.97)	(20.62)	(21.06)	(0.86)

Notes. The table summarizes cross metrics, reported as counts by industry group and size class at the CPC Section level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

Table B34: Cross Metrics by Industry and Size: CPC Class, in Counts

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	57.06	58.76	−1.70	68.45	65.67	2.78
		(36.13)	(36.24)	(0.50)	(51.00)	(49.50)	(0.40)
	Mid	56.00	62.03	−6.03	65.33	73.30	−7.97
		(36.05)	(36.21)	(0.21)	(54.28)	(50.15)	(0.14)
	Small	64.87	64.91	−0.05	72.50	69.40	3.10
		(31.82)	(35.36)	(0.99)	(34.00)	(34.40)	(0.44)
	Private	57.58	47.87	9.70	66.77	47.63	19.13
		(33.85)	(32.58)	(0.03)	(41.40)	(34.42)	(0.00)
Service	Large	61.99	66.97	−4.99	62.18	69.18	−7.00
		(19.64)	(18.59)	(0.00)	(26.67)	(23.67)	(0.00)
	Mid	61.61	68.89	−7.28	62.33	71.45	−9.12
		(21.21)	(18.80)	(0.00)	(29.17)	(19.00)	(0.00)
	Small	62.78	66.65	−3.87	64.62	68.50	−3.88
		(20.30)	(17.88)	(0.00)	(27.64)	(22.44)	(0.00)
	Private	58.13	65.49	−7.36	59.29	67.11	−7.83
		(21.40)	(17.31)	(0.00)	(27.87)	(21.25)	(0.00)
Resource	Large	48.15	46.29	1.86	46.37	45.77	0.59
		(12.06)	(11.89)	(0.05)	(17.30)	(10.15)	(0.43)
	Mid	46.99	47.09	−0.10	45.68	45.23	0.45
		(13.12)	(11.04)	(0.93)	(13.26)	(11.25)	(0.47)
	Small	46.79	46.11	0.68	44.56	43.90	0.66
		(13.80)	(11.06)	(0.35)	(19.53)	(14.15)	(0.28)
	Private	46.89	51.24	−4.35	44.62	49.15	−4.53
		(12.74)	(12.00)	(0.00)	(14.98)	(15.47)	(0.00)
Manufacture	Large	50.87	54.05	−3.18	47.26	52.51	−5.25
		(16.08)	(14.65)	(0.00)	(25.08)	(22.52)	(0.00)
	Mid	51.16	53.74	−2.58	47.35	52.69	−5.34
		(14.87)	(14.85)	(0.00)	(24.01)	(22.35)	(0.00)
	Small	51.30	51.66	−0.37	48.81	50.52	−1.71
		(15.51)	(14.33)	(0.03)	(25.02)	(21.53)	(0.00)
	Private	50.03	52.02	−1.99	47.28	50.12	−2.85
		(14.16)	(13.26)	(0.00)	(19.39)	(20.20)	(0.00)

Notes. The table summarizes cross metrics, reported as counts by industry group and size class at the CPC Class level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

