

Israeli Competition-Enhancing Reforms in Network Sectors (Post-1995)

Key Reforms Increasing Competition and Capital Deepening

1. **Electricity Sector Law (1996) – Electricity Utilities Reform.** In 1996, Israel enacted the Electricity Sector Law to establish an independent regulator and lay the groundwork for liberalizing the state-run Israel Electric Corporation (IEC) ¹. The law's stated goal was to ensure reliable supply at minimum cost and create conditions for competition in generation ¹. It enabled licensing of Independent Power Producers (IPPs), although union resistance and slow implementation delayed large-scale entry ². The reform was a first step toward breaking IEC's monopoly, eventually allowing private power plants (fueled by newly discovered natural gas) to supply about 30% of electricity by the mid-2010s ³. This legislative change paved the way for capital-intensive private generation investments in subsequent years, aiming to raise efficiency and labor productivity.
2. **Electricity Market Structural Reform (2018) – IEC Restructuring and Generation Competition.** After two decades of stalled attempts, a landmark reform agreement was reached in 2018 to overhaul the electricity sector ⁴ ⁵. The government approved a plan to unbundle IEC's vertical monopoly, forcing IEC to sell off about 5-6 of its power stations and reduce its generation market share from ~70% to 40% ⁶ ⁷. A new independent system operator was carved out, the retail supply segment opened to competition, and IEC refocused on the regulated transmission-distribution grid ⁶. The reform set an 8-year timetable (2018-2026) for implementation ⁸. Massive capital investments by new private owners and IEC itself were integral: IEC would invest NIS ~8-9 billion in upgrading the grid ⁸ ⁹, while private buyers of IEC's plants and new IPPs deploy modern gas-fired units. The reform explicitly aimed to increase competition and efficiency, cut consumer costs, and facilitate capital deepening via new entrants and grid modernization ¹⁰ ¹¹.
3. **Ports Sector Corporatization (2004–2005) – Port Authority Reform.** In 2005, Israel implemented a contentious ports reform law that restructured the Israel Ports Authority's operations ¹². The reform split the national port authority into separate companies for the major seaports (Haifa, Ashdod, and Eilat) and a landlord Ports Company ¹³. This corporatization was intended to prepare the way for competition and privatization in a sector long plagued by inefficiencies and labor unrest. The government's commitment to reform included agreements with unions to mitigate strikes ¹². However, actual competition remained absent after 2005 – Haifa and Ashdod port companies retained a comfortable duopoly (handling ~90% of Israel's cargo) ¹⁴ ¹⁵. While the 2005 reform did improve management incentives, it is largely seen as an initial, incomplete step toward genuine competition, pending later measures to introduce new operators ¹⁶ ¹⁵. It did set the stage for major capital investments (e.g. new cranes, terminal upgrades) but fell short of breaking the monopoly on cargo handling.

4. Introduction of Private Ports and Competition (2013-2021) – Seaport Competitive Entry. Confronting persistent port inefficiencies, the government launched a bold plan in 2013-2014 to **build and concession two entirely new deep-water ports** to compete with the incumbent state-owned ports ¹⁶ ¹⁷. Agreements were signed with international operators to construct modern terminals adjacent to Haifa and Ashdod ¹⁶. In **September 2021**, the \$1.7 billion **Bay Port in Haifa** opened under China's SIPG, marking the first time a **private foreign operator entered Israel's port sector** ¹⁸ ¹⁹. A second new port in Ashdod (the South Port, run by Switzerland-based TIL) began operations in 2022 ²⁰. These entrants ended the Haifa/Ashdod duopoly, **injecting competition** that has already cut ship wait times and improved service ¹⁸ ¹⁹. The **massive capital outlay (NIS 5.5 billion for Bay Port alone)** introduced **state-of-the-art infrastructure and automation, dramatically raising capital per worker. Early reports indicate the new ports are driving efficiency gains and forcing the old ports to streamline****, heralding a new era of competition in Israeli maritime trade ¹⁶ ¹⁹.

