U.S. most-favored-nation pricing and foreign drug funding

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Abstract

We examine whether the May 2025 U.S. most-favored-nation pricing announcement was followed by changes in foreign public funding of medicines. International price discrimination theory predicts a tension where accepting lower foreign reimbursement prices under MFN expands sales abroad but risks reducing U.S. revenues, potentially delaying public-funding agreements for medicines with higher U.S. spending. We find that these medicines experienced a larger relative decline in new public-funding entries in reference OECD markets. Using records from three reference OECD markets and three non-OECD markets, we compare documented funding entry before and after the announcement through May 2026. Among 361 medicines linked to earlier U.S. spending, balancing FDA approval age yields a larger decline in reference OECD markets relative to non-OECD markets for higher-spending medicines of 0.261 entries per 100 medicines per month. This negative association persists across alternative weights and robustness tests.

Keywords: Most-favored-nation pricing, Drug funding, Reference pricing, Market entry, Difference-in-differences
JEL: I11, I18, L51

1. Introduction

Prices, regulation and market size shape when medicines are introduced across countries (Danzon et al., 2005; Kyle, 2007; Cockburn et al., 2016). Once a medicine is approved for sale, the manufacturer can offer it on the private market at a price it sets, subject to local pricing rules. Patients who rely on public insurance may still have to wait for their programme to cover it. In 2023, about 4.8 billion people worldwide had primary health coverage through a social health protection scheme (International Labour Organization, 2024). If a public insurance programme offers to cover a medicine at a low price, the manufacturer may hold out for better terms, delaying coverage. For

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patients who need an expensive treatment, including some patients with rare diseases, that wait can mean paying the private price out of pocket or going without treatment.

To further compound the issue, the price agreed in one country can become a benchmark for what other countries will pay, a practice known as international reference pricing (Maini and Pammolli, 2023). Accepting a low price can therefore bring new sales through one country's public insurance programme while reducing revenue from existing sales elsewhere. The greater the potential losses abroad relative to the gains from public coverage, the stronger the incentive for strategic delay.

Previous studies have examined how within-country's policy reforms affected prices and access in the countries that introduced them (Feng et al., 2023; Büssgen and Stargardt, 2023). The May 2025 U.S. most-favored-nation (MFN) announcement gives us a setting to causally estimate how a pricing policy affects medicine markets abroad. By specifying which countries' prices could serve as benchmarks for U.S. prices, the announcement created a basis for comparing changes in public funding across markets.

In May 2025, the U.S. administration introduced a most-favored-nation (MFN) drug pricing policy to bring U.S. prescription drug prices in line with the lower prices paid in comparable countries (The White House, 2025a). For brand-name medicines without generic or biosimilar competition, the policy sets a U.S. price target that covers public insurance programmes and other markets, using the lowest price for the same medicine among OECD countries with GDP per capita of at least 60% of the U.S. level (U.S. Department of Health and Human Services, 2025). A low price agreed in a reference OECD market could therefore put more U.S. revenue at risk, especially for medicines with higher U.S. sales. Using a difference-in-differences design, we compare changes in first public-funding entries before and after the announcement between reference OECD markets and non-OECD markets. We then test whether entries slowed more for medicines with higher prior U.S. spending.

In our main analysis, we find that medicines with higher earlier U.S. spending show a larger relative decline in new public-funding listings in reference OECD markets after the MFN announcement. Adjusting for differences in medicine characteristics preserves this negative association. Across the common 361-medicine cohort, the estimated relative decline is 0.468 recorded entries per country-month. As a robustness check, we extend the pre-announcement period used for the seasonal projection to five years, using a smaller sample of countries with complete medicine records, and find that the negative pattern persists.

Our analysis compares three reference OECD markets, Australia, Switzerland and Britain, with three non-OECD markets, Brazil, Hong Kong and Singapore. We select these markets because their records are publicly verifiable and allow us to identify dated public-funding evidence for a common set of medicines over the same period. To build this common cohort, we start with 589 single-ingredient medicines approved by the FDA from 2010 through April 2025. Focusing on

medicines with one active ingredient gives us a consistent way to match medicines across countries by ingredient and keeps combination products separate from their components (World Health Organization, 2017). We match medicines by their original brand names to 2023 Medicare Part D records and retain the 361 with positive recorded spending. We follow this fixed cohort, counting each medicine once per market at its earliest documented publicly funded access.

Across these six markets, a funding entry marks the first time we can document that a public reimbursement or subsidy programme covers some or all of a medicine's cost for eligible patients. We draw on effective listings, implementation notices and records of paid prescriptions from public databases. These dates let us compare changes in new funding entries after May 2025 between reference OECD markets and non-OECD markets. If manufacturers were concerned about losing U.S. revenue, we would expect a larger slowdown for medicines with more U.S. sales at stake. In the main analysis, we first pool all 361 medicines to estimate the overall change. We then repeat the comparison separately for medicines with higher and lower prior U.S. spending. The difference between those two estimates is our triple difference.

In the main analysis, we use 2023 Medicare Part D spending to divide medicines into higher- and lower-spending groups. Medicare Part D is the prescription drug benefit of Medicare, the U.S. federal health insurance programme that primarily covers people aged 65 and older. Spending can rise as a medicine gains sales after approval and fall when generics or biosimilars enter. To check whether medicine age or competition explains the result, we compare medicines approved by the FDA in the same year, repeat the analysis for older medicines, and separately exclude medicines with documented generic or biosimilar competition. We also check whether the year we use to measure spending matters. For the 323 medicines with positive spending in both 2022 and 2023, we run the same test twice, once using 2022 spending and once using 2023 spending. The spending estimates remain negative across these checks.

Next, we ask whether the spending comparison captures dependence on the U.S. market. A medicine can have high U.S. spending because it sells well everywhere. We use all public company filings and earnings reports we could identify that provide enough information to measure both U.S. and worldwide product sales for medicines in our sample. These disclosures cover 92 medicines from 12 manufacturers. In this sample, a one-standard-deviation increase in the U.S. share of worldwide sales is associated with a larger relative decline of 0.407 entries per 100 medicines per month. The estimate remains negative after accounting for worldwide sales. To bring the comparison closer to the revenue at stake in reference OECD markets, we also use foreign payer spending, list values and historical price benchmarks. These measures give mixed estimates.

Having compared several measures of U.S. exposure, we turn to when manufacturers could have responded. President Trump had pursued MFN during his first term, so his November 2024 election could have alerted firms to its return before the May 2025 announcement. To account for this

possibility, we remove the months between the election and the announcement from the baseline. The estimated slowdown is similar. We then check whether the slowdown persisted after three further steps in the policy. These were (1) the July 2025 letters asking 17 manufacturers to bring U.S. prices in line with lower prices abroad, (2) the September agreement with Pfizer, the first MFN deal, which offered state Medicaid programmes access to MFN prices, and (3) the November agreements with Eli Lilly and Novo Nordisk to lower the prices of selected medicines (The White House, 2025d,e,c). The estimated slowdown persists when we compare the period after each event with the same pre-May 2025 baseline. We also run a placebo test to see whether a similar slowdown appeared a year earlier. Using only data from before the actual announcement, we move the cutoff back to May 2024. The estimated relative decline for higher-spending medicines is 0.064 entries per 100 medicines per month at the placebo date, compared with 0.261 at the actual announcement.

After tracing the slowdown through the 2025 letters and agreements, we ask how it compares with the response to the first MFN rule. In November 2020, the Trump administration issued a rule that would have tied Medicare Part B payments for about 50 medicines to foreign prices. A federal court blocked the rule before it took effect (Centers for Medicare and Medicaid Services, 2020, 2022). To check whether the slowdown was more pronounced after the broader 2025 announcement, we compare Australia and Switzerland with Brazil using six months on either side of each announcement. The relative decline is larger in 2025 when we compare medicines at a similar stage after FDA approval. When we follow the same medicines already approved in 2020, few are newly listed in 2025 and the estimated relative change that year is zero. Across our main analysis and the spending robustness checks, public-funding entries slow more for medicines with higher prior U.S. spending in reference OECD markets relative to non-OECD markets. This pattern is consistent with manufacturers delaying entry when a low foreign reimbursement price could reduce U.S. revenue.

