

Online Appendix

to “Revealed Preference Analysis of Hicks-Neutral Productivity”

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This online appendix supports the empirical application in Section 6 of the paper. Section B.1 gives the variable construction, Section B.2 the numerical implementation, Section B.3 supplementary results (the sector summary, the decade pattern of interval widths, the capital-price specification, the random-allocation benchmarks, joint-test certificates, and sharp constant-returns path bounds), and Section B.4 the interpretation and limitations of the results. Sections B.5 and B.6 report the complete industry-level results: a per-industry summary table and the marginal intervals for every industry-year. Both report marginal, that is coordinatewise, intervals. Each is a projection of the joint identified set onto a single year and serves to localize where and when a published series departs from the model; lying inside every marginal interval is necessary but not sufficient for the complete profile to be rationalizable, which is decided by the exact joint test of the paper (Table 2). Machine-readable bounds, including the capital-price variants, are in the replication package. References to numbered objects without the prefix B are to the main paper.

B.1 Data Construction

Table B.1 maps the NBER-CES fields to the theory objects. Output is real gross shipments rather than value added, matching the output concept in `tfp5`. Labor is split into production-worker hours and non-production employment because the database prices them differently: production workers have an observed wage bill and hours, while non-production labor is priced by residual payroll per worker. The Census cost of materials includes purchased fuels and electricity, so real energy is netted out of real total materials, exactly as in the database’s five-factor input definitions, and the materials price is the implicit deflator of the resulting quantity. This avoids double counting while preserving the cost identity exactly: by construction $c_t = \sum_i w_{it}x_{it}$ equals `pay` + `matcost`, the industry’s variable-input outlay, and the identity holds on the constructed panel with a largest relative error of 3.6×10^{-16} . All four inputs are strictly positive in every usable industry-year.

Capital. The database contains a real capital stock, available only through 2016, but no rental price of capital; a user cost rests on auxiliary choices of a rate of return and a depreciation schedule. The baseline therefore treats capital as quasi-fixed. Observed

Table B.1: Variable construction

Object	Construction	Description
y	<code>vship/piship</code>	real gross output (shipments)
x_L	<code>prodh</code>	production-worker hours
x_N	<code>emp - prode</code>	non-production workers
x_E	<code>energy/pien</code>	real energy
x_M	<code>matcost/pimat - energy/pien</code>	real non-energy materials
w_L	<code>prodw/prodh</code>	wage per production-worker hour
w_N	<code>(pay - prodw)/(emp - prode)</code>	non-production payroll per worker
w_E	<code>pien</code>	energy deflator
w_M	<code>(matcost - energy)/x_M</code>	implicit non-energy materials deflator

Notes: Typewriter entries are NBER-CES field names: `vship` (nominal value of shipments) and `piship` (its price deflator); `prodh` (production-worker hours) and `prodw` (their wage bill); `emp` (total employment) and `prode` (production workers); `pay` (total payroll); `matcost` (total materials cost, including purchased fuels and electricity) and `pimat` (its deflator); `energy` (cost of purchased fuels and electricity) and `pien` (its deflator). Monetary variables are in millions of current dollars, employment in thousands, production-worker hours in millions, and deflators equal one in 2012.

input choices then solve a short-run cost-minimization problem over the four variable inputs, conditional on output and the capital stock, and the common technology is properly $F(x; K_t)$. Using a single capital-free $F(x)$ requires capital differences across years either not to shift the variable-input technology or to be absorbed by the Hicks-neutral scalar. Section B.3.2 prices capital as a fifth variable input instead; this changes the maintained technology and is an alternative specification rather than a resolution of the issue.

Price normalization. Rescaling $w_t \mapsto \alpha_t w_t$ with $\alpha_t > 0$ rescales c_t in proportion, leaves the revealed-feasibility relation unchanged, and is absorbed by the Afriat multiplier $\lambda_t \mapsto \lambda_t/\alpha_t$. Nominal prices can therefore be used as they are; what the analysis requires is that relative input prices within each year be correctly measured.

Supports. The published index ends in 2016. The common support (28) is therefore 1958–2016 for 361 industries and 1997–2016 for the three late entrants, while the full input-data support used for the marginal bounds runs through 2018. Dropping 2017 and 2018 removes restrictions, which is why production GARP passes in 192 industries on the common support and 186 on the full support.

B.2 Numerical Implementation

Production GARP. We compute normalized cross-costs $v_s \cdot x_t$ with $v_s = w_s/c_s$ and treat dimensionless gaps $|v_s \cdot x_t - 1| \leq 10^{-12}$ as equal expenditure. Production GARP fails when the transitive closure of affordability reaches an observation with a strictly cheaper return edge. An independent Afriat feasibility program cross-checks every verdict. Its unrestricted system is homogeneous in technology levels and multipliers, so positivity may be imposed as $U_t \geq 1$, $\gamma_t \geq 1$ after the change of variables $\gamma_t = \lambda_t c_t$. A solver failure is recorded as

indeterminate and is never counted as an economic rejection; none occurs.

The joint test. For each industry we set $\hat{\theta}_t = \mathbf{tfp5}_t$ and $\hat{U}_t = y_t/\hat{\theta}_t$, rescaled so that $\hat{U}_{2012} = 1$, which affects conditioning but not the verdict (Remark 3). The closed form of Corollary 2 needs $O(T^2)$ arithmetic; we record the source year and target years supplying each violation. The slack program (8) is solved as a cross-check, with positivity imposed through κ : a fixed floor such as $\lambda_s \geq 1$ is legitimate only in the unrestricted test, where U is free, and would test a stricter condition once $\hat{U}$ is fixed. The two agree for all 364 industries. We also check the fixed-profile CRS condition (27) for all ordered pairs and record the largest violation. The code asserts the nesting of the four tests on each common support: the fixed-profile CRS test implies the general joint test and the cycle condition, and the joint test implies production GARP. No violation occurs.

Marginal bounds. For conditioning the closure programs use $u_t = U_t/y_r$ and $\gamma_t = \lambda_t c_t/y_r$, with $u_r = 1$, and divide each constraint row by the larger of one and its largest absolute coefficient. Primal and dual feasibility tolerances are set to 10^{-9} ; they impose no economic restriction. Each solution is checked against the scaled constraints with a residual threshold of 10^{-8} ; a failure triggers a fresh-basis retry at 10^{-10} or stops the computation. The model and basis are reused across objectives, and statuses, retries, and maximum residuals are saved. Each complete 61-year industry contributes $2(T-1) = 120$ programs in $2T = 122$ variables with $T(T-1) + T = 3,721$ inequality constraints. In the baseline, all 22,086 programs solve without a retry, with a largest scaled residual of 3.2×10^{-9} ; the three capital specifications have largest residuals below 6×10^{-9} . By Proposition 3, an unbounded program cannot arise in a rationalizable dataset. We report closure intervals; whether a particular empirical endpoint is attained by strictly positive multipliers is not checked.

Constant returns. With $b_{st} = \log(y_t/y_s) - \log(v_s \cdot x_t)$, a max-plus Floyd–Warshall pass detects any positive cycle and returns all longest-path distances, hence the sharp bounds of Theorem 7. Windows are non-overlapping blocks of consecutive years anchored at the start of each industry’s series.

B.3 Supplementary Results

B.3.1 Sector summary and interval widths

Table B.2 aggregates the full-support results by three-digit sector. Pass rates are lowest in nonmetallic minerals (2 of 18), beverage and tobacco (1 of 7), and primary metals (3 of 18), and highest in textile mills (7 of 7) and textile products (4 of 5). Violations concentrate where the bounds are tight: sectors with narrow median intervals, such as primary metals, food, and chemicals, have the highest above-bound shares, while sectors with wide intervals, such as apparel and leather, rarely reject the published index. Table B.3 reports the decline of median widths toward the 2012 reference.

Table B.2: Sector-level summary of the empirical results

Sector (NAICS 3-digit)	Industries	Pass	Median width	Inside	Above
311 Food	43	20	0.06	14%	69%
312 Beverage and tobacco	7	1	0.00	3%	21%
313 Textile mills	7	7	1.06	51%	15%
314 Textile products	5	4	0.33	61%	12%
315 Apparel	7	5	3.18	96%	3%
316 Leather	4	2	2.38	96%	3%
321 Wood	14	8	0.32	32%	45%
322 Paper	11	5	0.15	34%	53%
323 Printing	4	3	0.14	25%	53%
324 Petroleum and coal	5	2	0.48	2%	94%
325 Chemicals	29	14	0.13	11%	74%
326 Plastics and rubber	16	7	0.23	18%	67%
327 Nonmetallic minerals	18	2	0.18	25%	55%
331 Primary metals	18	3	0.00	1%	74%
332 Fabricated metals	36	15	0.06	11%	70%
333 Machinery	40	25	0.12	19%	63%
334 Computer and electronics	24	18	0.27	34%	55%
335 Electrical equipment	21	14	0.10	26%	44%
336 Transportation equipment	27	15	0.30	24%	57%
337 Furniture	12	9	0.12	25%	50%
339 Miscellaneous	16	7	0.32	22%	47%
All manufacturing	364	186	0.15	26%	55%

Notes: “Pass” counts six-digit industries satisfying production GARP over the full input-data support. “Median width” is the median across passing industries of each industry’s median interval width. “Inside” and “Above” classify the published **tfp5** relative to the marginal interval across non-reference industry-years of passing industries. Section B.5 gives the industry rows.

Table B.3: Median width of the marginal interval by decade

Decade	1950s	1960s	1970s	1980s	1990s	2000s	2010s
Median width	0.26	0.23	0.20	0.17	0.14	0.10	0.04

Notes: GARP-passing industries, reference year 2012. Width is $y_t/\underline{U}_t - y_t/\overline{U}_t$. The comparison changes the target year while holding the dataset fixed, so it is not the comparative static of Proposition 5.