5. Fixed-Line Telecom Liberalization (2000-2005) – Bezeq Monopoly Erodes via Cable Telephony. In the early 2000s, Israel opened its fixed telecom market to infrastructure competition, **ending Bezeq's decades-long monopoly** in fixed voice services. Cable TV operators were permitted to offer broadband internet (around 2000) and then licensed for telephony in 2003-2004, leading to the creation of HOT Telecom as a nationwide alternative to Bezeq's landlines ²¹ ²². Bezeq was privatized in 2005, and regulatory steps (like number portability and interconnection rules) further **lowered entry barriers**. By 2006, HOT's cable network was delivering phone and internet service, **establishing a competing fixed infrastructure**. This **duopoly in fixed broadband and voice** spurred service improvements and some price competition. The liberalization set the stage for **major capital upgrades** – Bezeq invested in ADSL and later fiber, while HOT upgraded its cable system – thereby **increasing the capital intensity** (network electronics, fiber nodes, etc.) of the telecom sector per subscriber. Although initial competition was limited to two players, it marked a shift from monopoly to **infrastructure-based rivalry**, with long-run productivity implications for Israel's communications sector.

6. Wholesale Broadband Access Reform (2015) – Telecom Open-Access Competition. To further boost fixed-line competition, the Ministry of Communications implemented a “**wholesale market**” reform **in 2015**. Under this reform, incumbent operators (mainly Bezeq) were **obliged to lease their infrastructure (local loops and bandwidth) to rival Internet Service Providers at regulated prices** ²³. This allowed new retail providers (Cellcom, Partner, etc.) to enter fixed broadband without laying new cables ²³. The wholesale access mandate **ended the previous split between infrastructure and ISP services**, enabling consumers to buy internet access as a single product ²⁴ ²². The reform led to dozens of wholesale agreements and increased ISP competition, resulting in lower broadband prices and higher speeds. However, Bezeq resisted implementation (incurring fines for non-compliance) ²⁵, and some analysts argue the low regulated fees **disincentivized Bezeq's own fiber investment**, delaying infrastructure upgrades ²⁶ ²³. Nonetheless, the 2015 wholesale reform significantly **opened the market**, leveraging existing capital more efficiently and prompting some competitors to consider **deploying their own fiber (capital deepening) to bypass Bezeq**.

7. Nationwide Fiber-Optic Broadband Initiative (2019-2021) – Accelerated Fiber Deployment Reform. Responding to lagging fiber rollout, Israel undertook a major reform in 2020 to **incentivize rapid expansion of fiber-optic networks**. Communications Minister Yoaz Hendel removed regulatory barriers that had discouraged Bezeq from deploying fiber – notably **lifting the universal**

deployment obligation in exchange for a commitment to cover ~80% of households, and creating a government-supervised fund to subsidize fiber build-out in less profitable areas ²⁷ ²⁸. This “Fiber Optic Plan” (approved by the Knesset in 2020) immediately unleashed a wave of capital investment: Bezeq, Cellcom, and Partner laid hundreds of thousands of fiber lines, and by mid-2022 fiber infrastructure passed 1.6 million households (70% of Israelis) ²⁹ ²⁷. The reform also allowed the electric utility’s fiber venture (IBC) and others to fill gaps via the subsidized fund ²⁷ ³⁰. This **dramatic capital deepening** – replacing copper with fiber – is poised to **boost labor productivity** in telecom (fiber networks require fewer technicians per gigabit of capacity) and enable economy-wide digital productivity gains. It also transformed the competitive landscape: multiple ISPs now offer gigabit service over fiber, ending Bezeq’s dominance in high-speed broadband. The fiber reform is widely seen as a **policy success, closing Israel’s broadband gap** through coordinated regulatory and capital investment measures ²⁹ ²⁷.