We contribute to the literature on pharmaceutical price regulation and international reference pricing, which shows that pricing rules shape when medicines enter national markets (Kyle, 2007; Maini and Pammolli, 2023). We extend this work by examining how a U.S. pricing announcement relates to entry into public coverage abroad and how the response varies with prior U.S. spending. For policymakers, the findings highlight a potential trade-off. Using foreign prices to lower domestic drug costs can give manufacturers a reason to delay accepting reimbursement terms in the countries whose prices serve as benchmarks, leaving patients there waiting longer for public coverage.

2. Data and design

2.1. International Reference Pricing and Most-Favored-Nation

Identifying the effect of international reference pricing on market entry is difficult because countries with different pricing rules also differ in market size, approval procedures and public

coverage. Maini and Pammolli (2023) address this problem by estimating a structural model of drug launch in Europe. The closest empirical comparison is Gamba et al. (2025), who use a difference-in-differences design to study how Germany's 2011 reference-pricing reform affected the prices of 65 cancer medicines in 16 countries.

The U.S. setting differs in two respects. First, the United States spends substantially more on medicines. In 2023, retail pharmaceutical spending was $1,713 per person in the United States and $1,158 in Germany, after adjusting for purchasing power. The United States also had the highest healthcare spending per person in the OECD in 2024, at $14,885 compared with $9,365 in Germany on the same basis (OECD, 2025, Figures 7.4 and 9.1). A low price abroad can put more revenue at stake when a market of this size uses it as a benchmark. Second, we study when medicines across all areas first gain public coverage abroad. For patients with advanced cancer, delays in coverage can be especially consequential. Some health systems offer early access or dedicated funding for cancer medicines (Hofmarcher et al., 2024). The urgency of treatment and the availability of special funding can change how manufacturers and public payers negotiate over prices and coverage, so the response in a sample of cancer medicines may differ substantially from the response across all medicines.

International reference pricing uses the price of a medicine abroad to set or negotiate its domestic price. The U.S. most-favored-nation (MFN) policy is one example. It uses the lowest price among eligible countries as the U.S. benchmark, giving us a setting to study how reference pricing affects the timing of public coverage abroad. In 2020, near the end of President Trump's first term, the Centers for Medicare & Medicaid Services (CMS) issued a mandatory MFN rule for selected Medicare Part B drugs. A federal court quickly blocked it over the lack of prior public notice and comment, and CMS later withdrew it (Centers for Medicare and Medicaid Services, 2020, 2022). In May 2025, the U.S. Department of Health and Human Services (HHS) began by announcing price targets and seeking voluntary agreements with manufacturers. The executive order called for a rulemaking plan only if those efforts made insufficient progress (The White House, 2025a; U.S. Department of Health and Human Services, 2025).

The U.S. announcement gives us a common policy date and a rule for which countries' prices could serve as benchmarks. We compare changes in first public-funding listings for the same medicines in reference OECD markets and non-OECD markets before and after May 2025. Following Feng et al. (2023), who use differences in prior exposure to study how a Medicaid rebate reform affected spending elsewhere in the U.S. market, we also ask whether the response is larger for medicines with higher prior U.S. spending. This spending comparison assumes that without the announcement, the gap in entry rates between higher- and lower-spending medicines would have evolved similarly in the two sets of markets. Because the executive order and the price-target announcement both occurred in May, we treat them as one event in our monthly data.

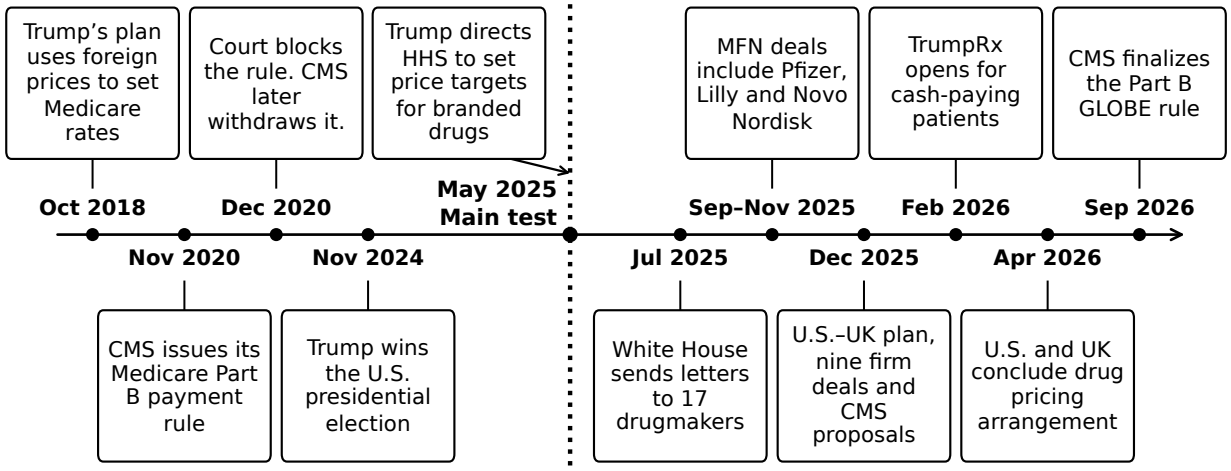

Figure 1: This figure shows the sequence from the 2018 international price-index proposal through the 2020 MFN rule and the 2025 directive and subsequent actions. Milestones are dated by month and year and spaced for readability. The thick dotted line marks May 2025, the cutoff for the main difference-in-differences test. The funding data end in May 2026. Sources are The White House (2018); Centers for Medicare and Medicaid Services (2020, 2022); Federal Election Commission (2024); The White House (2025a); U.S. Department of Health and Human Services (2025); The White House (2025d,e,c,b); Centers for Medicare and Medicaid Services (2025a,b); The White House (2026); Office of the United States Trade Representative (2026); Centers for Medicare and Medicaid Services (2026a).

2.2. Funding records and empirical design

The announced reference rule covers OECD countries with GDP per capita at least 60% of the U.S. level; Australia, Switzerland and Britain meet this income screen using revised 2024 GDP (U.S. Department of Health and Human Services, 2025; World Bank, 2026), while Brazil, Hong Kong and Singapore lie outside the country rule. Constructability of dated programme-entry histories, shared observation periods and common drug identifiers defines the comparative sample; Appendix A explains source coverage and event identification.

We follow the approach of Danzon et al. (2005) and Maini and Pammolli (2023) by tracking identifiable medicines across countries. Our source cohort contains 589 single-ingredient medicines approved by the FDA between 2010 and April 2025. This restriction simplifies matching across approval, spending and reimbursement records and avoids conflating combination products with their components. Following the broader approach of Feng et al. (2023), who compare responses by prior exposure to the market affected by a pricing reform, we use pre-announcement Medicare Part D spending as a proxy to measure U.S. spending exposure (Centers for Medicare and Medicaid Services, 2026b). The exposure measure is calendar-year 2023 Medicare Part D spending. We match 361 medicines by original brand to positive spending that year. All were FDA-approved by the end of 2023, and the same medicines enter both main outcomes. We divide them into 181

medicines with spending at or above the sample median of $28.1 million and 180 below. Medicines without a spending match are excluded.

Next, we use a difference-in-differences design to compare changes in public funding between reference OECD markets and non-OECD markets. For country c and month t, we estimate

$$y_{ct} = \alpha_c + \lambda_t + \beta(\text{OECD}_c \times \text{Post}_t) + \varepsilon_{ct}. \tag{1}$$

We examine two outcomes. The first counts medicines with their earliest documented entry into public funding in each country-month. We date entry from the first effective listing, implementation record, or evidence of paid use within the programmes we observe. A positive paid record establishes funding by its recorded date. When the date is bounded, we assign the entry only to an admissible period. A zero records the absence of a new documented entry that month, and each market is defined by the programmes its sources cover. Each medicine contributes one entry per country. Later months do not count that medicine again. The second asks whether coverage slows more for medicines with higher prior U.S. spending. For each country-month, we calculate new funding entries per 100 medicines separately for the higher- and lower-spending groups, then subtract the lower-spending rate from the higher-spending rate. This puts the two groups on the same scale and shows which group is gaining public coverage faster. Each group's denominator remains its original cohort size throughout. For this second outcome, a negative β means that higher-spending medicines lose ground relative to lower-spending medicines in reference OECD markets compared with non-OECD markets after the announcement.