B.3.2 Capital as a priced input

The five-input specification adds the real capital stock with user-cost price $w_K = \text{piinv} \cdot \kappa$, where the deflator `piinv` prices investment goods and $\kappa = r + \delta$ combines the required return and the depreciation rate. The capital series ends in 2016, so the exercise also changes the observation support. Table B.4 reports the grid. The higher GARP pass counts are an empirical finding rather than a consequence of a nesting theorem: an additional priced input changes own and cross expenditures and can create or remove affordability relations. The share above the upper bound stays above one-half for every κ considered; this is robustness within the grid, not evidence that arbitrary capital-price assumptions leave the conclusion unchanged.

Table B.4: Pricing capital services

κ	GARP pass	tfp5 obs.	Inside	Below	Above
0.08	219 / 364	12,624	26.5%	18.7%	54.8%
0.10	229 / 364	13,204	25.0%	17.8%	57.2%
0.15	232 / 364	13,378	24.7%	17.1%	58.2%

Notes: Sample through 2016. “Inside,” “Below,” and “Above” classify the published `tfp5` relative to the marginal interval across non-reference industry-years of passing industries. Baseline four-input shares: 25.7%, 19.2%, 55.1%.

B.3.3 Random-allocation benchmarks

Following Bronars (1987), each artificial dataset holds the observed (w_t, c_t) fixed, draws cost shares s_t uniformly on the simplex, and sets $\tilde{x}_t^\ell = s_t^\ell c_t / w_t^\ell$, so every draw lies on the observed cost hyperplane. Table B.5 applies production GARP and Table B.6 the CRS cycle condition, each to 1,000 artificial datasets per horizon. The two experiments use the same allocation rule but independent seeds and different horizon grids; within each, observed and random windows come from the same sampling pool, and the seeds are fixed in the replication code. The GARP benchmark says nothing about the stricter CRS test, which is why the second experiment is needed. At two years random data pass the CRS test 56.3% of the time, so the test has limited power at that horizon; from five years on random data almost never pass.

Table B.5: Power of the production-GARP test against random cost allocation

Window length (years)	5	10	20	40	61
Random data passing (%)	70.0	30.6	5.0	0.0	0.0
Observed data passing (%)	99.5	96.4	87.9	67.6	51.1

Notes: Observed pass rates are computed on non-overlapping windows of the stated length. These are descriptive pass rates, not rejection probabilities at a specified significance level.

Table B.6: Power of the CRS cycle test against random cost allocation

Window length (years)	2	5	10	15
Random data passing (%)	56.3	1.0	0.0	0.0
Observed data passing (%)	74.5	19.2	2.3	0.9

Notes: The CRS-specific Bronars benchmark: random datasets hold observed input prices and total cost fixed and reallocate cost across inputs by a uniform draw on the simplex, and the cycle condition (25) of Theorem 7 is applied on the same non-overlapping windows as the observed CRS test. The cycle condition is output-independent, so no productivity profile enters.

B.3.4 Joint-test certificates

On the common support the closed-form verdicts of Corollary 2 agree with the slack program (8) for all 364 industries. In the two joint-only industries, NAICS 335222 and 335224, the closed-form conditions fail at 53 and 51 of the 59 source years, respectively, so the conflict is not confined to a single pair of dates. At the earliest failing source, 1958, a bundle that was strictly cheaper at 1958 prices (2007 for NAICS 335222, 1987 for 335224) is assigned a higher normalized output, so no positive supporting multiplier exists. In the projection of Figure 2, the published point for NAICS 335222 is (0.763, 1.077).

B.3.5 Sharp constant-returns path bounds

The main paper’s table of bilateral and sharp path bounds summarizes the comparison on CRS-passing windows.

Two observable pairwise statistics remain informative as descriptions when the full system fails. On average across industries, the ranking criterion of Corollary 5 holds for 47.7% of ordered year pairs, and the product test of Corollary 6 refutes constant returns, at any productivity profile, for 17.1% of year pairs. Because the full CRS system is empty in every industry, the first figure is the frequency of an observable inequality, not an identified ranking; the conditional interpretation applies on the short windows where CRS holds.

Figure B.1 shows the CRS-passing window with the largest gap between the bilateral and sharp intervals. The sharp interval is far narrower than the bilateral one late in the window, and from 1983 on the published `tfp5` ratio lies inside the bilateral interval but above the sharp one: a bilateral comparison would accept values that the full set of paths rules out.

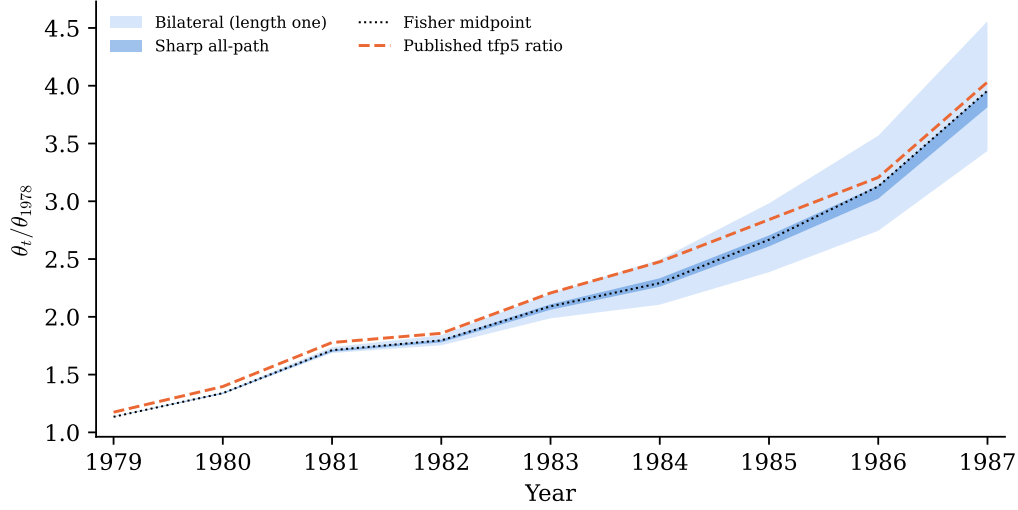


Figure B.1: Bilateral versus sharp CRS bounds: computer storage device manufacturing (NAICS 334112), 1978–1987, the non-overlapping decade window with the largest gap between the bilateral and sharp intervals across all industries. The light band is the length-one bilateral interval $[L^{(1)}, U^{(1)}]$; the darker band is the sharp all-path interval of Theorem 7. The dotted line is the bilateral Fisher midpoint and the dashed line the published `tfp5` ratio; the reference is the first year of the window.

B.4 Interpretation and Limitations

Every rejection reported in the paper is a rejection of a joint maintained model. Where we suggest a leading interpretation, we flag it as such.

First, the joint hypothesis underlying growth accounting fails at long horizons. The Solow residual measures Hicks-neutral technical change only under a common technology, constant returns, and neutral shifts, the joint model of Section 4. That model survives at adjacent-year frequencies but fails in essentially every industry over the decadal horizons at which growth accounting is typically used, and adding constant returns is what turns most passing windows into failures. This reading should be tempered by Basu and Fernald (1997), who find approximately constant returns in comparable U.S. industry data once utilization, aggregation, and imperfect competition are accounted for. Those corrections are precisely the confounds our test cannot separate, so the fragility documented here is fragility of the joint constant-returns model as measured, not evidence that technologies depart from constant returns once they are made.

Second, the direction of the published-index violations is consistent with, though not identified as, revenue-share weighting under imperfect competition (Hall, 1988; De Loecker and Warzynski, 2012; De Loecker et al., 2020): when price exceeds marginal cost, revenue shares understate output elasticities and the residual absorbs the markup, biasing measured productivity upward. Our bounds use cost data only and cannot attribute the wedge to market power. Non-neutral or time-varying technology, omitted inputs, adjustment costs,

measurement error, and the difference between gross-output and value-added concepts are alternative explanations. The bounds locate the wedge by industry and year without adjudicating among them.

Third, the observations are industry aggregates. An aggregate production function exists only under restrictive conditions (Fisher, 1969; Blackorby and Schworm, 1988), and heterogeneous technologies, changing composition, entry and exit, heterogeneous input prices, and product-mix changes can each generate violations unrelated to any producer's behavior. We provide no aggregation theorem, so the exercise applies the inequalities descriptively to industry aggregates rather than testing the behavior of an individual firm. Energy and materials prices are industry deflators rather than transaction prices, and measurement error in relative prices or quantities can distort the revealed-feasibility relation; the power benchmark is not a measurement-error correction. Annual observations are treated as separate cost-minimization problems, although adjustment costs and input commitments can generate static violations under a stable technology. Finally, longer windows test more inequalities, and the horizon comparisons do not net out this mechanical increase in stringency. None of these caveats affects the internal logic of the bounds, which are exact implications of the maintained model; they qualify how its rejections should be read.

B.5 Per-Industry Summary Table

Table B.7 summarizes every GARP-passing industry, grouped by 3-digit NAICS sector. For each industry it reports the number of non-reference industry-years with a published **tfp5** value, the median width of the marginal identified interval for θ_t/θ_{2012} , and the share of industry-years in which **tfp5** lies inside, above, or below that marginal interval. These inside, above, and below shares are coordinatewise localization statistics, not an industry-level acceptance rate: the industry-level verdict on the complete profile is the joint test in the paper. The reference year 2012 is excluded from all table counts, widths, and shares. Median widths use the full non-reference input-data support; the three comparison shares use only non-reference years with published **tfp5**.