Table B35: Cross Metrics by Industry and Size: CPC Subclass, in Counts

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	71.12	70.71	0.41	69.00	69.20	−0.20
		(30.22)	(30.23)	(0.86)	(29.68)	(30.23)	(0.91)
	Mid	68.67	82.72	−14.05	66.44	81.12	−14.69
		(29.24)	(27.81)	(0.00)	(30.58)	(22.36)	(0.00)
	Small	66.67	77.31	−10.65	66.20	72.33	−6.12
		(23.77)	(29.70)	(0.00)	(27.67)	(33.62)	(0.05)
	Private	67.16	62.71	4.44	64.75	59.92	4.83
		(28.02)	(32.06)	(0.21)	(28.60)	(32.74)	(0.13)
Service	Large	58.73	61.45	−2.72	57.34	61.82	−4.48
		(17.19)	(16.39)	(0.00)	(22.52)	(19.97)	(0.00)
	Mid	59.12	62.60	−3.48	58.43	63.93	−5.51
		(18.45)	(16.06)	(0.00)	(24.28)	(20.14)	(0.00)
	Small	60.11	60.70	−0.58	60.11	61.43	−1.32
		(17.66)	(15.15)	(0.11)	(23.89)	(18.88)	(0.00)
	Private	56.32	60.18	−3.85	55.20	59.57	−4.37
		(18.62)	(15.11)	(0.00)	(22.41)	(19.42)	(0.00)
Resource	Large	48.66	47.49	1.17	46.72	46.06	0.66
		(12.42)	(11.60)	(0.25)	(18.11)	(10.14)	(0.41)
	Mid	48.19	49.27	−1.08	46.70	47.44	−0.74
		(13.27)	(12.78)	(0.28)	(14.08)	(15.31)	(0.47)
	Small	48.28	45.46	2.82	45.98	44.26	1.72
		(14.48)	(12.24)	(0.00)	(22.73)	(13.45)	(0.03)
	Private	47.95	51.21	−3.27	45.32	49.43	−4.11
		(13.07)	(12.19)	(0.00)	(14.40)	(16.80)	(0.00)
Manufacture	Large	51.18	51.92	−0.73	49.34	51.39	−2.05
		(15.14)	(13.35)	(0.11)	(24.49)	(20.12)	(0.00)
	Mid	51.24	51.71	−0.47	49.58	51.32	−1.74
		(14.41)	(13.58)	(0.12)	(23.20)	(19.60)	(0.00)
	Small	50.22	49.31	0.91	49.66	49.33	0.33
		(15.03)	(13.74)	(0.00)	(23.56)	(18.31)	(0.11)
	Private	49.11	51.49	−2.38	47.40	50.80	−3.40
		(13.49)	(13.18)	(0.00)	(17.48)	(18.86)	(0.00)

Notes. The table summarizes cross metrics, reported as counts by industry group and size class at the CPC Subclass level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

Table B36: Cross Metrics by Industry and Size: CPC Group, in Counts

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	60.29	59.39	0.90	57.46	58.30	−0.84
		(18.73)	(18.92)	(0.49)	(21.99)	(21.75)	(0.56)
	Mid	57.20	66.18	−8.99	53.88	64.60	−10.72
		(17.70)	(19.54)	(0.00)	(20.00)	(19.91)	(0.00)
	Small	53.87	63.61	−9.74	51.43	59.80	−8.37
		(14.81)	(24.01)	(0.00)	(16.77)	(27.82)	(0.00)
	Private	54.33	53.15	1.18	51.60	47.63	3.97
		(16.31)	(17.24)	(0.58)	(17.61)	(20.09)	(0.05)
Service	Large	51.01	53.63	−2.62	49.85	53.65	−3.80
		(14.45)	(14.07)	(0.00)	(19.45)	(16.91)	(0.00)
	Mid	51.41	54.58	−3.17	50.23	55.15	−4.93
		(16.25)	(13.99)	(0.00)	(21.14)	(18.51)	(0.00)
	Small	52.08	52.05	0.04	51.03	52.07	−1.04
		(15.48)	(13.61)	(0.92)	(20.99)	(17.87)	(0.01)
	Private	48.88	51.82	−2.94	47.46	51.45	−3.99
		(15.00)	(13.25)	(0.00)	(18.92)	(17.72)	(0.00)
Resource	Large	43.52	43.32	0.20	43.03	42.23	0.80
		(10.15)	(12.52)	(0.81)	(12.35)	(10.09)	(0.31)
	Mid	43.08	42.97	0.11	42.69	41.84	0.84
		(10.08)	(10.42)	(0.88)	(11.96)	(14.69)	(0.39)
	Small	42.41	39.45	2.96	40.90	38.65	2.25
		(11.59)	(10.60)	(0.00)	(16.49)	(13.46)	(0.00)
	Private	42.89	45.07	−2.18	41.06	44.24	−3.19
		(10.59)	(10.37)	(0.00)	(12.09)	(12.62)	(0.00)
Manufacture	Large	43.54	43.00	0.54	42.59	42.74	−0.16
		(12.14)	(11.03)	(0.17)	(17.26)	(15.48)	(0.74)
	Mid	43.05	42.44	0.60	42.67	42.20	0.46
		(11.69)	(11.26)	(0.02)	(17.20)	(15.52)	(0.13)
	Small	41.55	39.90	1.65	41.61	39.93	1.68
		(12.39)	(11.35)	(0.00)	(17.69)	(14.76)	(0.00)
	Private	41.61	42.05	−0.44	40.63	41.88	−1.26
		(10.83)	(10.94)	(0.04)	(14.76)	(15.58)	(0.00)