The spending-group comparison is a triple difference. With $Y_{ict} = 100$ in medicine i's recorded entry month and zero recorded entries otherwise, the equivalent specification is

$$Y_{ict} = \mu_{ic} + \nu_{it} + \xi_{ct} + \delta(\text{OECD}_c \times \text{Post}_t \times \text{High}_i) + u_{ict}. \tag{2}$$

The pairwise fixed effects absorb all lower-order terms. The estimates agree with our fixed medicine weights, which sum to one in each spending group. Phase averages preserve this equivalence for British records whose month is bounded within a phase (Appendix B).

We include country fixed effects to absorb persistent differences across markets and month fixed effects to absorb common shocks. We compare January 2023–April 2025 with June 2025–May 2026, omitting May 2025 because the announcement occurred during that month. Countries receive equal weight in the main analysis. Supplementary analyses estimate weights for non-OECD markets using 2023 outcomes and assess predictive fit in 2024 (Appendix C). Standard errors are clustered by country, with a finite-sample correction and a t distribution with five degrees of freedom.

3. Results

We first ask whether the slowdown is larger for medicines with more U.S. spending at stake. After balancing the higher- and lower-spending groups by FDA approval age, we estimate that their gap in monthly funding entries falls by 0.261 entries per 100 medicines in reference OECD markets relative to non-OECD markets (Figure 2 and Table 1, Panel B). This difference compares medicines at similar stages after FDA approval.

Pooling all 361 medicines, reference OECD markets record 0.468 fewer new listings per country-month relative to non-OECD markets after the announcement. Listings fell in all three reference OECD markets. Switzerland had the largest proportional decline, from 1.14 to 0.58 monthly entries. Listings also fell in Hong Kong and Brazil, while they rose in Singapore (Table 1, Panel A).

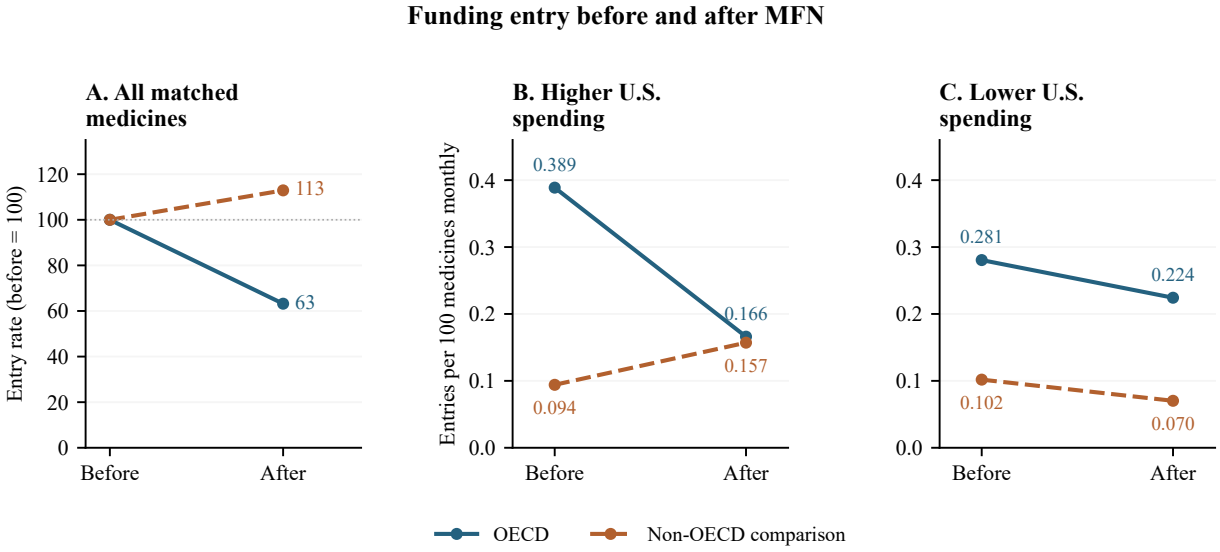

Figure 2: This figure shows documented funding entry before and after the MFN announcement. Panel A indexes each group's mean entry rate to 100 before the announcement. Panels B and C show age-balanced entry rates for higher- and lower-U.S.-spending medicines. Before is January 2023–April 2025; after is June 2025–May 2026. All panels use the same 361 medicines and equal country weights; May 2025 is omitted. The difference between the exposure-specific relative changes is -0.261, with an approximate 95% interval of [-0.605, 0.083].

Table 1: First public-funding entries and main estimates

Panel A. First public-funding entries by market

Market	Entries		Monthly mean		Change
	Pre	Post	Pre	Post	Monthly
Australia	23	8	0.82	0.67	-0.15
Switzerland	32	7	1.14	0.58	-0.56
Britain	41	11	1.46	0.92	-0.55
Brazil	3	0	0.11	0.00	-0.11
Hong Kong	17	5	0.61	0.42	-0.19
Singapore	11	10	0.39	0.83	0.44

Panel B. Reference OECD markets relative to non-OECD markets

Outcome	Estimate	Approximate 95% interval
All medicines (entries per country-month)	-0.468	$[-1.077, 0.140]$
Higher minus lower U.S. spending (entries per 100 medicines per month)	-0.261	$[-0.605, 0.083]$

This table shows first public-funding entries by market and the two main estimates. The pre period is January 2023–April 2025 and the post period is June 2025–May 2026. The common cohort contains 361 medicines. Panel B uses equal country weights and balances FDA approval age across the two spending groups in the second row. British observations pool captured English, Scottish and Welsh evidence.

The country totals show where entries fell. Figure Appendix C.2 shows which markets drive the spending result after accounting for FDA approval age. Britain and Australia account for most of the estimated decline, while Switzerland contributes a smaller share even though its overall listing rate fell sharply.

Panels B and C of Figure 2 show how the spending result arises. The higher-spending entry rate falls from 0.389 to 0.166 per 100 medicines per month in reference OECD markets and rises from 0.094 to 0.157 in non-OECD markets. The corresponding relative change is -0.286, compared with -0.025 for lower-spending medicines. Subtracting the two gives the main estimate of -0.261.

We next ask whether the result is concentrated among newer medicines. Figure 3 compares three FDA approval cohorts. The newest cohort, approved in 2020–2023, has the largest estimated slowdown and accounts for approximately 74% of the pooled point estimate at the observed cohort shares.

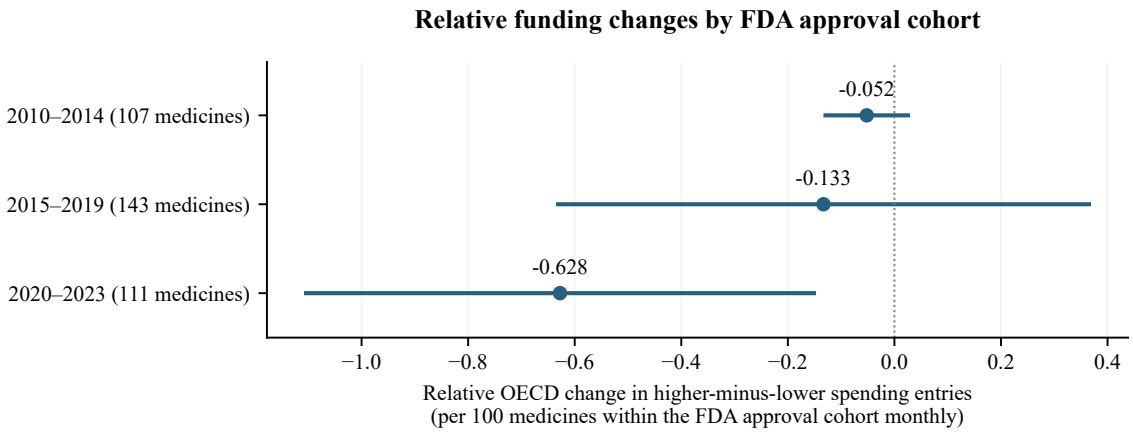

Figure 3: This figure shows relative funding changes by FDA approval cohort. Points show the change in reference OECD markets relative to non-OECD markets in higher-minus-lower U.S.-spending entry rates within each cohort; lines show approximate 95% country-cluster intervals using six countries. The 2020–2023 cohort accounts for about 74% of the pooled point estimate at the observed cohort shares. The three approval bands are those already used in the main age balancing; all 361 medicines are retained across them. Weights are normalized within each cohort and spending group. FDA approval year does not denote foreign approval or launch year.