8. Natural Gas Sector Law (2002) – *Gas Pipeline Market Opening*. In 2002, amid newly discovered offshore gas reserves, Israel passed the Natural Gas Sector Law to create a framework for transporting and distributing natural gas domestically. The law established a licensing system to **encourage competition in gas transmission and distribution**, overseen by a new Natural Gas Authority regulator ³¹. Under this reform, **Israel Natural Gas Lines Ltd. (INGL)** was founded in 2004 as a state-owned pipeline company, but private firms can be licensed for local distribution ³¹. This setup – akin to a regulated open-access pipeline – helped attract investment in pipeline infrastructure while keeping the core network under public ownership ³². The result was a rapid build-out of the national high-pressure gas pipeline (about 800 km by 2010) ³³, connecting new offshore gas fields to power plants and industries. **Capital spending on the gas network was massive**, and gas quickly displaced more labor-intensive fuels (like imported oil and coal handling) in electricity generation. By enabling cheaper and cleaner fuel, the law spurred **capital deepening in power plants** (as new gas turbines were built) and improved productivity (one gas pipeline technician can deliver the fuel equivalent of many truck deliveries). The gas market reform also introduced a degree of competition at the distribution level and laid the groundwork for later moves to prevent upstream monopolies. Overall, this 2002 reform was pivotal in **transitioning Israel’s energy sector to a capital-intensive gas infrastructure**, with attendant efficiency gains.

9. Water and Sewerage Corporations Law (2001) – *Municipal Water Sector Reform*. In 2001, Israel fundamentally reorganized its urban water supply by mandating the transfer of water and sewage services from municipalities to **regional Water & Sewage Corporations** ³⁴. This corporatization reform aimed to **ensure revenues were invested in infrastructure** rather than diverted, and to professionalize service delivery ³⁵. Dozens of municipal utilities were consolidated into 56 companies (as of 2020) covering 95% of the population under the law ³⁶ ³⁷. Crucially, the corporations operate on a commercial basis, charging uniform tariffs regulated by the national Water Authority. The reform led to a **surge in capital investment**: from 2011–2018, water corporations invested **NIS 8.6 billion in upgrading pipes, treatment plants, and desalination connections** ³⁸. This far outstripped prior municipal investment rates, reflecting effective **capital deepening** in the sector. By improving infrastructure (reducing leaks, automating operations) and trimming over-staffing, the water corporatization has **raised labor productivity** – measured by cubic meters delivered per employee – and improved service quality. However, implementation has been uneven (24 small municipalities still hadn’t corporatized by 2019) ³⁶, and debates continue on merging the many firms for scale efficiency. Still, the 2001 reform is regarded as a milestone that introduced **commercial discipline and long-term capital planning** to Israel’s water sector.

10. **Large-Scale Seawater Desalination Program (2002 onward)** – *Private Water Supply Contracts*. In response to severe droughts, the Israeli government in 2002 approved an ambitious plan to procure **seawater desalination plants via public-private partnerships**³⁹. Over the 2005–2015 period, five giant desalination facilities were built along the Mediterranean by private consortia under Build-Operate-Transfer contracts (e.g. Ashkelon in 2005, Hadera 2009, Sorek 2013). These plants were tendered competitively, driving costs per cubic meter to some of the lowest in the world⁴⁰. The program **injected billions of shekels in capital investment** – each plant costing \$~200–400 million – into what had been a stagnant water supply sector. By 2014, desalination supplied roughly 35–40% of Israel's drinking water⁴¹, essentially replacing over-pumped natural sources. This paradigm shift made Israel's water supply **far more capital-intensive** (massive high-tech plants run by relatively small crews) and boosted output per water-sector worker (each plant produces tens of millions of cubic meters annually with minimal labor). The desalination rollout also **introduced a form of market mechanism**: private operators compete for 25-year supply contracts, injecting some competitive pressure into a sector formerly monopolized by the national water company, Mekorot³⁹⁴¹. Overall, Israel's desal program exemplifies **capital-deepening driving productivity**, turning a water-scarce nation into a water-surplus one via technology and private investment.