Notes. The table summarizes cross metrics, reported as counts by industry group and size class at the CPC Group level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

Table B37: Cross Metrics by Industry and Size: CPC Patent, in Counts

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	52.35	51.35	1.01	50.82	50.35	0.47
		(15.89)	(17.65)	(0.38)	(20.81)	(24.66)	(0.77)
	Mid	51.13	51.75	−0.62	49.13	48.37	0.76
		(16.23)	(21.53)	(0.79)	(21.66)	(27.29)	(0.81)
	Small	49.40	49.23	0.18	47.38	49.16	−1.78
		(15.35)	(23.31)	(0.91)	(19.83)	(32.88)	(0.38)
	Private	47.91	48.44	−0.53	46.37	44.48	1.89
		(15.75)	(18.98)	(0.77)	(19.20)	(25.54)	(0.40)
Service	Large	46.42	39.83	6.59	44.61	37.33	7.28
		(15.96)	(15.14)	(0.00)	(23.38)	(20.12)	(0.00)
	Mid	46.63	39.38	7.25	45.34	37.17	8.17
		(16.11)	(15.05)	(0.00)	(22.44)	(19.23)	(0.00)
	Small	46.00	38.52	7.48	44.95	36.34	8.60
		(15.93)	(14.05)	(0.00)	(22.32)	(18.71)	(0.00)
	Private	43.48	40.45	3.03	41.66	38.07	3.59
		(15.57)	(14.87)	(0.00)	(20.97)	(21.05)	(0.00)
Resource	Large	46.93	46.62	0.31	48.08	45.38	2.69
		(9.68)	(10.72)	(0.68)	(11.62)	(13.04)	(0.00)
	Mid	47.51	46.01	1.50	48.36	45.51	2.85
		(10.44)	(12.44)	(0.06)	(12.59)	(16.15)	(0.00)
	Small	46.62	41.47	5.14	46.84	41.42	5.42
		(11.39)	(13.75)	(0.00)	(14.97)	(21.88)	(0.00)
	Private	46.13	45.29	0.83	46.68	46.11	0.57
		(11.38)	(12.69)	(0.22)	(14.41)	(15.27)	(0.48)
Manufacture	Large	42.23	36.01	6.22	43.22	35.38	7.84
		(12.84)	(13.08)	(0.00)	(16.29)	(18.85)	(0.00)
	Mid	41.16	33.88	7.28	41.66	32.50	9.17
		(12.48)	(12.84)	(0.00)	(16.78)	(18.80)	(0.00)
	Small	36.59	30.56	6.03	36.04	28.36	7.68
		(13.18)	(11.68)	(0.00)	(20.10)	(15.78)	(0.00)
	Private	37.24	34.45	2.79	36.53	32.21	4.32
		(12.46)	(12.33)	(0.00)	(17.99)	(17.16)	(0.00)

Notes. The table summarizes cross metrics, reported as counts by industry group and size class at the CPC Patent level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