Table B.7: Complete per-industry results

NAICS	Industry	Years	Width	Inside	Above	Below
311 Food						
311111	Dog & Cat Food	58	0.15	2%	91%	7%
311119	Other Animal Food	58	0.03	0%	90%	10%
311224	Soybean & Other Oilseed Processing	58	0.02	0%	91%	9%
311225	Fats & Oils Refining & Blending	58	0.10	0%	88%	12%
311313	Beet Sugar	58	0.01	12%	45%	43%
311411	Frozen Fruit, Juice, & Veg.	58	0.09	41%	55%	3%
311422	Specialty Canning	58	0.04	12%	78%	10%
311511	Fluid Milk	58	0.05	57%	31%	12%
311512	Creamery Butter	58	0.04	0%	53%	47%
311513	Cheese	58	0.36	2%	91%	7%
311514	Dry, Condensed, & Evaporated Dairy Prod.	58	0.07	0%	97%	3%
311520	Ice Cream & Frozen Dessert	58	0.02	0%	62%	38%
311710	Seafood Prod. Prep. & Packaging	58	0.18	38%	62%	0%
311811	Retail Bakeries	19	0.13	47%	16%	37%
311812	Comm. Bakeries	58	0.15	88%	12%	0%
311813	Frozen Cakes, Pies, & Other Pastries	58	0.06	0%	90%	10%
311821	Cookie & Cracker	58	0.02	3%	66%	31%
311824	Dry Pasta, Dough, & Flour Mixes Mfg. from Purch. Flour	58	0.03	0%	97%	3%
311911	Roasted Nuts & Peanut Butter	58	0.10	0%	93%	7%
311920	Coffee & Tea	58	0.01	7%	41%	52%
312 Beverage and tobacco						
312120	Breweries	58	0.00	3%	21%	76%
313 Textile mills						
313110	Fiber, Yarn, & Thread Mills	58	0.49	31%	0%	69%
313210	Broadwoven Fabric Mills	58	3.64	91%	7%	2%
313220	Narrow Fabric Mills & Schiffli Machine Embroidery	58	1.06	88%	7%	5%
313230	Nonwoven Fabric Mills	58	0.12	12%	74%	14%
313240	Knit Fabric Mills	58	1.69	83%	16%	2%
313310	Textile & Fabric Finishing Mills	58	1.34	29%	2%	69%
313320	Fabric Coating Mills	58	0.28	26%	0%	74%

(continued)

NAICS	Industry	Years	Width	Inside	Above	Below
314 Textile products						
314110	Carpet & Rug Mills	58	0.36	81%	17%	2%
314120	Curtain & Linen Mills	58	0.80	81%	3%	16%
314994	Rope, Cordage, Twine, Tire Cord, & Tire Fabric Mills	58	0.29	3%	7%	90%
314999	All Other Misc. Textile Prod. Mills	58	0.18	79%	21%	0%
315 Apparel						
315110	Hosiery & Sock Mills	58	2.68	97%	2%	2%
315190	Other Apparel Knitting Mills	58	6.75	97%	2%	2%
315210	Cut & Sew Apparel Contractors	58	1.60	98%	0%	2%
315220	Men's & Boys' Cut & Sew Apparel	58	15.28	93%	7%	0%
315990	Apparel Access. & Other Apparel	58	3.18	93%	7%	0%
316 Leather						
316210	Footwear	58	2.83	95%	2%	3%
316998	All Other Leather Good & Allied Prod.	58	1.92	97%	3%	0%
321 Wood						
321113	Sawmills	58	0.13	29%	2%	69%
321114	Wood Preservation	58	0.12	3%	69%	28%
321213	Engineered Wood Member (exc. Truss)	58	0.52	34%	64%	2%
321214	Truss	58	0.41	31%	62%	7%
321911	Wood Window & Door	58	0.24	34%	53%	12%
321918	Other Millwork (incl. Flooring)	58	0.10	7%	69%	24%
321991	Mfd. Home (Mobile Home)	58	1.05	43%	17%	40%
321992	Prefab. Wood Bldg.	58	0.40	71%	22%	7%
322 Paper						
322122	Newsprint Mills	58	0.75	81%	0%	19%
322212	Folding Paperboard Box	58	0.00	0%	90%	10%
322220	Paper Bag & Coated & Treated Paper	58	0.15	24%	57%	19%
322291	Sanitary Paper Prod.	58	0.16	38%	50%	12%
322299	All Other Converted Paper Prod.	58	0.09	29%	71%	0%
323 Printing						
323111	Comm. Printing (exc. Screen & Books)	58	0.14	17%	55%	28%
323113	Comm. Screen Printing	58	0.00	0%	67%	33%
323117	Books Printing	58	0.22	57%	36%	7%
324 Petroleum and coal						
324110	Petrol. Refineries	58	0.49	2%	95%	3%
324191	Petrol. Lubricating Oil & Grease	58	0.47	2%	93%	5%
325 Chemicals						
325110	Petrochemical	58	0.07	0%	93%	7%
325130	Synthetic Dye & Pigment	58	0.02	3%	24%	72%
325193	Ethyl Alcohol	58	0.62	2%	93%	5%
325211	Plastics Material & Resin	58	0.22	0%	76%	24%
325413	In-Vitro Diagnostic Substance	58	0.16	22%	72%	5%
325414	Biological Prod. (exc. Diagnostic)	58	0.23	0%	93%	7%
325520	Adhesive	58	0.04	0%	90%	10%
325611	Soap & Other Detergent	58	0.00	7%	71%	22%
325612	Polish & Other Sanitation Good	58	0.06	12%	72%	16%

(continued)

NAICS	Industry	Years	Width	Inside	Above	Below
325620	Toilet Prep.	58	0.30	7%	81%	12%
325910	Printing Ink	58	0.10	16%	81%	3%
325991	Custom Compounding of Purch. Resins	58	0.39	7%	67%	26%
325992	Photo. Film, Paper, Plate, & Chemical	58	0.50	72%	28%	0%
325998	All Other Misc. Chemical Prod. & Prep.	58	0.00	0%	91%	9%
326 Plastics and rubber						
326112	Plastics Packaging Film & Sheet (incl. Laminated)	58	0.23	0%	93%	7%
326121	Unlaminated Plastics Profile Shape	58	0.16	38%	53%	9%
326122	Plastics Pipe & Pipe Fitting	58	0.34	9%	74%	17%
326150	Urethane & Other Foam Prod. (exc. Polystyrene)	58	0.06	2%	60%	38%
326191	Plastics Plumbing Fixture	58	0.32	29%	71%	0%
326199	All Other Plastics Prod.	58	0.26	36%	62%	2%
326212	Tire Retreading	19	0.01	0%	37%	63%
327 Nonmetallic minerals						
327310	Cement	58	0.30	40%	59%	2%
327320	Ready-Mix Concrete	58	0.05	10%	52%	38%
331 Primary metals						
331210	Iron & Steel Pipe & Tube Mfg. from Purch. Steel	58	0.00	0%	97%	3%
331512	Steel Investment Found.	58	0.00	0%	79%	21%
331529	Other Nonfer. Metal Found. (exc. Die-Casting)	58	0.02	2%	45%	53%
332 Fabricated metals						
332114	Custom Roll Forming	58	0.00	0%	90%	10%
332119	Metal Crown, Clos., & Other Metal Stamp. (exc. Auto.)	58	0.06	14%	33%	53%
332216	Saw Blade & Handtool	58	0.50	69%	24%	7%
332311	Prefab. Metal Bldg. & Compon.	58	0.17	16%	72%	12%
332312	Fab. Structural Metal	58	0.00	0%	84%	16%
332322	Sheet Metal Work	58	0.03	2%	71%	28%
332323	Ornam. & Archit. Metal Work	58	0.18	29%	71%	0%
332710	Machine Shops	58	0.21	12%	83%	5%
332721	Precision Turned Prod.	58	0.00	0%	93%	7%
332811	Metal Heat Treating	58	0.01	0%	88%	12%
332813	Electroplat., Plating, Polishing, Anodizing, & Coloring	58	0.02	3%	52%	45%
332912	Fluid Power Valve & Hose Fitting	58	0.24	0%	98%	2%
332913	Plumbing Fixture Fitting & Trim	58	0.06	9%	52%	40%
332919	Other Metal Valve & Pipe Fitting	58	0.07	10%	83%	7%
332999	All Other Misc. Fab. Metal Prod.	58	0.02	3%	60%	36%
333 Machinery						
333111	Farm Mach. & Equip.	58	0.31	59%	40%	2%
333120	Construction Mach.	58	0.04	0%	95%	5%
333131	Mining Mach. & Equip.	58	0.08	0%	88%	12%
333242	Semicond. Mach.	58	0.12	0%	76%	24%
333243	Sawmill, Woodworking, & Paper Mach.	58	0.59	93%	0%	7%
333244	Printing Mach. & Equip.	58	0.72	52%	14%	34%

(continued)