The stronger slowdown among newer medicines raises the question of whether medicine age or competition explains the spending result. Table 2 reports three sets of checks. First, the spending estimate stays negative when we give each medicine the same weight or balance several medicine characteristics in addition to age. Second, the estimates remain negative when we compare medicines approved by the FDA in the same year, restrict to older medicines or exclude those with documented generic or biosimilar competition. Using 2022 spending in place of 2023 spending for the same 323 medicines gives similar estimates (Panel B).

The result also persists when we allow earlier dates for two British medicines or vary inclusion of three paid-prescription records. The age-balanced estimates range from -0.271 to -0.251. Appendix Appendix C reports the country exclusions and funding-date checks. Higher U.S. spending could reflect higher worldwide sales. To test whether the U.S. share matters, we use company disclosures for 92 medicines. A one-standard-deviation increase in the share of worldwide sales earned in the U.S. is associated with about 0.407 fewer monthly entries per 100 medicines in reference OECD markets relative to non-OECD markets. The estimate is 0.356 fewer entries after controlling for worldwide sales. The estimate for absolute U.S. sales is positive in the same sample (Table 2, Panel C). The sales share provides a closer measure of dependence on the U.S. market. Table Appendix B.1 shows the original disclosure sample and the tests using spending and price proxies from the reference markets.

Table 2: Medicine characteristics and U.S. spending exposure

Specification	Medicines	Estimate	95% interval
Panel A. Alternative weights for the high-minus-low spending comparison			
FDA approval age (main estimate)	361	−0.261	[−0.605, 0.083]
Equal medicine weights	361	−0.149	[−0.477, 0.180]
Balance four medicine characteristics	361	−0.207	[−0.531, 0.116]
Panel B. Medicare Part D spending, age and competition			
2023 spending, unadjusted	361	−0.030	[−0.194, 0.135]
2023 spending, FDA approval-year controls	361	−0.083	[−0.288, 0.122]
2023 spending, approved by 2021	314	−0.086	[−0.243, 0.071]
2023 spending, omit documented generic or biosimilar competition	355	−0.081	[−0.289, 0.125]
2022 spending, matched sample	323	−0.102	[−0.337, 0.133]
2023 spending, same matched sample	323	−0.112	[−0.356, 0.132]
Panel C. Company disclosures of U.S. and worldwide sales			
U.S. share of worldwide sales	92	−0.4065	[−0.821, 0.008]
U.S. share, control for worldwide sales	92	−0.3556	[−0.724, 0.012]
U.S. share, FDA approval-year effects	92	−0.3214	[−0.882, 0.239]
Absolute U.S. sales (log)	92	+0.1834	[−0.361, 0.728]

This table shows changes in first public-funding entries in reference OECD markets relative to non-OECD markets. Estimates are in monthly entries per 100 medicines. Panels B and C report changes per standard deviation of log Medicare Part D spending or the indicated sales measure. Panel B uses FDA approval-year controls except where noted. Panel C covers 12 manufacturers and uses CR2 country-cluster intervals with a small-sample degrees-of-freedom adjustment. Panel A balances FDA approval age, or balances approval year, biologic status, priority review and orphan designation in the four-characteristic specification.

Next, we check whether the spending pattern was already emerging before the announcement. Removing the months after the November 2024 election from the baseline leaves an estimated decline of about 0.29 entries per 100 medicines per month. Moving the cutoff back to May 2024 gives a smaller decline of 0.064, while a shorter January 2025 placebo gives a larger negative estimate (Table 3, Panel A).

We then ask how long the slowdown lasts. Funding entries for higher-spending medicines remain lower relative to lower-spending medicines after the July letters and the September and November agreements, using the same pre-May baseline. The January–May 2026 estimate is −0.220 (Table 3, Panel B). Using only the months immediately around each milestone gives mixed estimates, which Table Appendix B.2 reports alongside the longer comparisons.

Finally, we compare the May 2025 announcement with the November 2020 rule using Australia, Switzerland and Brazil. In the six months after each announcement, the relative slowdown is larger in 2025 when we compare medicines at similar stages after FDA approval. The same 264 medicines observed in both episodes show a decline in 2020 and no relative change in 2025, when this older cohort recorded only six new listings (Table 3, Panel C). In a separate check on the same three

markets, first listings also fall below a seasonal benchmark fitted to five years of pre-announcement data (Table Appendix C.5).

Table 3: Timing of the MFN response

Panel A. Anticipation and earlier placebo dates	
Comparison	Spending estimate
May 2025, omit November 2024–April 2025 from baseline	$[-0.293, -0.287]$
May 2024 placebo	-0.064
January 2025 placebo	-0.335
Panel B. Persistence after later milestones	
Post period starts after	Spending estimate
July 2025 manufacturer letters	$[-0.253, -0.248]$
September 2025 Pfizer agreement	$[-0.261, -0.256]$
November 2025 Lilly and Novo Nordisk agreements	$[-0.186, -0.181]$
January–May 2026 comparison	-0.220

Panel C. Australia and Switzerland relative to Brazil		
Six months before and after each announcement	Nov. 2020	May 2025
Similar FDA approval age (entries per 100 medicines per month)	-0.150	-0.336
Same 264 medicines (entries per country-month)	-0.750	0.000

This table shows whether the spending pattern predates May 2025, whether it persists after later milestones, and how the overall response compares with 2020. Panels A and B use all six markets and report age-balanced higher-minus-lower spending estimates per 100 medicines per month. Brackets show the range across admissible British dates. Panel B uses a common January 2023–April 2025 baseline and ends each post period in May 2026. Each starts in the month after the milestone, or in January 2026 for the final row. Panel C uses three markets with the needed monthly histories. Table Appendix B.2 reports the shorter event windows.

We also vary country assignments, outcomes, weights, timing windows and funding-record rules together, following the descriptive specification-curve approach of Simonsohn et al. (2020). Among 300 distinct specifications that retain the original age-balanced 2023 spending measure, 288 (96%) yield a negative estimate. Table Appendix C.4 reports the sign counts and the number of confidence intervals below zero for every outcome and weighting family (Menkveld et al., 2024).

4. Conclusion

During the first year after the MFN announcement, higher-U.S.-spending medicines show a larger relative decline in new public-funding listings in reference OECD markets. Adjusting for medicine characteristics preserves this negative association. These findings document how foreign public-funding listings evolved during the first year of the renewed MFN policy push.

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Data availability

Replication data, provenance records, and code are available from the authors upon reasonable request. Original documents remain subject to their publishers' terms.

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Appendix A. Measurement and coverage

The outcome covers PBS ingredient-group listings, ordinary Swiss SL medicine families, captured British NHS funded eligibility or paid use, Brazilian SUS medicine-procedure entries, Hong Kong safety-net coverage and Singapore SDL/MAF subsidies (Australian Department of Health and Aged Care, 2026; Federal Office of Public Health, 2026; NHS England, 2026; NHS Business Services Authority, 2026; Public Health Scotland, 2026; NHS Wales Shared Services Partnership, 2026). Approval, favourable assessment, self-financed formulary placement and later payment intervals identify different events. Table Appendix A.1 summarises identification limits in additional public sources.

Table Appendix A.1: This table shows first-funding identification limits in additional public sources.