11. **Postal Sector Reform and Corporatization (2006)** – *Introducing Competition in Mail Services*. After accumulating losses and service complaints, the state postal service underwent major reform in the early 2000s. In 2006, Israel Post was transformed from a government agency into the **Israel Postal Company**, a government-owned corporation, following legislative changes in 2002⁴². The reform also **partially opened postal markets to competition**, for example allowing private firms to handle bulk mail and non-urgent letters starting in 2006⁴³. These steps eroded the Postal Company's monopoly in areas like direct mail and courier services. The new corporatized entity gained more managerial flexibility and invested in modernization (such as computerized sorting centers and digital services). However, Israel Post continued to struggle with inefficiency and lagged the digital revolution⁴⁴. In 2020, 20% of its shares were sold to a strategic investor, and in 2021 the government announced plans for **full privatization and further competition expansion** (including easing entry for mail processing competitors and imposing performance incentives)⁴⁵⁴⁶. While not yet fully realized, the postal reforms have driven some **capital deepening** (e.g. automated mail sorting, IT systems) and workforce downsizing. They carry significant policy importance as Israel attempts to turn its postal service into a viable, efficient operation in the e-commerce era⁴⁷.

(Each reform above is supported by authoritative sources. Official government reports, laws, and data from regulators or the Bank of Israel were used where available.)

Scoring Evaluation of Each Reform (0–5 Scale per Criterion)

The following tables score each reform across five dimensions – **(A)** Data Feasibility, **(B)** Identification Strength, **(C)** Capital Deepening Plausibility, **(D)** Novelty & Literature Gap, and **(E)** Policy Relevance – using a 0–5 rubric (5 = very high) as per the provided weighting scheme. Each score is justified briefly with evidence.

Electricity Sector Law (1996)

Criterion	Score	Justification
A. Data Feasibility	3	The law's impact is diffuse (enabling later changes), making isolated data analysis tricky. However, sector-level data on electricity output, employment, and capital stock are available from the IEC, the regulator, and national accounts ¹ ³¹ . We can track the gradual entry of IPPs (e.g. share of generation) over time ³ . Firm-level productivity data is limited (since major changes occurred much later), so measuring a <i>1996 effect</i> relies on long-run series. Data exists but not at a granular treatment/control level – hence moderate feasibility.
B. Identification	1	There is no clear timing shock to exploit – competition did not materialize immediately in 1996. The law's passage alone is an early policy input , but actual changes (IPPs investing) occurred years later confounded by other factors (e.g. gas discovery in 2000, emergency tenders in 2008). Thus, isolating the law's causal effect on productivity is very difficult. One might analyze a structural break in sector trends post-1996, but IEC remained a monopoly through the 1990s ² . Identification strength is therefore very weak (score 1).
C. Capital Deepening	2	The 1996 law signaled future private investment but did not itself inject capital immediately. IEC remained the sole builder of capacity in the late 1990s. Only in the 2000s did private producers start adding generation capital (thanks to the legal framework). So while the law was a precondition for later capital deepening, its direct effect on K/L in the short term was negligible. We assign a low score, acknowledging some plausibility that it enabled later K deepening (private IPPs eventually invested billions in new plants) ³ .
D. Novelty & Lit.	2	Electricity liberalization is well-trodden globally, and Israel's 1996 effort is historically noted but not unique . The literature on power market reforms covers many countries; Israel's failed attempts in the 90s are referenced in policy reports ² but not extensively studied academically. A study focusing on the 1996 law's long-delayed impact would be somewhat novel (little direct evaluation exists), but the concept (legislative intent vs. outcomes) is not a major gap. Score: 2 (somewhat niche interest).
E. Policy Relevance	3	At the time, the law was very significant – it established the Electricity Authority and competition principles. Today, its relevance is mostly historical , since the <i>real</i> reform happened in 2018. However, understanding why the 1996 framework failed to immediately produce competition is relevant to policymakers (it highlights barriers like labor unions and political economy issues). Thus, it has moderate policy learning value, but current focus is on the 2018 reform's implementation.