NAICS	Industry	Years	Width	Inside	Above	Below
333249	Other Ind. Mach.	58	0.17	29%	43%	28%
333316	Photo. & Photocop. Equip.	58	0.48	17%	19%	64%
333318	Other Comm. & Service Industry Mach.	58	0.14	31%	69%	0%
333413	Ind. & Comm. Fan & Blower & Air Purification Equip.	58	0.02	3%	71%	26%
333414	Heat. Equip. (exc. Warm Air Furnaces)	58	0.10	28%	72%	0%
333415	Air-Conditioning & Warm Air Heat. Equip. & Comm. & Ind. Refrig. Equip.	58	0.07	5%	66%	29%
333511	Ind. Mold	58	0.01	0%	78%	22%
333515	Cutting Tool & Machine Tool Accessory	58	0.09	29%	57%	14%
333517	Machine Tool	58	0.27	55%	5%	40%
333611	Turbine & Turbine Generator Set Units	58	0.01	0%	100%	0%
333612	Speed Changer, Ind. High-Speed Drive, & Gear	58	0.01	0%	100%	0%
333911	Pump & Pumping Equip.	58	0.26	3%	91%	5%
333922	Conveyor & Conveying Equip.	58	0.14	12%	67%	21%
333923	Overhead Traveling Crane, Hoist, & Monorail Sys.	58	0.22	22%	76%	2%
333924	Ind. Truck, Tractor, Trailer, & Stacker Mach.	58	0.00	0%	97%	3%
333991	Power-Driven Handtool	58	0.08	17%	24%	59%
333993	Packaging Mach.	58	0.20	29%	48%	22%
333995	Fluid Power Cylinder & Actuator	58	0.30	0%	93%	7%
333996	Fluid Power Pump & Motor	58	0.08	0%	78%	22%
334 Computer and electronics						
334111	Electronic Computer	58	0.02	64%	36%	0%
334112	Computer Storage Device	58	0.07	24%	72%	3%
334210	Telephone Appar.	58	0.29	83%	10%	7%
334290	Other Commun. Equip.	58	0.37	21%	72%	7%
334310	Audio & Video Equip.	58	0.91	91%	7%	2%
334413	Semicond. & Rel. Device	58	0.01	19%	72%	9%
334416	Capacitor, Resistor, Coil, Transf., & Other Inductor	58	0.13	21%	52%	28%
334417	Electronic Connector	58	0.15	10%	67%	22%
334418	Printed Circuit Assembly (Electronic Assembly)	58	0.79	91%	3%	5%
334419	Other Electronic Compon.	58	0.26	38%	62%	0%
334510	Electromedical & Electrotherapeutic Appar.	58	0.42	9%	90%	2%
334511	Search, Detect., Navig., Guid., Aero., & Naut. Sys. & Instr.	58	0.33	48%	52%	0%
334513	Instr. & Rel. Prod. Mfg. for Meas., Display., & Control. Ind. Proc. Var.	58	0.12	3%	90%	7%
334515	Instr. Mfg. for Meas. & Test. Elec. & Elec. Sig.	58	0.47	12%	71%	17%
334516	Analytical Lab. Instr.	58	0.26	12%	84%	3%
334517	Irradiation Appar.	58	0.78	10%	83%	7%
334519	Other Meas. & Control. Device	58	0.25	38%	60%	2%
334613	Blank Magnetic & Optical Recording Media	58	1.43	16%	10%	74%
335 Electrical equipment						
335110	Electric Lamp Bulb & Part	58	0.03	3%	16%	81%
335122	Comm., Ind., & Inst. Electric Lighting Fixture	58	0.01	2%	71%	28%

(continued)

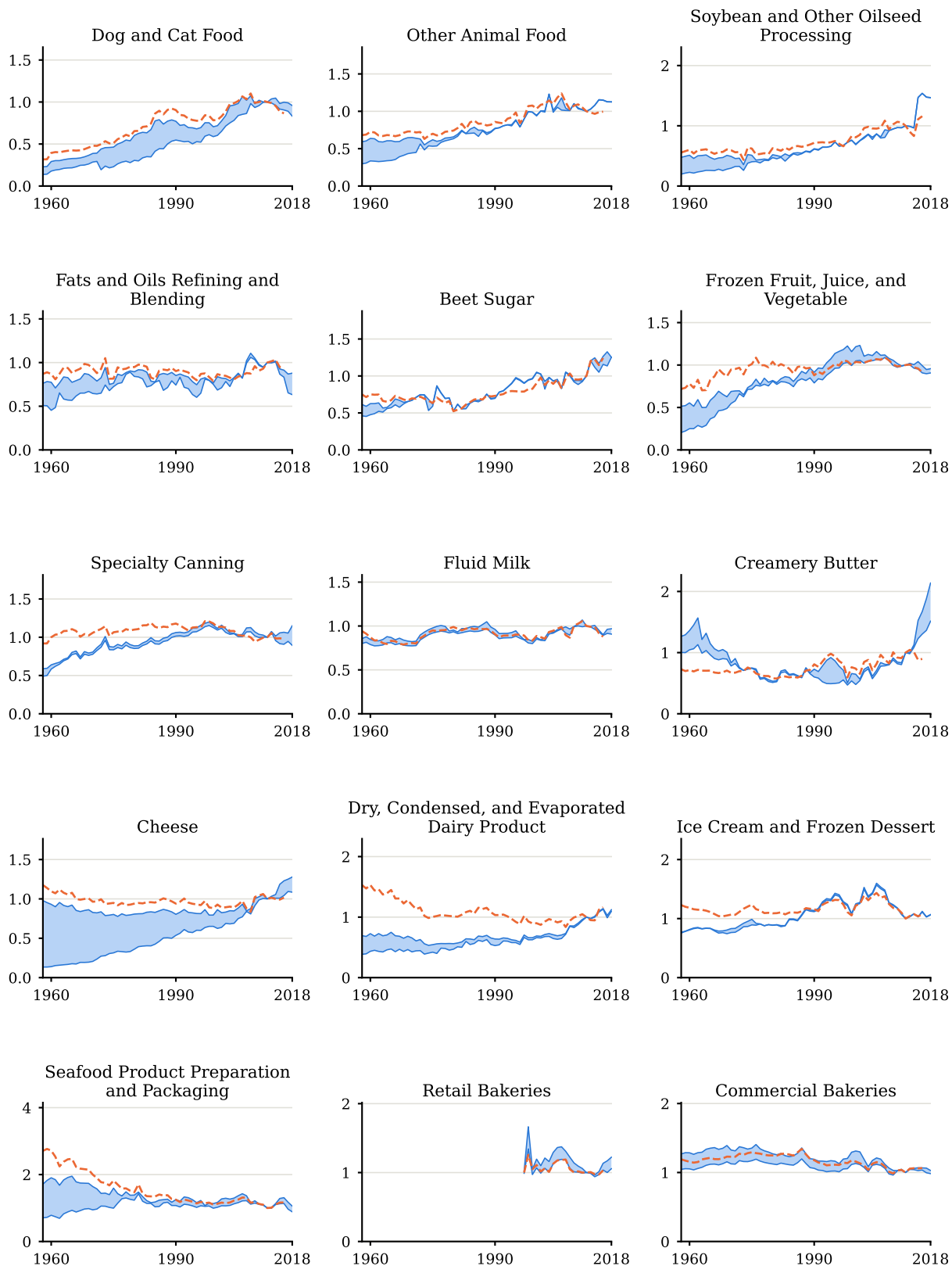
NAICS	Industry	Years	Width	Inside	Above	Below
335210	Small Elec. Appliance	58	0.63	91%	7%	2%
335222	Hhld. Refrigerator & Home Freezer	58	0.44	40%	0%	60%
335224	Hhld. Laundry Equip.	58	0.27	100%	0%	0%
335312	Motor & Generator	58	0.15	36%	14%	50%
335313	Switchgear & Switchboard Appar.	58	0.09	3%	76%	21%
335314	Relay & Ind. Control	58	0.26	45%	47%	9%
335911	Storage Battery	58	0.02	0%	76%	24%
335929	Other Commun. & Energy Wire	58	0.12	9%	21%	71%
335931	Current-Carrying Wiring Device	58	0.11	24%	60%	16%
335932	Noncurrent-Carrying Wiring Device	58	0.03	12%	57%	31%
335991	Carbon & Graphite Prod.	58	0.03	3%	93%	3%
335999	All Other Misc. Elec. Equip. & Compon.	58	0.08	2%	86%	12%
336 Transportation equipment						
336111	Automobile	58	0.26	14%	79%	7%
336112	Light Truck & Utility Vehicle	58	0.31	93%	0%	7%
336120	Heavy Duty Truck	58	0.47	57%	40%	3%
336211	Motor Vehicle Body	58	0.30	7%	74%	19%
336213	Motor Home	58	0.30	2%	34%	64%
336214	Travel Trailer & Camper	58	0.40	33%	60%	7%
336360	Motor Vehicle Seating & Interior Trim	58	0.36	3%	79%	17%
336411	Aircraft	58	0.24	9%	84%	7%
336413	Other Aircraft Parts & Auxiliary Equip.	58	0.09	3%	90%	7%
336414	Guided Missile & Space Vehicle	58	0.07	12%	78%	10%
336415	Guided Missile & Space Vehicle Propul. Unit & Propul. Unit Parts	58	0.08	10%	28%	62%
336510	Railroad Rolling Stock	58	0.08	0%	91%	9%
336612	Boat Bldg.	58	0.39	48%	52%	0%
336992	Military Armored Vehicle, Tank, & Tank Com- pon.	58	0.31	53%	0%	47%
336999	All Other Transportation Equip.	58	0.36	21%	72%	7%
337 Furniture						
337110	Wood Kitchen Cabinet & Countertop	58	0.33	24%	72%	3%
337121	Upholstered Hhld. Furniture	58	0.07	7%	64%	29%
337122	Nonupholstered Wood Hhld. Furniture	58	1.83	88%	7%	5%
337124	Metal Hhld. Furniture	58	0.39	83%	0%	17%
337127	Inst. Furniture	58	0.09	2%	67%	31%
337212	Custom Archit. Woodwork & Millwork	58	0.23	3%	90%	7%
337214	Office Furniture (exc. Wood)	58	0.12	14%	55%	31%
337215	Showcase, Partition, Shelving, & Locker	58	0.00	0%	52%	48%
337920	Blind & Shade	58	0.06	3%	41%	55%
339 Miscellaneous						
339112	Surgical & Medical Instr.	58	0.32	0%	93%	7%
339113	Surgical Appliance & Supplies	58	0.35	12%	88%	0%
339114	Dental Equip. & Supplies	58	0.14	2%	91%	7%
339116	Dental Labs	19	0.02	5%	16%	79%
339940	Office Supplies (exc. Paper)	58	0.20	17%	14%	69%
339993	Fastener, Button, Needle, & Pin	58	0.45	10%	2%	88%