Jurisdiction	Measurement limit in the collected records
Taiwan	Payment intervals can reflect repricing or replacement codes; their first observed start does not consistently establish original funding.
Canada	Approval and marketing dates do not establish first provincial public coverage.
United Kingdom (main pool)	Commissioning, local implementation and paid-prescription histories identify dated funded access for 276 of 361 medicines. The other 85 histories remain unknown. Dates are earliest documented access or funded-by bounds, rather than certified first national funding.
Japan	Price and product-status records do not consistently distinguish first medicine funding from presentation changes and code replacements.
France	Product and assessment extracts do not establish effective dates of first public reimbursement.
Denmark	Documentation and example files do not constitute an observed historical production series.

Brazilian editions and implementation notices identify operational listing (DATASUS, 2026). Hong Kong tables separate discussion, formulary and subsidy dates (Hong Kong Health Bureau, 2026); Singapore clauses separate implementation from recommendations and delisting (Agency for Care Effectiveness, 2026).

Britain pools English, Scottish and Welsh evidence into one country cluster. Earlier English funding and Scottish overlaps are reconciled before counting entries. Positive paid prescriptions establish funding by that date; advice publication, statutory deadlines, stock issues and manufacturer-free access do not establish public payment. Some records are interval-dated, and some local access may precede captured routine funding. Unlinked medicines are not classified as unfunded.

A separate FDA-age comparison retains all medicines in a fixed cohort rather than conditioning on eventual funding. Among the 296 medicines with at least five years of calendar follow-up by May 2026, documented funding by the fifth FDA anniversary is established for 69.9% in Britain, 58.4% in Switzerland, 37.8% in Australia, 7.1% in Hong Kong, 3.7% in Singapore and 3.0% in the captured Brazilian programme. Every medicine remains in the denominator; unmatched histories are retained as unknown. These percentages measure dated positive evidence within the respective programme histories, rather than comparable national coverage probabilities. They therefore provide descriptive context separately from the calendar-time DiD and do not assign waiting times to medicines with unknown funding histories.

In the wider 589-medicine cohort retained for the original five-country comparison, Australia's monthly entries rise from 0.93 to 1.25 and Switzerland's fall from 1.64 to 1.17, a 29% decline. Those descriptive counts concern a different cohort from the common 361-medicine main analysis and remain in the replication archive.

Brands, strengths and repeated indications are pooled; earlier paid cases prevent false new entries. Future dates are excluded. Zeros concern the observed programmes, not national non-funding. Coverage ends May 2026. Hong Kong recovery uses CCF introduction notes and patient newsletters (Hong Kong Hospital Authority, 2026). Four April 2026 SF clauses rely on indexed historical official text; direct downloads return a replacement. They are flagged separately. A dinutuximab-beta mismatch is removed.

Appendix B. Funding events, sales exposure and announcement timing

A funding event is a flow into the recorded programme. For example, Singapore's guidance specifies March 1, 2024 as the effective Medication Assistance Fund date for abrocitinib. The public-funding count includes one entry that month and zero further entries for that medicine. British paid-prescription records establish access by the recorded date. Where an interval stays within a pre or post phase, it contributes to that phase total without assigning it a month. A zero in the entry series denotes no new documented event. We use the original medicine cohort as the denominator and retain unknown funding histories. The outcome therefore measures changes in recorded additions to the programmes, distinct from commercial launch, the stock of funded medicines, or the probability of first funding conditional on an unfunded history.

Equation (2) and the difference-in-differences in age-balanced spending-group rates both give -0.261 entries per 100 medicines per month. With continuous log spending rather than a median split, the estimate with FDA approval-year controls is -0.083 per standard deviation. It is -0.086 for medicines FDA-approved by 2021 and -0.081 when we exclude medicines with documented paid generic or biosimilar competition before the announcement. Among 323 medicines with positive 2022 and 2023 spending and FDA approval by 2022, the same specification gives -0.102 using 2022 spending and -0.112 using 2023 spending. Each 95% country-cluster interval includes zero.

To separate sales dependence from market size, we match 29 medicines to FY2023 product revenues disclosed by AbbVie, Amgen, Bristol Myers Squibb and Gilead. A standard deviation in the U.S. share of reported worldwide sales is 16.3 percentage points. On the same medicines, the estimated difference is -0.887 entries per 100 medicines monthly for the sales share and $+0.356$ for log U.S. product revenue, each per standard deviation. Controlling for log worldwide sales gives a sales-share coefficient of -0.845. Excluding identified territorial licensing, alliance-accounting, incomplete-year and zero-geography cases leaves 18 medicines and gives an unadjusted share coefficient of -0.949. These disclosures cover selected products and report international sales jointly. The comparison tests U.S. dependence relative to the issuer's worldwide sales. Sales in the three reference OECD markets alone are not separately observable from these disclosures.

Expanding the disclosures to 92 medicines from 12 companies gives a U.S. sales-share estimate of -0.407 per standard deviation, with a 95% interval of $[-0.821, 0.008]$. Table 2, Panel C, reports the main estimates for this sample. The estimate is -0.356 after accounting for worldwide sales, -0.321 with exact FDA approval-year effects, and -0.220 for the 63 newly matched medicines alone. It remains negative when we omit each issuer in turn. Absolute U.S. sales in the expanded sample give an estimate of $+0.183$. The relationship is more consistently negative when exposure is measured by the fraction of sales earned in the U.S.

We also compare U.S. Part D spending with measured foreign spending for the same medicine. The Australian denominator uses public payer costs or, separately, dispensing quantities valued at scheduled ex-manufacturer list prices. The UK denominator uses observed NHS costs and the Swiss denominator uses observed reimbursed spending. Table Appendix B.1, Panel C, distinguishes payer costs from list-price values and shows the British, Swiss and historical price estimates. The corresponding list-value estimates are -0.028 and $+0.112$. The UK and Swiss payer estimates differ in sign across sources and samples. A separate match to international Part B benchmark illustrations for 2019 gives -0.146 on 17 medicines and four funding events (95% interval $[-0.786, 0.493]$). These measures cover selected public spending, scheduled list values or historical prices. Product-level net sales for each reference OECD market would be needed to measure the foreign revenue at stake directly.

Table Appendix B.1: Company sales and reference-market spending measures

Specification	Medicines	Estimate	95% interval
Panel A. Original company disclosures			
U.S. share of worldwide sales	29	-0.887	$[-1.235, -0.539]$
U.S. share, control for worldwide sales	29	-0.845	$[-1.274, -0.416]$
Absolute U.S. sales (log)	29	$+0.356$	$[-0.046, 0.757]$
U.S. share, exclude incomplete or ambiguous sales records	18	-0.949	$[-1.429, -0.469]$
Panel B. Expanded disclosure sample checks			
U.S. share, additional matches only	63	-0.220	$[-0.601, 0.162]$
U.S. share, omit flagged sales records	64	-0.371	$[-0.816, 0.074]$
Absolute U.S. sales, FDA approval-year effects	92	-0.203	$[-0.717, 0.311]$
Panel C. Reference-market spending and historical prices			
Australian dispensing costs, linear FDA year	134	-0.080	$[-0.157, -0.002]$
Australian dispensing costs, exact FDA year	134	$+0.004$	$[-0.162, 0.169]$
Australian list-price values, linear FDA year	114	-0.028	$[-0.137, 0.081]$
Australian list-price values, exact FDA year	114	$+0.112$	$[-0.237, 0.460]$
England community spending, linear FDA year	83	$+0.044$	$[-0.192, 0.280]$
England hospital spending, linear FDA year	242	-0.173	$[-0.541, 0.196]$
Wales community spending, linear FDA year	51	-0.216	$[-0.443, 0.010]$
Scotland community spending, linear FDA year	80	$+0.078$	$[-0.224, 0.380]$
Swiss reimbursed spending, linear FDA year	16	$+0.252$	$[-1.727, 2.231]$
Swiss reimbursed spending, exact FDA year	16	$+0.385$	$[-1.422, 2.192]$
Spending in all three reference markets, linear FDA year	15	$+0.230$	$[-1.699, 2.158]$
2019 Medicare Part B international price benchmarks	17	-0.146	$[-0.786, 0.493]$

This table shows how the entry estimate varies across measures of U.S. exposure. The unit is monthly entries per 100 medicines per standard deviation of the exposure. In Panel C, the exposure is log U.S. Part D spending relative to the indicated foreign spending or list-price value. The last row uses the historical price gap. Panel A reports the original six-country cluster intervals. Panels B and C report CR2 country-cluster intervals.