Table B38: Cross Metrics by Industry and Size: CPC Section, in Fractions

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	2.20	2.70	−0.50	0.00	0.00	0.00
		(5.31)	(5.56)	(0.16)	(0.00)	(0.00)	(1.00)
	Mid	2.51	5.07	−2.56	0.00	0.00	0.00
		(5.75)	(7.31)	(0.00)	(0.00)	(14.31)	(1.00)
	Small	2.20	4.32	−2.11	0.00	0.00	0.00
		(5.47)	(6.31)	(0.00)	(0.00)	(10.48)	(1.00)
	Private	2.43	5.03	−2.60	0.00	0.00	0.00
		(5.54)	(6.49)	(0.00)	(0.00)	(11.45)	(1.00)
Service	Large	9.88	11.49	−1.61	12.40	13.99	−1.58
		(7.00)	(5.86)	(0.00)	(15.16)	(5.96)	(0.00)
	Mid	9.59	11.49	−1.90	11.98	14.16	−2.17
		(7.03)	(5.96)	(0.00)	(15.25)	(5.97)	(0.00)
	Small	9.76	11.48	−1.72	12.33	13.56	−1.23
		(7.00)	(5.58)	(0.00)	(15.25)	(5.94)	(0.00)
	Private	9.65	11.28	−1.62	12.13	13.56	−1.43
		(6.75)	(5.80)	(0.00)	(15.05)	(5.66)	(0.00)
Resource	Large	11.64	10.98	0.67	11.81	11.01	0.80
		(4.05)	(4.07)	(0.03)	(4.42)	(2.90)	(0.03)
	Mid	10.73	11.18	−0.45	10.85	11.12	−0.27
		(4.44)	(4.04)	(0.17)	(4.29)	(4.02)	(0.22)
	Small	10.69	10.25	0.44	10.84	10.87	−0.04
		(4.46)	(4.20)	(0.08)	(4.29)	(3.84)	(0.51)
	Private	10.87	11.45	−0.58	11.14	12.03	−0.89
		(4.11)	(4.05)	(0.02)	(3.86)	(4.71)	(0.00)
Manufacture	Large	11.64	12.24	−0.60	11.15	12.53	−1.38
		(4.73)	(3.99)	(0.00)	(5.80)	(5.42)	(0.00)
	Mid	12.07	12.23	−0.16	11.67	12.71	−1.04
		(4.11)	(3.76)	(0.08)	(5.14)	(4.96)	(0.00)
	Small	11.93	11.73	0.20	11.80	12.11	−0.32
		(4.25)	(3.80)	(0.00)	(5.63)	(5.49)	(0.00)
	Private	11.64	11.57	0.07	11.69	11.58	0.11
		(3.86)	(3.41)	(0.29)	(4.79)	(4.77)	(0.24)

Notes. The table summarizes cross metrics, reported as fractions by industry group and size class at the CPC Section level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

Table B39: Cross Metrics by Industry and Size: CPC Class, in Fractions

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	13.23	13.92	−0.68	16.04	15.53	0.51
		(8.32)	(8.51)	(0.22)	(11.48)	(11.78)	(0.43)
	Mid	13.09	14.58	−1.49	15.57	17.58	−2.01
		(8.35)	(8.51)	(0.21)	(12.06)	(11.58)	(0.09)
	Small	15.12	15.34	−0.21	16.91	16.00	0.91
		(7.28)	(8.38)	(0.80)	(7.37)	(7.55)	(0.20)
	Private	13.36	11.24	2.12	15.55	11.27	4.28
		(7.77)	(7.63)	(0.03)	(9.17)	(7.88)	(0.00)
Service	Large	14.44	15.83	−1.38	14.55	16.54	−1.99
		(4.40)	(4.25)	(0.00)	(5.84)	(4.94)	(0.00)
	Mid	14.34	16.26	−1.92	14.50	16.78	−2.28
		(4.79)	(4.36)	(0.00)	(6.42)	(4.56)	(0.00)
	Small	14.58	15.59	−1.01	14.89	16.25	−1.36
		(4.57)	(4.10)	(0.00)	(6.15)	(5.09)	(0.00)
	Private	13.55	15.21	−1.66	13.81	15.51	−1.70
		(4.87)	(3.93)	(0.00)	(6.16)	(4.86)	(0.00)
Resource	Large	11.19	10.80	0.39	10.81	10.69	0.12
		(2.56)	(2.60)	(0.05)	(3.47)	(2.08)	(0.46)
	Mid	10.94	10.95	−0.00	10.66	10.50	0.16
		(2.86)	(2.34)	(0.99)	(2.76)	(2.27)	(0.24)
	Small	10.91	10.85	0.06	10.37	10.35	0.03
		(2.94)	(2.35)	(0.73)	(3.85)	(3.02)	(0.82)
	Private	10.94	11.85	−0.91	10.42	11.49	−1.07
		(2.77)	(2.57)	(0.00)	(3.14)	(3.16)	(0.00)
Manufacture	Large	11.83	12.58	−0.74	11.06	12.29	−1.23
		(3.44)	(3.17)	(0.00)	(5.22)	(4.81)	(0.00)
	Mid	11.90	12.48	−0.58	11.05	12.22	−1.16
		(3.13)	(3.20)	(0.00)	(4.89)	(4.78)	(0.00)
	Small	11.93	12.04	−0.11	11.36	11.74	−0.39
		(3.29)	(3.07)	(0.00)	(5.19)	(4.59)	(0.00)
	Private	11.67	12.04	−0.38	11.04	11.56	−0.52
		(3.07)	(2.83)	(0.00)	(4.22)	(4.31)	(0.00)