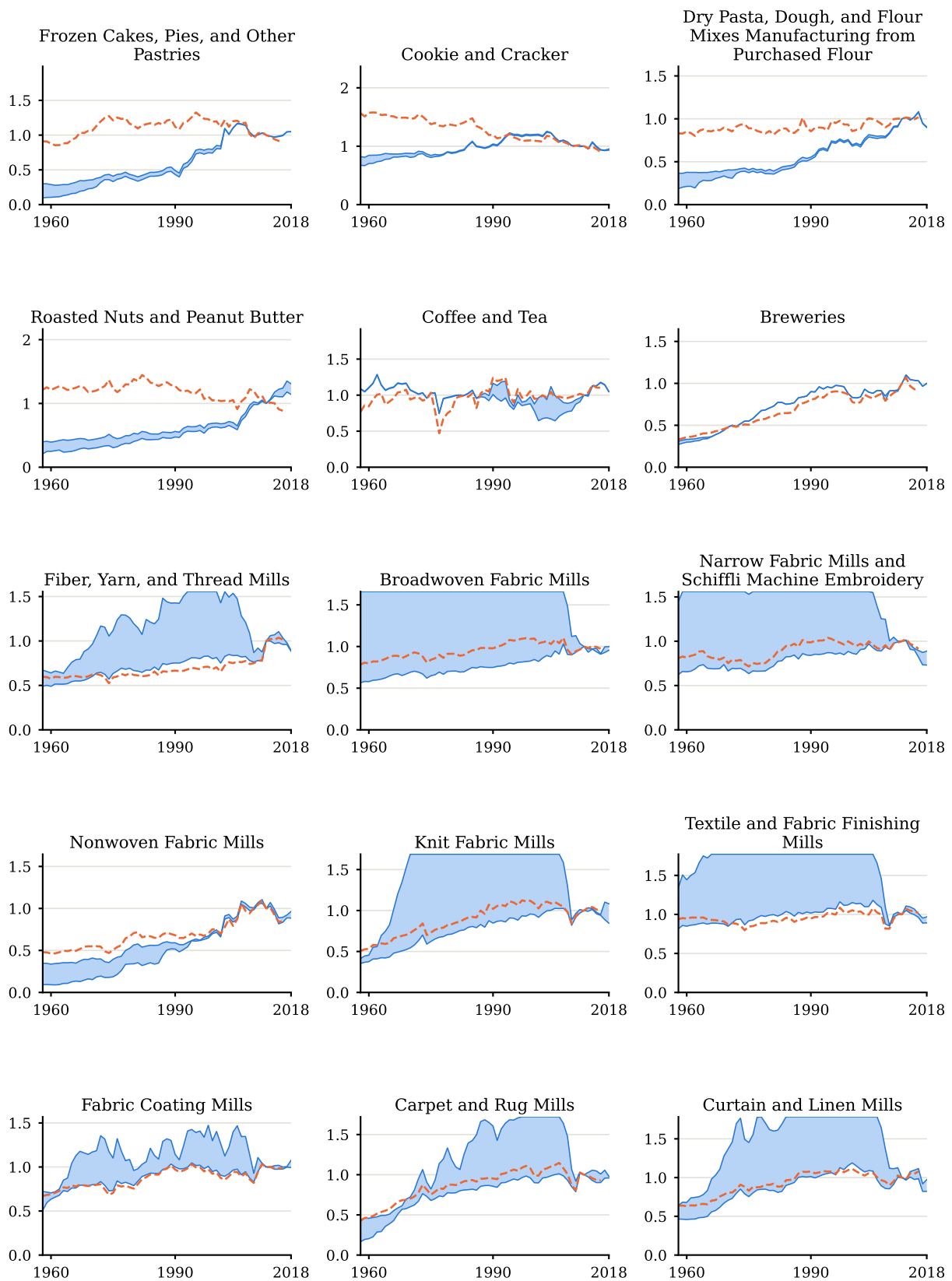
339995	Burial Casket	58	1.52	93%	5%	2%
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Notes: GARP-passing industries, grouped by 3-digit NAICS sector. Industry names are official 2012 NAICS titles, abbreviated (“Manufacturing” as “Mfg.”, and so on). “Years” counts non-reference industry-years with a published `tfp5` value; 2012 is excluded from all table counts, widths, and shares. “Width” is the median over the full non-reference input-data support of the width of the marginal identified interval for θ_t/θ_{2012} (the coordinate projection of the joint identified set); the last three columns use only non-reference years with published `tfp5` and classify its value relative to that marginal interval and localize, rather than accept, the published series.

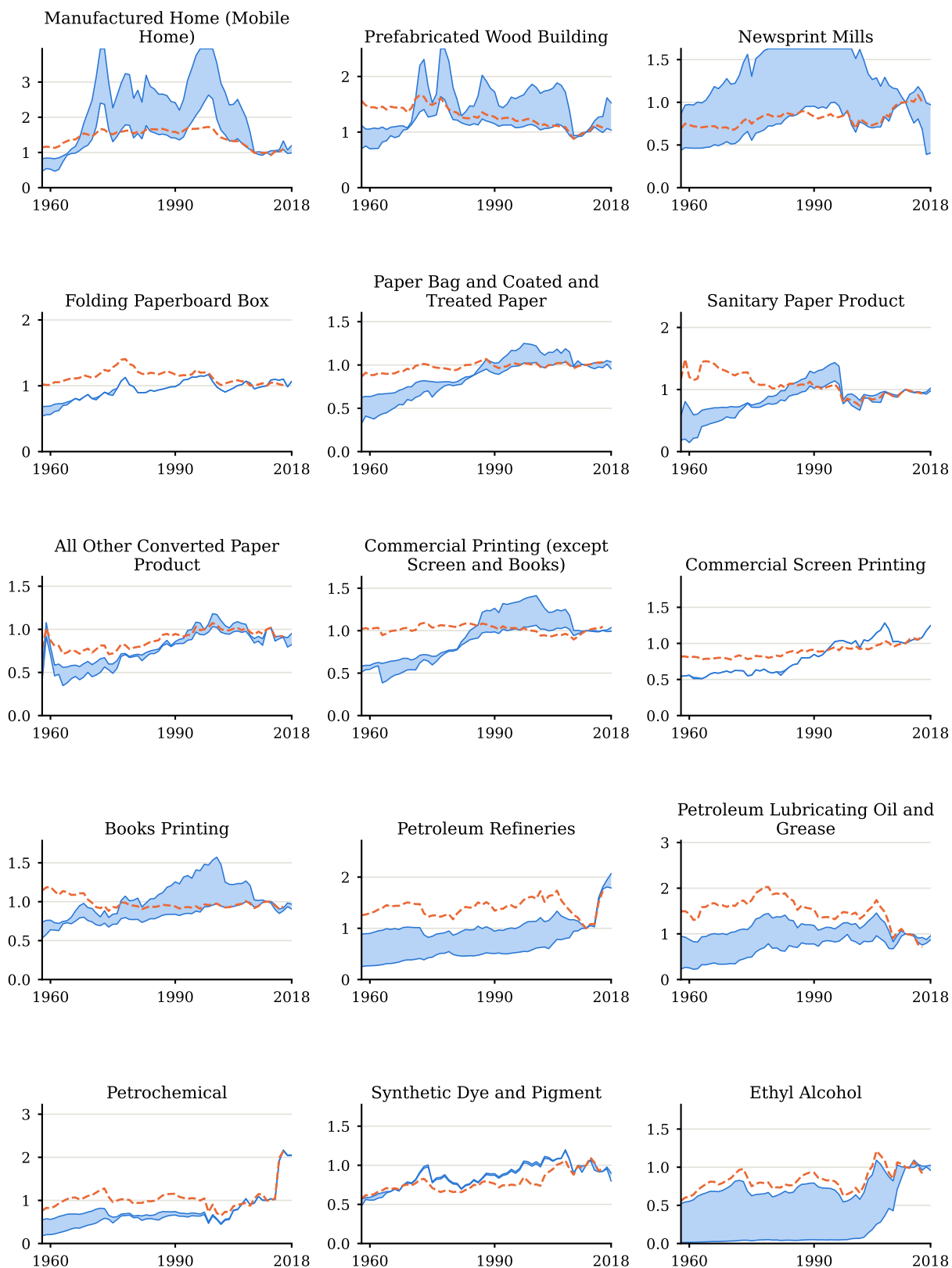
B.6 Marginal Intervals for Every Industry-Year

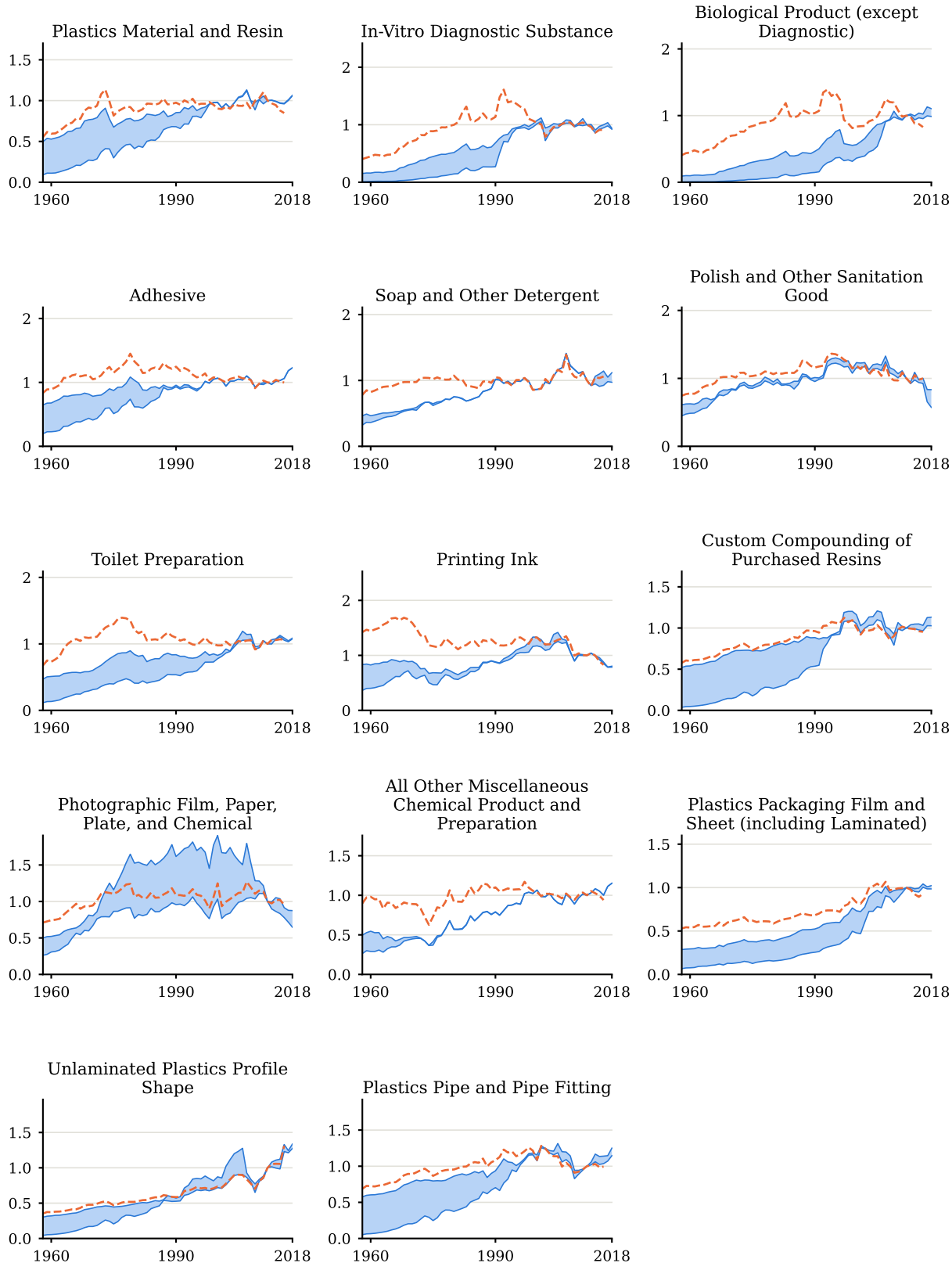
The charts cover every year of every GARP-passing industry, in the format of Figure 3. Shading shows the marginal interval for θ_t/θ_{2012} , the coordinate projection of the joint identified set onto year t ; the dashed line is published `tfp5`. A series inside every band may still fail the joint test because its annual coordinates require incompatible multipliers. Titles are official 2012 NAICS titles. Vertical scales are panel-specific, and upper bounds exceeding the frame are truncated.