Comparing the 2020 and 2025 episodes

Table Appendix B.2, Panel A, applies the same funding-entry DiD to Australia and Switzerland relative to Brazil in both episodes. We use six months on either side and omit the announcement month. The fixed-cohort comparison keeps the 264 medicines in the main data that were already FDA-approved before May 2020. Eighteen match the official CMS billing-code list for the 2020 model. We also estimate the named-minus-other contrast on that same cohort and repeat it among the 64 medicines that we can link to Medicare Part B billing codes. The code match identifies the medicine. We do not have verified 2019 claims for all comparison drugs. The six-month named-drug contrast is -0.689 in 2020 and 0.000 in 2025, and the three-month estimates are $+0.542$ and -0.068. For the five-month windows before the November 2020 rule and after the December injunction, it is -0.827. The six-month 2020 aggregate decline also reflects Brazil rising from zero to three documented entries. The age-aligned comparison instead selects medicines approved 12–60 months before each pre-window began and reports overall entries per 100 medicines. These are programme-level comparisons during different pandemic and market conditions. The three-market history includes only one non-OECD market, Brazil. The 2020 archive begins in May, and the monthly data cannot isolate the November announcement from the December court block.

Anticipation and later agreements

Between the November 2024 election and May 2025, the six-market spending contrast ranges from -0.092 to -0.058 across possible British dates. When we omit the election-to-May period from the pre-announcement baseline, it ranges from -0.293 to -0.287. Panel B compares each later phase with the common pre-May baseline, and then uses equal windows of up to two months on either side of each milestone. The first set asks whether the earlier slowdown persists. The second asks whether it becomes sharper at that specific date. The December window includes both company agreements and the announcement of the U.S.–UK pricing understanding and the GLOBE and GUARD proposals. The revised GLOBE rule was finalized in September 2026, after our data end (The White House, 2025b; Centers for Medicare and Medicaid Services, 2025a,b, 2026a).

We also use the identities of the firms involved. We match 169 medicines to the recipients of the July letters and 190 to other manufacturers, with two unresolved. Comparing August 2025–May 2026 with June–July 2025, the adjusted recipient contrast is -0.060 (95% interval $[-0.956, 0.837]$). Comparing each firm with firms whose announcements came later gives two-month estimates of -0.460 for Pfizer and $+0.867$ for AstraZeneca. The November agreements yield a one-month Lilly and Novo Nordisk estimate of -1.855 (95% interval $[-9.835, 6.126]$), with no post-window entries among those firms' matched medicines and insufficient comparison support for two months. The firm-specific tests give limited evidence of a separate break at the agreement dates.

Table Appendix B.2: Additional funding-entry comparisons around the two MFN episodes

Panel A. Australia and Switzerland relative to Brazil		
	Nov. 2020 rule	May 2025 order
Same 264 medicines, entries per country-month	−0.750	0.000
Same 264 medicines, named-minus-other contrast	−0.689	0.000
Same 264 medicines, three-month list contrast	+0.542	−0.068
Similar FDA approval age, entries per 100 medicines	−0.150	−0.336
Panel B. Six-market age-balanced spending contrast		
Announcement or event	Common pre-May baseline	Adjacent months
May 2025 order and HHS targets	[−0.266, −0.261]	−0.028
July 2025 letters	[−0.253, −0.248]	−0.098
September 2025 Pfizer agreement	[−0.261, −0.256]	+0.018
November 2025 Lilly and Novo Nordisk agreements	[−0.186, −0.181]	+0.054
December 2025 announcements	[−0.225, −0.220]	+0.442
February 2026 TrumpRx launch	[−0.344, −0.339]	−0.323
April 2026 U.S.–UK pricing arrangement	[−0.261, −0.256]	−0.140
Panel C. Entries around announcements by manufacturer		
Group and comparison window	Estimate	95% interval
July letter recipients, August–May vs. June–July	−0.060	[−0.956, 0.837]
Pfizer, two months on either side	−0.460	[−3.944, 3.024]
AstraZeneca, two months on either side	+0.867	[−4.650, 6.384]
Lilly and Novo Nordisk, one month on either side	−1.855	[−9.835, 6.126]

This table shows recorded entry changes around the MFN episodes. Panel A compares six months on either side, except for the three-month test. Its named-minus-other outcome compares the 18 matched drugs on the 2020 CMS list with the other drugs. The approval-age comparison uses 111 medicines in 2020 and 124 in 2025. Panel B uses 361 medicines and reports age-balanced higher-minus-lower U.S.-spending entries per 100 medicines monthly. The common baseline is January 2023–April 2025 and each post period ends in May 2026. Ranges reflect admissible British dates. Adjacent windows use two months on either side except for April 2026, which uses one. Panel C adjusts for FDA approval year and prior Part D spending and compares letter recipients with other firms and agreement signers with firms that signed later.

Appendix C. Weighting and sample sensitivity

Income screens use revised 2024 GDP. Drug balancing targets the matched cohort; supplementary country weights target the original Australia–Switzerland pair. Exact pre-period mean/trend balance is infeasible for every outcome. For the entropy-balanced outcome, January–April 2025 prediction errors are 0.228 with equal countries, 0.335 with nearest matching and 0.352 with a synthetic mixture.

Figure Appendix C.1 shows the observed history behind the supplementary synthetic comparison: 24 months for fitting weights, four further pre-announcement months for checking predictions, and twelve post-announcement months. In this figure, Australia and Switzerland are the reference

OECD markets. The non-OECD series combines Brazil, Hong Kong and Singapore using pre-announcement weights.

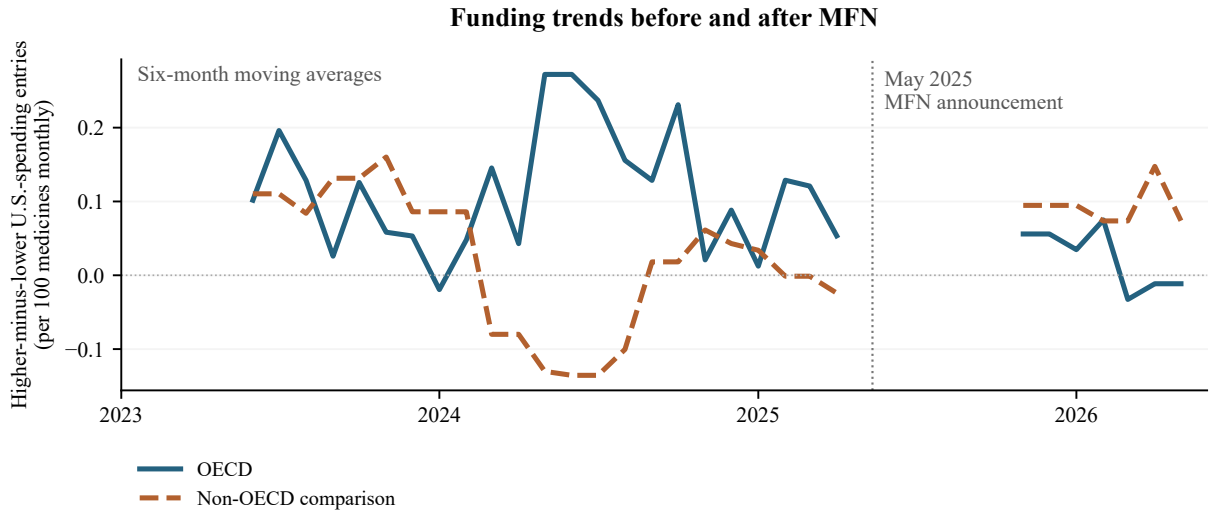

Figure Appendix C.1: This figure shows observed history for the supplementary synthetic comparison, January 2023–May 2026. Lines show six-month trailing averages, calculated separately before and after the omitted May 2025 announcement month. The first post-announcement average appears in November 2025, after six post-announcement months are observed. Tuning fits 2023 and validates 2024, followed by refitting on 2023–2024; January–April 2025 is held out.