Notes. The table summarizes cross metrics, reported as fractions by industry group and size class at the CPC Class level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

Table B40: Cross Metrics by Industry and Size: CPC Subclass, in Fractions

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	16.50	16.67	−0.17	15.84	16.09	−0.25
		(6.97)	(6.96)	(0.73)	(6.53)	(6.69)	(0.49)
	Mid	16.04	19.50	−3.46	15.42	18.97	−3.54
		(6.73)	(6.48)	(0.00)	(6.68)	(6.06)	(0.00)
	Small	15.54	18.28	−2.74	15.27	17.20	−1.93
		(5.41)	(6.99)	(0.00)	(5.91)	(7.92)	(0.00)
	Private	15.59	14.74	0.85	14.98	13.80	1.18
		(6.46)	(7.51)	(0.30)	(6.20)	(7.28)	(0.10)
Service	Large	13.66	14.51	−0.84	13.36	14.79	−1.43
		(3.75)	(3.66)	(0.00)	(4.91)	(4.52)	(0.00)
	Mid	13.74	14.76	−1.02	13.51	15.12	−1.61
		(4.08)	(3.64)	(0.00)	(5.50)	(4.72)	(0.00)
	Small	13.95	14.19	−0.24	13.87	14.39	−0.53
		(3.89)	(3.40)	(0.00)	(5.32)	(4.40)	(0.00)
	Private	13.12	13.97	−0.85	12.82	13.89	−1.08
		(4.17)	(3.38)	(0.00)	(4.90)	(4.37)	(0.00)
Resource	Large	11.29	11.06	0.24	10.84	10.75	0.10
		(2.60)	(2.45)	(0.27)	(3.57)	(1.98)	(0.61)
	Mid	11.21	11.44	−0.23	10.83	10.98	−0.15
		(2.82)	(2.70)	(0.30)	(2.88)	(3.04)	(0.46)
	Small	11.24	10.68	0.56	10.68	10.42	0.26
		(3.04)	(2.56)	(0.00)	(4.54)	(2.69)	(0.14)
	Private	11.17	11.82	−0.65	10.57	11.35	−0.78
		(2.80)	(2.53)	(0.00)	(2.95)	(3.48)	(0.00)
Manufacture	Large	11.91	12.07	−0.16	11.49	11.90	−0.41
		(3.19)	(2.81)	(0.09)	(4.97)	(4.20)	(0.00)
	Mid	11.91	12.00	−0.09	11.51	11.87	−0.36
		(2.99)	(2.86)	(0.14)	(4.68)	(4.05)	(0.00)
	Small	11.67	11.48	0.19	11.52	11.46	0.06
		(3.15)	(2.89)	(0.00)	(4.81)	(3.87)	(0.20)
	Private	11.45	11.91	−0.46	11.08	11.73	−0.65
		(2.88)	(2.77)	(0.00)	(3.70)	(4.00)	(0.00)

Notes. The table summarizes cross metrics, reported as fractions by industry group and size class at the CPC Subclass level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