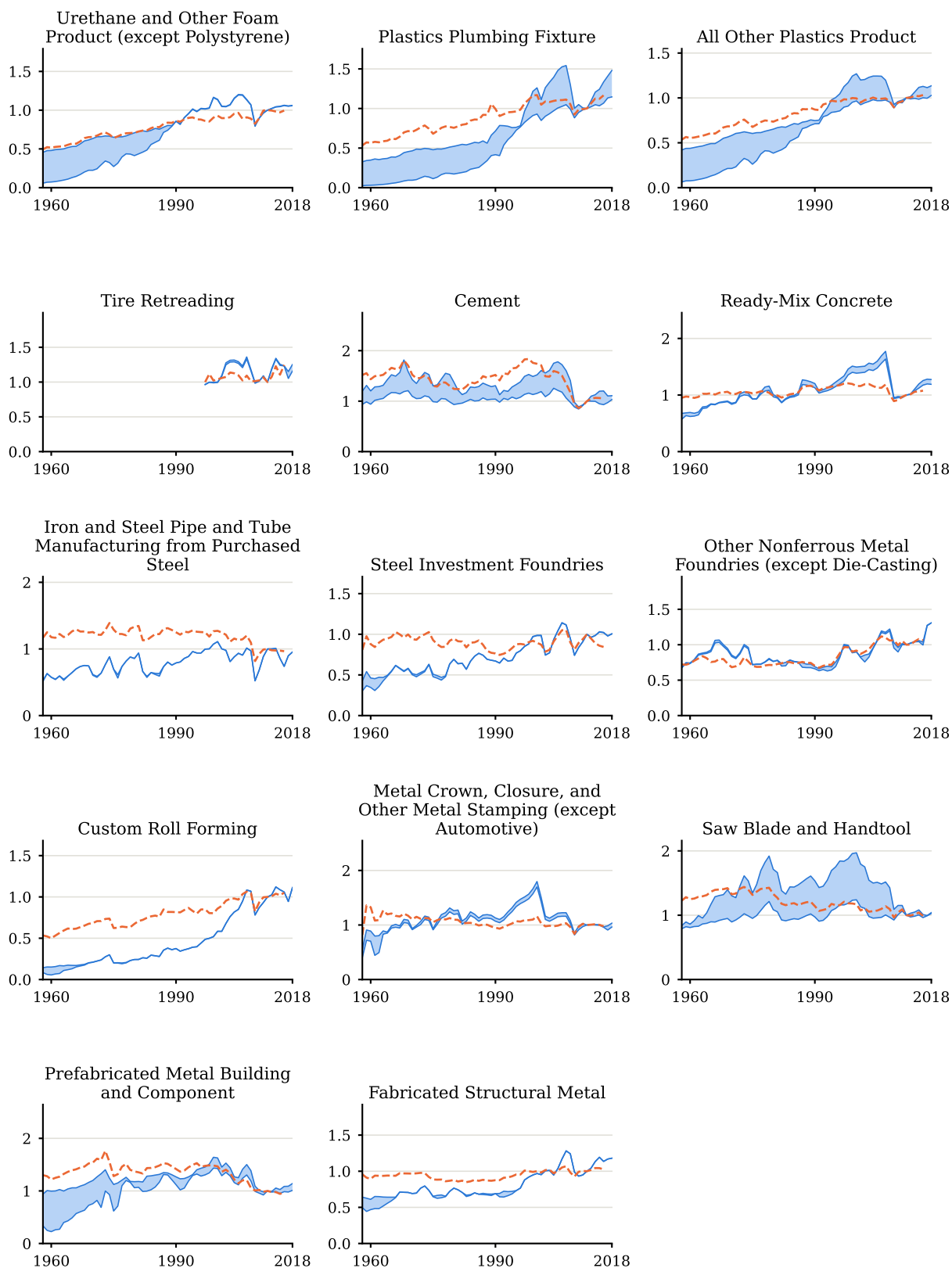


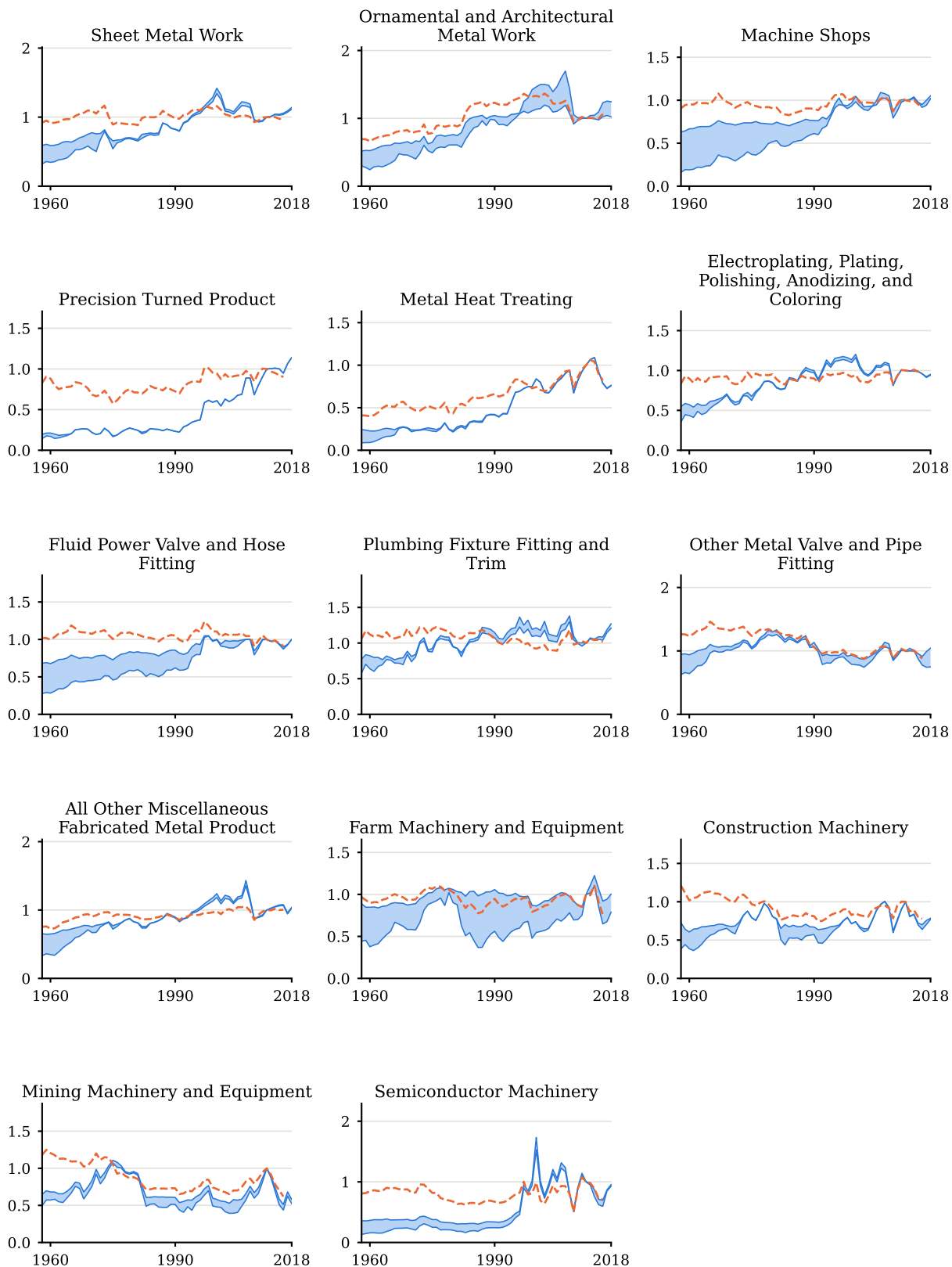


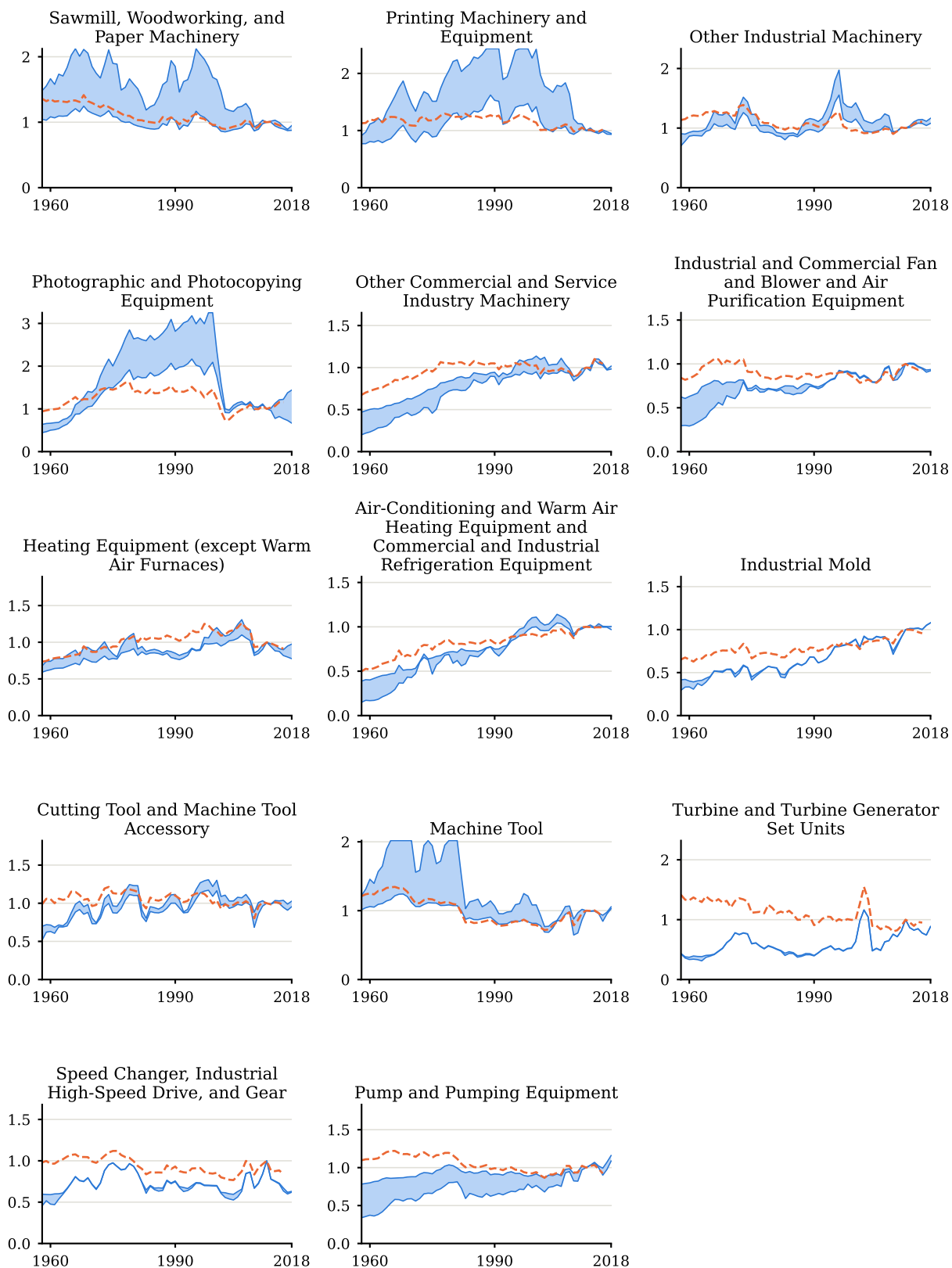


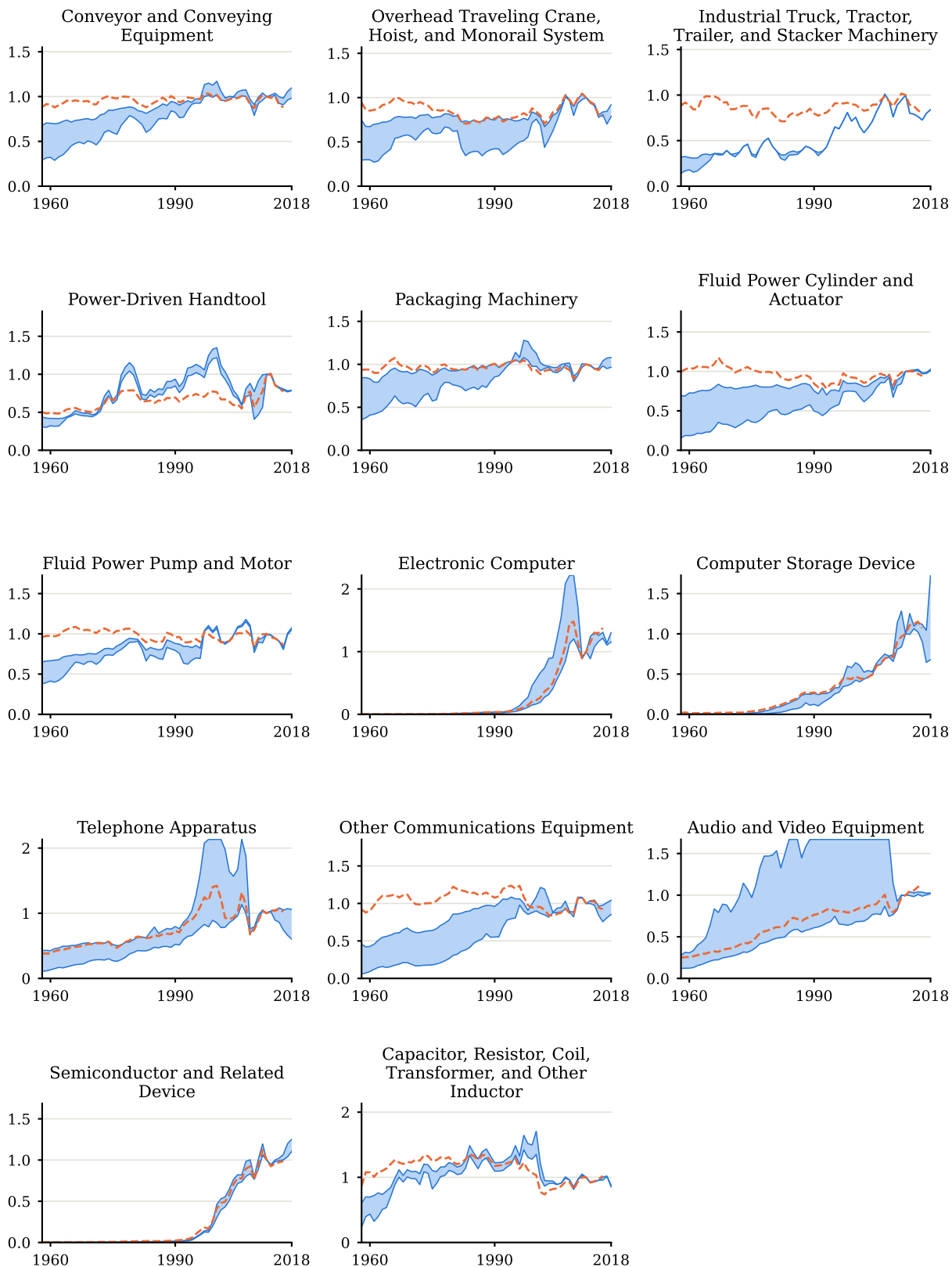


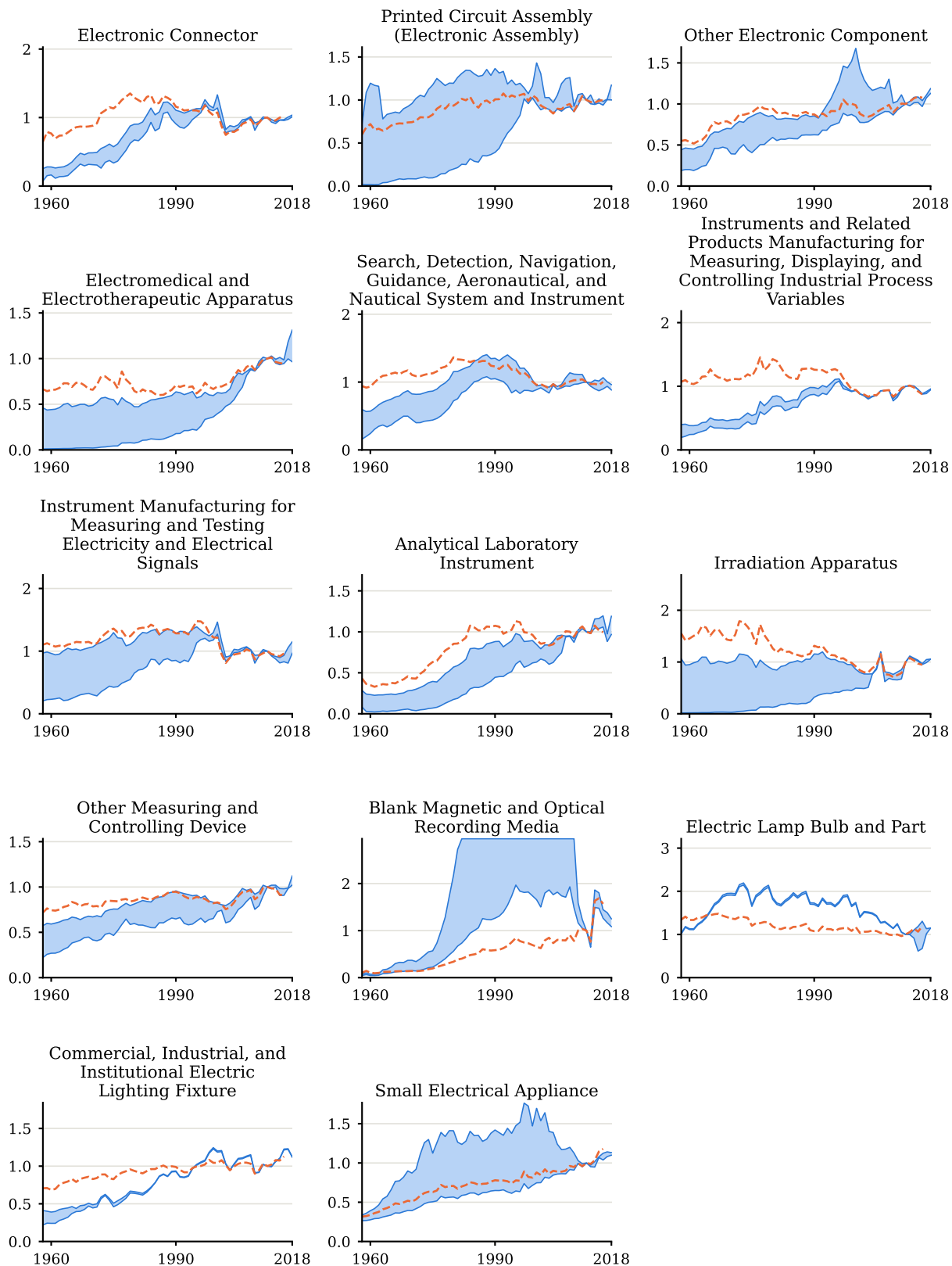


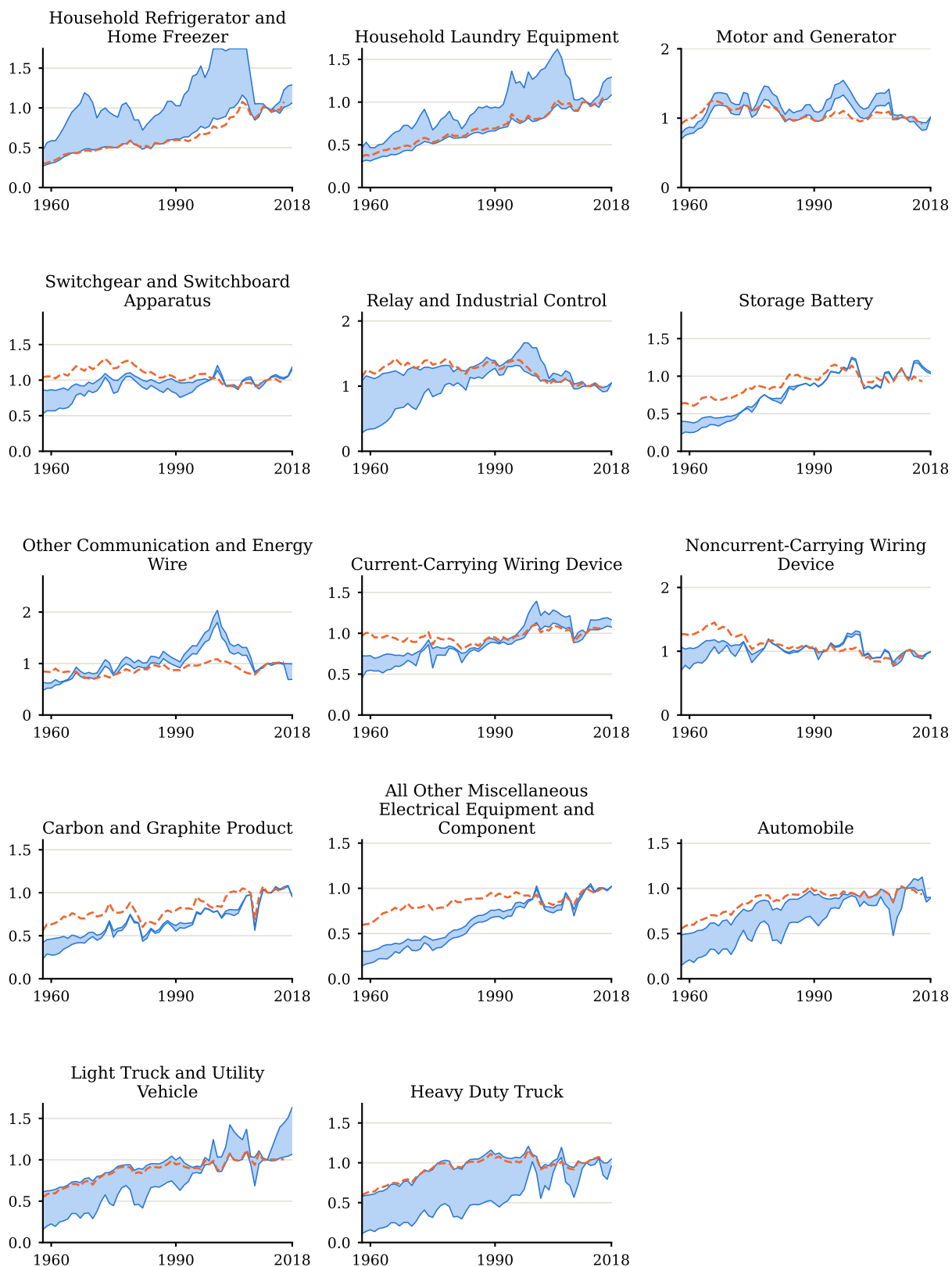






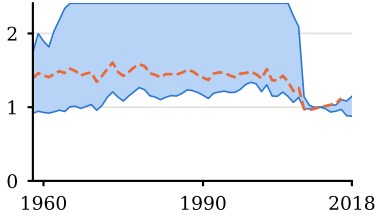




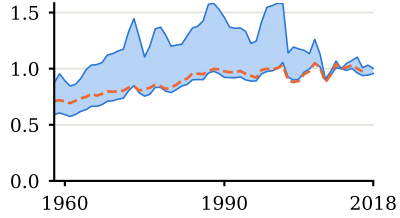




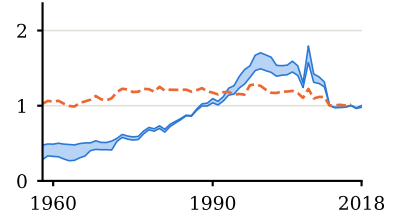
Nonupholstered Wood Household Furniture