Country contributions

Figure Appendix C.2 shows where the pooled estimate comes from. Each reference OECD market is compared with the same mean change in Brazil, Hong Kong and Singapore. Britain's contribution is -0.146, Australia's -0.097 and Switzerland's -0.018 entries per 100 medicines monthly; these add to the pooled estimate of -0.261. Singapore accounts for most of the increase across non-OECD markets.

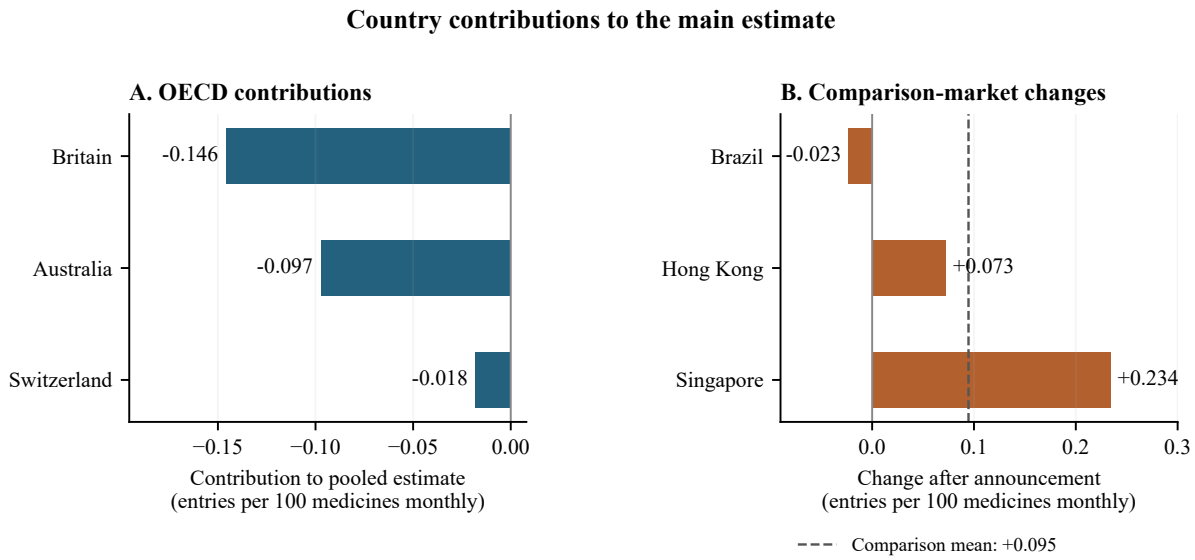

Figure Appendix C.2: This figure shows country contributions to the age-balanced estimate. Panel A assigns each reference OECD market one third of the difference between its change and the mean change across non-OECD markets; the three contributions sum to -0.261. Panel B shows changes for all three non-OECD markets; the dashed line is their equal-weight mean. All changes concern higher-minus-lower U.S.-spending entries. The pooled estimate's approximate 95% interval is [-0.605, 0.083].

Alternative medicine weights

Figure Appendix C.3 checks whether the result depends on how medicines are weighted. It compares the six-country age-balanced estimate of -0.261 with the equal-medicine-weight estimate of -0.149 and the four-characteristic estimate of -0.207. Age balancing yields effective sample sizes of 171 and 173 medicines in the higher- and lower-spending groups. Balancing approval year, biologic status, priority review and orphan designation yields effective sample sizes of 163 and 167 (Hainmueller, 2012).

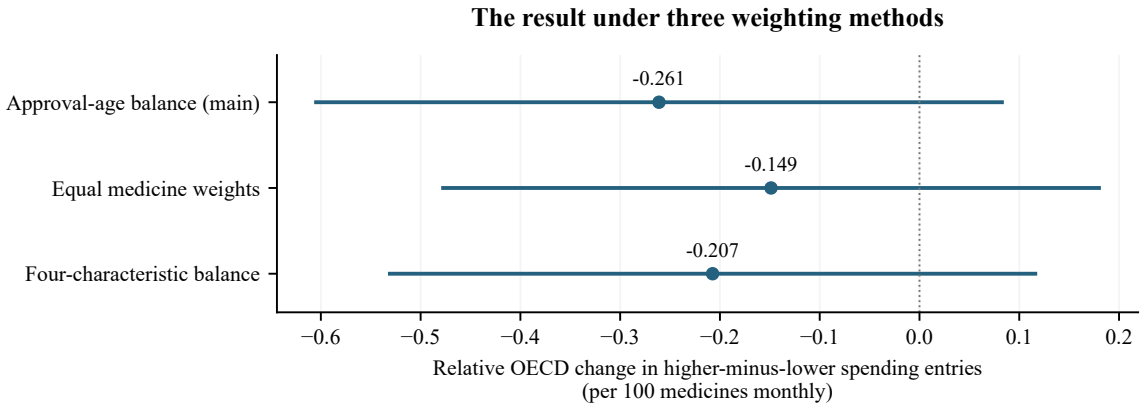

Figure Appendix C.3: This figure shows robustness to alternative medicine weights. Each point estimates the same six-country spending-exposure contrast using a different weighting method; horizontal lines show approximate 95% country-cluster intervals. Negative values indicate a larger decline in reference OECD markets relative to non-OECD markets for higher-spending medicines. All three intervals include zero.

Table Appendix C.1 retains each country-deletion contrast from the six-country main pool. The country specification was revised after initial forecasts were observed; an excluded OECD series exceeded its forecast. Original forecasts remain in the replication materials.

Table Appendix C.1: This table shows age-balanced exposure estimates when each country is omitted.

Omitted market	Estimate	Approximate 95% interval
Australia	-0.246	[-0.769, 0.278]
Switzerland	-0.365	[-0.646, -0.083]
Britain	-0.173	[-0.539, 0.193]
Brazil	-0.320	[-0.699, 0.059]
Hong Kong SAR	-0.272	[-0.725, 0.181]
Singapore	-0.191	[-0.534, 0.151]

Age-balanced entries per 100 medicines monthly; five country clusters per row. The six-country estimate is -0.261 [-0.605, 0.083]. All six country-deletion checks are shown.

Table Appendix C.2: This table shows age-balanced checks for the historical five-country component.

Specification	Estimate	Approximate 95% interval
Five-country, full-year	-0.173	[-0.539, 0.193]
Original seven-month follow-up	-0.143	[-0.362, 0.075]
Omit last two follow-up months	-0.110	[-0.405, 0.185]
Country-specific linear trends	-0.281	[-0.820, 0.257]
Exclude four indexed-only Hong Kong entries	-0.160	[-0.531, 0.211]
Historical June 2024 placebo	0.109	[-0.246, 0.465]
Add New Zealand: OECD-membership comparison	-0.177	[-0.437, 0.083]

Entries per 100 medicines monthly, using the same frozen FDA-age weights. These are supplementary checks on the earlier five-country component (Australia, Switzerland, Brazil, Hong Kong and Singapore); Britain is in the main pool but not these historical monthly checks. The full list of eleven original age-balanced specifications, together with the additional New Zealand check, is retained in the replication package. Adding New Zealand links 63 distinct FDA-cohort medicines to its community schedule; the six-country check concerns OECD membership, not verified eligibility under the MFN income screen. Programme scopes differ. Historical exposure checks in the final appendix paragraph use uniform drug weights. The primary six-country estimates do not depend on assigning unknown British event months.

Table Appendix C.3 reports the earlier five-country estimates under alternative country weights; the full list of alternative specifications is retained in the replication package. Eight of nine exposure estimates are negative, and all intervals include zero. The fixed oncology subset in the main six-country pool gives 0.113 [-0.364, 0.590], showing that the negative pooled contrast is not shared by every therapeutic subset. All eight British history/scope cases are retained in replication; their individual intervals include zero. Approximate 80%-power detectable effects in the main pool are 0.808 entries per country-month for the aggregate outcome and 0.456 entries per 100 medicines monthly for the age-balanced exposure contrast, using $(t_{.975,5} + z_{.8})\widehat{\mathrm{SE}}$ and treating source histories as fixed.