Table B41: Cross Metrics by Industry and Size: CPC Group, in Fractions

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	13.99	14.02	−0.02	13.28	13.37	−0.09
		(4.30)	(4.32)	(0.93)	(5.03)	(4.87)	(0.78)
	Mid	13.37	15.62	−2.25	12.54	15.25	−2.70
		(4.03)	(4.60)	(0.00)	(4.50)	(4.70)	(0.00)
	Small	12.57	15.04	−2.47	11.95	13.81	−1.87
		(3.33)	(5.65)	(0.00)	(3.55)	(6.36)	(0.00)
	Private	12.62	12.53	0.09	11.96	11.02	0.95
		(3.72)	(4.06)	(0.85)	(3.86)	(4.80)	(0.03)
Service	Large	11.88	12.67	−0.79	11.61	12.76	−1.15
		(3.17)	(3.14)	(0.00)	(4.35)	(3.94)	(0.00)
	Mid	11.96	12.88	−0.92	11.58	13.05	−1.47
		(3.62)	(3.18)	(0.00)	(4.83)	(4.33)	(0.00)
	Small	12.09	12.17	−0.08	11.78	12.21	−0.42
		(3.44)	(3.08)	(0.28)	(4.76)	(4.31)	(0.00)
	Private	11.40	12.03	−0.64	11.01	11.93	−0.91
		(3.37)	(2.97)	(0.00)	(4.21)	(4.08)	(0.00)
Resource	Large	10.11	10.08	0.03	10.01	9.79	0.22
		(2.14)	(2.73)	(0.88)	(2.51)	(2.16)	(0.17)
	Mid	10.04	9.98	0.06	9.95	9.67	0.28
		(2.16)	(2.20)	(0.75)	(2.46)	(3.12)	(0.13)
	Small	9.89	9.27	0.62	9.55	9.13	0.42
		(2.42)	(2.22)	(0.00)	(3.27)	(2.83)	(0.01)
	Private	10.00	10.41	−0.41	9.62	10.25	−0.63
		(2.26)	(2.15)	(0.01)	(2.54)	(2.71)	(0.00)
Manufacture	Large	10.14	10.00	0.14	9.97	9.92	0.05
		(2.60)	(2.34)	(0.08)	(3.53)	(3.25)	(0.63)
	Mid	10.01	9.85	0.16	9.91	9.77	0.15
		(2.43)	(2.40)	(0.00)	(3.49)	(3.25)	(0.03)
	Small	9.66	9.29	0.37	9.68	9.27	0.40
		(2.62)	(2.42)	(0.00)	(3.64)	(3.14)	(0.00)
	Private	9.71	9.73	−0.02	9.49	9.67	−0.18
		(2.32)	(2.32)	(0.68)	(3.15)	(3.31)	(0.00)

Notes. The table summarizes cross metrics, reported as fractions by industry group and size class at the CPC Group level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

Table B42: Cross Metrics by Industry and Size: CPC Patent, in Fractions

Industry Group	Size Class	Mean Rate			Median Rate		
		NP	P	Diff	NP	P	Diff
Finance	Large	12.16	12.12	0.04	11.74	11.87	−0.14
		(3.58)	(4.00)	(0.87)	(4.49)	(5.23)	(0.68)
	Mid	11.97	12.24	−0.27	11.39	11.82	−0.44
		(3.68)	(5.03)	(0.57)	(4.62)	(6.14)	(0.45)
	Small	11.55	11.65	−0.10	10.97	11.89	−0.92
		(3.50)	(5.44)	(0.78)	(4.28)	(7.08)	(0.03)
	Private	11.14	11.42	−0.28	10.67	10.21	0.45
		(3.62)	(4.41)	(0.53)	(4.31)	(5.80)	(0.35)
Service	Large	10.82	9.40	1.42	10.36	8.95	1.41
		(3.54)	(3.36)	(0.00)	(4.96)	(4.46)	(0.00)
	Mid	10.87	9.28	1.58	10.53	8.78	1.74
		(3.57)	(3.38)	(0.00)	(4.79)	(4.29)	(0.00)
	Small	10.69	9.00	1.69	10.45	8.55	1.91
		(3.54)	(3.16)	(0.00)	(4.79)	(4.21)	(0.00)
	Private	10.14	9.38	0.76	9.74	8.85	0.89
		(3.51)	(3.35)	(0.00)	(4.68)	(4.72)	(0.00)
Resource	Large	10.95	10.88	0.06	11.13	10.55	0.58
		(2.03)	(2.34)	(0.69)	(2.33)	(2.87)	(0.00)
	Mid	11.11	10.73	0.38	11.24	10.65	0.59
		(2.25)	(2.78)	(0.03)	(2.63)	(3.23)	(0.00)
	Small	10.92	9.77	1.14	10.93	9.81	1.12
		(2.41)	(3.05)	(0.00)	(3.10)	(4.93)	(0.00)
	Private	10.78	10.47	0.31	10.89	10.68	0.21
		(2.50)	(2.76)	(0.05)	(3.11)	(3.43)	(0.23)
Manufacture	Large	9.91	8.41	1.50	10.10	8.24	1.86
		(2.90)	(2.94)	(0.00)	(3.68)	(4.25)	(0.00)
	Mid	9.64	7.90	1.74	9.77	7.54	2.23
		(2.80)	(2.89)	(0.00)	(3.71)	(4.25)	(0.00)
	Small	8.55	7.14	1.41	8.42	6.62	1.80
		(2.92)	(2.61)	(0.00)	(4.53)	(3.40)	(0.00)
	Private	8.71	7.98	0.74	8.56	7.49	1.08
		(2.80)	(2.72)	(0.00)	(4.10)	(3.81)	(0.00)