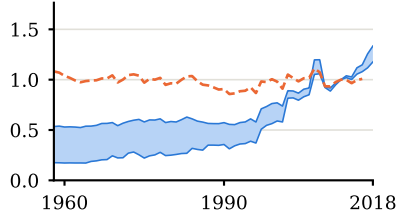
Metal Household Furniture



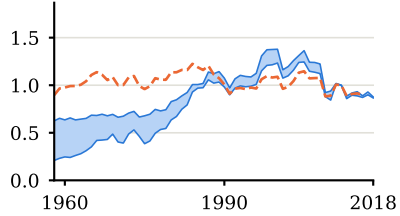
Institutional Furniture



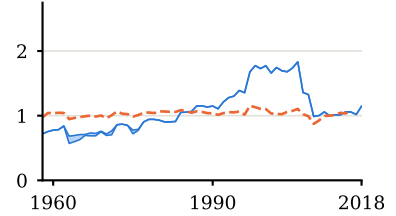
Custom Architectural Woodwork and Millwork



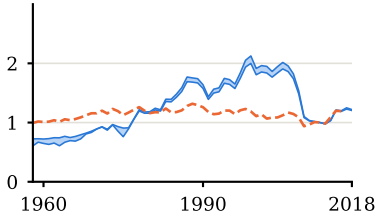
Office Furniture (except Wood)



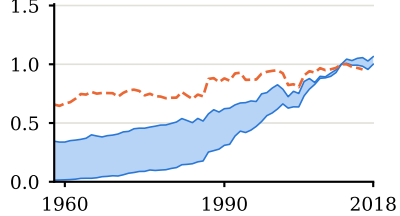
Showcase, Partition, Shelving, and Locker



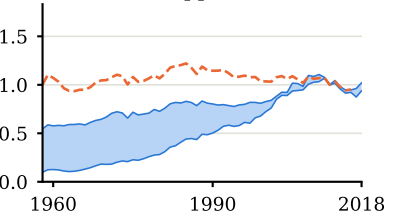
Blind and Shade



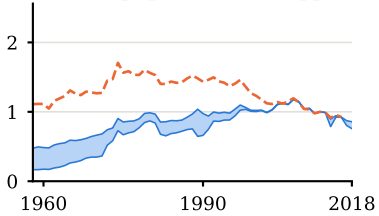