Table Appendix C.3: This table shows historical five-country estimates under alternative country weights.

Drug weights	Equal countries	Nearest match	Synthetic mixture
FDA age	-0.173 [-0.539, 0.193]	-0.312 [-0.864, 0.239]	-0.147 [-0.547, 0.253]
Uniform	-0.065 [-0.447, 0.316]	-0.085 [-0.591, 0.422]	0.007 [-0.636, 0.650]
Four covariates	-0.123 [-0.466, 0.220]	-0.256 [-0.780, 0.267]	-0.039 [-0.387, 0.309]

Exposure contrasts per 100 medicines monthly; approximate 95% intervals in brackets. Country counts range from three to five. "Four covariates" denotes entropy balancing. Britain is included in the main pool but excluded from these historical country-weighting specifications because its complete monthly event history is not identified.

Historical five-country diagnostics follow. Hong Kong introduced quarterly prioritisation in early 2025, targeting shorter funding timelines (Hong Kong Hospital Authority, 2025). Four May entries followed earlier committee discussions; funding calendars matter independently of MFN. The exposure placebo is 0.121 [-0.232, 0.473]; country-specific trends give -0.176 [-0.747, 0.395]. Excluding the four indexed-only events gives aggregate -0.065 [-1.249, 1.118] and exposure -0.066 [-0.447, 0.316]. The original seven-month coefficients reproduce. Historical five-country approximate 80%-power detectable effects are 1.465 entries per country-month and 0.511 exposure entries per 100 medicines monthly. The ten country relabellings give a rank fraction of 0.7 for both outcomes; assignment is not random.

Table Appendix C.4: Sensitivity to alternative specifications

Outcome or spending measure	Distinct designs	Negative	95% CI below zero
Overall entries	300	296	9
2023 spending groups, age balanced (main)	300	288	27
2023 spending groups, equal medicine weights	300	274	16
2023 spending groups, balance four characteristics	300	284	17
2023 spending groups, 323 common medicines	300	294	0
2022 spending groups, 323 common medicines	300	253	0
2023 continuous log spending, FDA age adjustment	300	285	0
All outcomes and weights	2,100	1,974	69

This table shows how often estimates are negative under alternative specifications. The 2,688 combinations vary country assignment, outcome or weights, timing and which funding records are included. Identical effective designs count once. Confidence intervals use CR2 country-cluster inference.

Additional calendar-time and funding-history checks

The monthly calendar check retains all 361 medicines and equal country weights. Observed monthly entries are displayed alongside six-month trailing means calculated separately before and after the omitted May 2025 announcement month. Smoothing therefore does not blend pre- and post-announcement observations. The six-country calculation independently reproduces -0.468 entries per country-month overall and -0.261 entries per 100 medicines monthly for the FDA-age-balanced higher-minus-lower spending contrast. CR2/Satterthwaite 95% intervals are [-1.130, 0.194] and [-0.635, 0.113], respectively. Exhaustive restricted wild-bootstrap tests using all $6^6 = 46{,}656$ Webb weight combinations give two-sided p-values of 0.085 and 0.091. These checks retain the same point estimates while accounting for the small number of country clusters; the intervals include zero.

Using the earliest rather than latest admissible British dates changes the overall estimate from -0.468 to -0.456 and the spending contrast from -0.261 to -0.266. The January–May 2026 comparison with January 2023–April 2025 gives -0.707 overall and -0.220 for the spending contrast, with CR2

intervals of [-1.735, 0.321] and [-0.781, 0.342]. June–December 2025 is excluded from the pre-period in this comparison. This five-month check is a separate calendar window, rather than an assumption that every medicine became subject to MFN pricing in January 2026.

Earlier-date comparisons use only pre-announcement observations. A May 2024 placebo compares June 2024–April 2025 with January 2023–April 2024, giving 0.057 overall and -0.064 for the spending contrast. A January 2025 placebo compares January–April 2025 with 2023–2024, giving 0.264 and -0.335, respectively. The spending estimates have CR2 intervals of [-0.523, 0.395] and [-1.047, 0.377]. The difference between reference OECD markets and non-OECD markets in country-specific pre-period linear slopes is -0.0010 for overall entries ($p = 0.968$) and -0.0014 for the spending contrast ($p = 0.907$), using Welch tests across the six country slopes. The negative January 2025 spending comparison shows that some movement precedes May; the earlier-date checks do not establish a unique announcement-date break. Calendar-bin estimates, both British date conventions and each country's monthly series are retained with the replication results.

Five-year historical benchmark

This supplementary comparison retains the common 361-medicine cohort and uses the complete monthly histories of Australia, Switzerland and the captured Brazilian medicine-procedure programme. We average Australia and Switzerland with equal country weights and subtract Brazil. The pre-period is May 2020–April 2025 (60 months); the evaluation period is June 2025–May 2026 (12 months), omitting May 2025. The observed-data DiD is -0.367 recorded entries per country-month overall and -0.084 age-balanced higher-minus-lower entries per 100 medicines monthly. With Brazil as the only non-OECD market, the synthetic DiD calculation has a donor weight of one and uniform pre-period weights, reproducing this ordinary DiD.

For the projection check, we fit a seasonal benchmark to the pre-announcement OECD-minus-Brazil gap, using an intercept and annual sine and cosine terms without extrapolating a linear trend. The seasonal specification has the lowest mean absolute prediction error among four candidate specifications over three earlier 12-month prediction windows beginning in June 2022, June 2023 and May 2024. The corresponding training histories contain 24, 36 and 47 months; the last two evaluation windows overlap by one month. Mean absolute errors are 0.402 for overall entries and 0.081 for the spending contrast. These historical comparisons condition on the paper's fixed medicine cohort and 2023 spending groups rather than reconstructing the information set available to a forecaster at each earlier date.

Observed post-announcement outcomes fall below the seasonal benchmark by 0.367 overall entries and 0.084 spending-contrast entries monthly. Omitting each pre-period year in turn from the constant-gap benchmark retains negative estimates, ranging from -0.458 to -0.229 overall and from -0.130 to -0.039 for the spending contrast. Table Appendix C.5 reports all four projection

specifications. The seasonal benchmark is selected using pre-announcement prediction errors, rather than the sign of its post-announcement deviation.

Table Appendix C.5: This table shows deviations from five-year historical funding benchmarks.

Pre-period projection	Overall entries	Spending contrast
Seasonal benchmark (selected)	-0.367 [-1.025, 0.142]	-0.084 [-0.302, 0.201]
Constant-gap benchmark	-0.367 [-1.033, 0.150]	-0.084 [-0.305, 0.198]
Linear gap trend	-0.314 [-1.221, 0.429]	-0.020 [-0.325, 0.332]
Linear trend and seasonality	-0.329 [-1.227, 0.424]	+0.0003 [-0.301, 0.360]

This table shows observed minus projected monthly OECD-minus-Brazil gaps for Australia and Switzerland relative to Brazil. Overall entries are per country-month; the spending contrast is higher-minus-lower entries per 100 medicines, using the existing FDA-age weights. Brackets give 95% predictive deviation ranges from 5,000 circular 12-month residual-block bootstrap draws with model refitting. They describe time-series prediction uncertainty conditional on the three-country sample, not country-clustered causal confidence intervals. The selected seasonal benchmark's 95% predictive ranges cover two of the three earlier evaluation outcomes; three windows provide a limited calibration check. With a full 12-month evaluation, the annual seasonal terms average to zero, so the seasonal and constant-gap point estimates coincide. The linear specifications are retained as sensitivity checks. All predictive ranges include zero.

The longer pre-period supplies an observed historical benchmark and permits earlier prediction checks; it does not extend the observed post-announcement period beyond one year. Projection draws are used only to quantify predictive uncertainty and are never added as observations to the DiD. Brazil remains the only non-OECD market in this test, and the analysis concerns the captured funding programmes rather than all national routes.