Electricity Market Reform (2018)

Criterion	Score	Justification
A. Data Feasibility	4	The 2018 reform's effects can be tracked using rich data: sectoral output, employment, and capacity are reported by IEC and the Electricity Authority annually ⁴⁸ ₇ . We know which plants were sold and when, and private vs. IEC generation shares ⁴⁹ . Labor productivity (MWh per worker) can be computed using IEC headcount reductions (several thousand employees took early retirement ⁵⁰) and generation data. Additionally, hourly electricity market data (prices, reliability) and international benchmarks exist. While we lack a perfect control group within Israel, data quality is high, enabling time-series or synthetic control analysis.
B. Identification	3	Identification is moderate . The reform's timing (mid-2018) is well-defined ⁵¹ ₅ , but it affected the entire sector at once. A before-after comparison could be bolstered by using other countries as a synthetic control or by examining segments: e.g. large industrial consumers who could switch suppliers vs. residential (still captive until 2024) as a quasi-control. Alternatively, one can exploit the staggered sale of plants (e.g. plants sold in 2019 vs. those sold in 2020–21) to do a difference-in-differences on plant performance. There is some exogeneity (the reform was a sudden policy breakthrough after years of gridlock), but concurrent factors (economic cycle, gas prices) must be controlled. Overall, identification is feasible but not entirely "clean," hence a mid-level score.
C. Capital Deepening	5	Capital deepening is highly plausible and observable. The reform directly led to new investment: IEC's plan freed it to invest ₪2.5 billion in grid upgrades ⁹ , and private buyers of IEC's generation units committed significant capex to upgrade efficiency and add capacity. New entrants (like IPPs) with modern combined-cycle plants operate with fewer staff per MW, raising K/L. IEC also decommissioned old coal units and is building gas units, again substituting capital for labor. Workforce downsizing (targeted ~25% reduction) ⁵⁰ further boosts capital per worker. Given these concrete changes, the link from reform to higher K/L and labor productivity is very strong (score 5).
D. Novelty & Lit.	4	While power market reforms have been studied, Israel's case offers new insights . Few papers have evaluated Israel's electricity restructuring, especially as it is ongoing. The reform's unique elements – a government-owned monopoly undergoing partial breakup, with strong union concessions – make it a valuable case to add to the literature on late electricity market liberalizers. It also ties into research on how privatization and competition affect productivity in utilities. Thus, a study here would be a novel contribution , filling a gap on Israel and contributing to global evidence. We assign 4 (novel, though building on known reform concepts).

Criterion	Score	Justification
E. Policy Relevance	5	<p>This reform is highly relevant. Domestically, it's under close watch – success or failure will inform Israeli policy in energy and privatization for years. Internationally, it provides a model for other countries with state-dominated utilities (many developing countries) on how to sequence competition introduction. Moreover, the reform has implications for renewable energy integration and reliability under competition ¹⁰ ⁵².</p> <p>Given the stakes (electricity prices, energy security), evidence on its outcomes (especially on productivity and costs) is of great interest to policymakers and regulators.</p>

Ports Corporatization Reform (2005)

Criterion	Score	Justification
A. Data Feasibility	3	<p>We have basic port performance data – e.g. annual container throughput (TEUs) and the ports companies' financials (revenue, employees) – from official reports and the Ports Company. Labor productivity (e.g. TEU per dockworker) can be computed for Haifa and Ashdod ports over time.</p> <p>However, isolating the 2005 corporatization effect is hard; the data will show gradual improvements but also volatility due to trade fluctuations. No obvious control port exists (Eilat is tiny and specialized). Data on union agreements and investment levels pre/post 2005 are available qualitatively ¹² but quantitative metrics are limited. Thus, feasibility is moderate (score 3).</p>
B. Identification	2	<p>The reform's impact on productivity is difficult to identify cleanly. It was essentially an organizational/legal change without an immediate competitive shock – both main ports continued under government ownership. Any improvements (or lack thereof) post-2005 could be due to internal efficiency drives or external trends (global trade boom mid-2000s). A possible approach is a pre/post analysis focusing on efficiency KPIs (like ship wait times, crane moves/hour) around 2005, but results would be descriptive. Labor outcomes (like strikes frequency) could be compared before vs. after corporatization. Without a true counterfactual, identification is weak (score 2).</p>
C. Capital Deepening	3	<p>The 2005 reform itself did not inject major new capital immediately – it primarily changed governance. However, it <i>enabled</i> later capital investments by the port companies (new equipment, yard expansion) with more autonomy. In the years after corporatization, the ports did undertake upgrades (e.g. Ashdod purchased modern cranes) as they prepared for future competition. So there was some increase in capital per worker, but incremental. We score 3: some plausibility of capital deepening, but not a dramatic jump until the competition phase later ¹⁶.</p>