Surgical and Medical Instrument



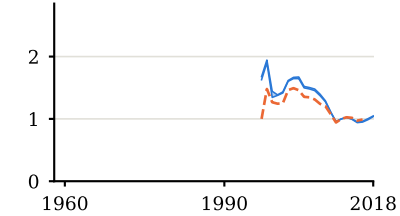
Surgical Appliance and Supplies



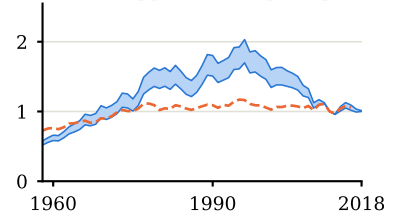
Dental Equipment and Supplies



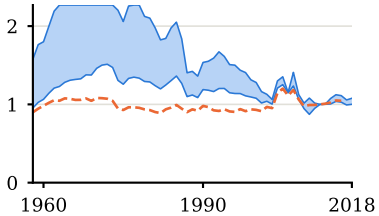
Dental Laboratories



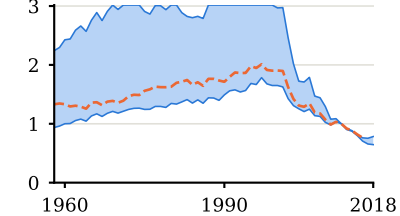
Office Supplies (except Paper)



Fastener, Button, Needle, and Pin



Burial Casket



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