Notes. The table summarizes cross metrics, reported as fractions by industry group and size class at the CPC Patent level. NP and P columns show statistics for non-patenting and patenting firms, respectively, and Diff columns show the difference between them. Means and medians are computed from firm-year observations for the period 1997 to 2023. Standard deviations and interquartile ranges are reported below means and medians, respectively. P-values, reported below differences, are based on 1,000 bootstrap iterations under the null that both groups are drawn from the same distribution. In each iteration, we sample with replacement from the pooled data, compute the difference in means and medians, and report the p-value as the proportion of iterations where the absolute resampled difference exceeds or equals the observed value.

B.5 Technology Momentum

Table B43: Technology Momentum Monthly Alpha by Factor Model

		Non-Patenting Firms					Patenting Firms				
	Decile	One	Three	Four	Five	Six	One	Three	Four	Five	Six
Equal-Weighted	High	0.90	0.84	0.89	0.83	0.87	0.71	0.68	0.74	0.81	0.86
		(3.10)	(3.55)	(3.75)	(3.38)	(3.55)	(1.71)	(2.07)	(2.24)	(2.56)	(2.71)
	Low	−1.34	−1.39	−1.24	−1.27	−1.17	−0.37	−0.40	−0.28	−0.22	−0.14
		(−4.38)	(−5.07)	(−4.66)	(−4.55)	(−4.32)	(−1.24)	(−1.46)	(−1.04)	(−0.76)	(−0.50)
	High–Low	2.08	2.07	1.97	1.94	1.88	0.93	0.93	0.87	0.87	0.84
		(5.01)	(4.98)	(4.74)	(4.57)	(4.43)	(1.75)	(1.82)	(1.69)	(1.69)	(1.63)
Value-Weighted	High	0.57	0.56	0.51	0.49	0.46	0.22	0.25	0.24	0.15	0.16
		(2.46)	(2.41)	(2.22)	(2.05)	(1.93)	(0.83)	(0.94)	(0.92)	(0.58)	(0.61)
	Low	−0.45	−0.46	−0.38	−0.43	−0.37	0.18	0.20	0.27	0.24	0.29
		(−1.87)	(−1.89)	(−1.58)	(−1.71)	(−1.51)	(0.72)	(0.78)	(1.06)	(0.93)	(1.13)
	High–Low	0.86	0.86	0.74	0.76	0.68	−0.11	−0.10	−0.18	−0.25	−0.29
		(2.19)	(2.17)	(1.88)	(1.86)	(1.68)	(−0.26)	(−0.24)	(−0.42)	(−0.57)	(−0.66)

Notes. The table shows monthly alpha in percentage points from factor models estimated using monthly returns from 1998 to 2023 for equal-weighted and value-weighted technology momentum portfolios, for patent-owning and non-owning firms. The five models we estimate are: 1) a market model (MKT), 2) a three-factor market, size, and value model (MKT, SMB, HML), 3) a four-factor market, size, value, and momentum model (MKT, SMB, HML, MOM), 4) a five-factor market, size, value, profitability, and investment model (MKT, SMB, HML, RMW, CMA), and 5) a six-factor market, size, value, profitability, investment, and momentum model (MKT, SMB, HML, RMW, CMA, MOM). Each sub-table shows factor loadings for high-decile and low-decile portfolios, as well as for a high-minus-low portfolio. T-statistics are reported in parentheses under each alpha estimate.

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