Criterion	Score	Justification
D. Novelty & Lit.	3	Many countries reformed port authorities in the 1990s–2000s; Israel's 2005 attempt is noted but not extensively studied internationally. A study of why this corporatization failed to achieve competition could be insightful, but the topic overlaps with broader literature on port governance. Novelty is moderate – it adds a case study of limited reform. There is some literature gap on Israel's port sector (most analyses focus on the later 2010s competition), so a focused study on 2005 would be somewhat niche. Score 3.
E. Policy Relevance	3	This reform is less directly relevant today because it was overtaken by the 2013–2021 competitive entry. However, it offers policy lessons on corporatization without competition – a halfway reform. For countries considering port corporatization as a step to privatization, Israel's experience is instructive (it shows that without introducing competitors, efficiency gains may be limited). Domestically, the 2005 reform's shortfalls justified the later actions ⁵³ , so understanding it has retrospective policy value. Overall, moderately relevant (3).

Ports Competition Introduction (2013–2021)

Criterion	Score	Justification
A. Data Feasibility	4	There is good data on port output and efficiency around the time competition was introduced. We can compare cargo volumes, ship waiting times, and productivity metrics at Haifa/Ashdod before and after 2021 ¹⁸ ¹⁹ . Each port company publishes annual reports (with tonnage, TEUs, labor costs). We also have data on the new entrants (e.g. Bay Port throughput). A feasible strategy is to use a difference-in-differences : Haifa and Ashdod main ports as treated (facing new competition starting 2021) and perhaps Eilat port as a quasi-control (no new competitor). Alternatively, monthly performance data pre/post-entry could be analyzed. Given multiple indicators and sources (government and international shipping databases), data feasibility is high (score 4).
B. Identification	3	The timing is sharp (Bay Port opened Sep 2021; Ashdod's new port in 2022) ¹⁸ ⁵⁴ , which provides a clear before/after for the affected ports. We can observe immediate changes (e.g. reduction in backlog) that are plausibly caused by the competition infusion. However, with only a couple of treated units, statistical power is limited. A DID with Eilat as control is imperfect (Eilat is much smaller). Another angle: within Haifa port, analyze how measures improved once Bay Port began taking traffic. Or compare Israel's port performance trend to similar countries (synthetic control using global port indices). These give some identification, but external factors (COVID-19 trade disruptions in 2020–21) complicate inference. Overall, identification strength is moderate (3) – clear event, but few units and some confounds to manage.

Criterion	Score	Justification
C. Capital Deepening	5	<p>The competition reform came <i>hand-in-hand with massive capital investment</i>. The new ports themselves represent ~₪5.5 billion in new physical capital (berths, cranes, automation) ⁵⁵. They are highly automated, employing far fewer dockworkers per container moved than the old ports. This has effectively raised capital-to-labor ratio sector-wide – the incumbents also had to invest in new equipment and IT systems to keep up. Additionally, the anticipated privatization of Haifa Port Company (completed in 2022) brought private capital for upgrades. Altogether, the reform unleashed a wave of modernization in a sector that was previously labor-intensive and under-invested. The link to capital deepening is direct and strong (score 5).</p>
D. Novelty & Lit.	5	<p>No academic study yet has analyzed the impact of Israel's new port competition, as the change is very recent. This is a novel case: introducing private operators in an advanced economy's ports that were state-run. It can contribute to literature on port privatization and competition (most prior work focuses on either fully privatized ports or incremental efficiency tweaks). The Israel case – two parallel new entrants – is unique. It also offers data on how competition affects port labor productivity and costs. Thus, the contribution to literature would be significant (score 5, a fresh and under-researched topic).</p>
E. Policy Relevance	5	<p>The relevance is very high. For Israel, this reform is critical for trade competitiveness – policymakers are already assessing if it lowers logistics costs as intended ¹⁹. The outcomes will guide further steps (like Ashdod Port Company's future). Internationally, many countries consider adding port capacity via private investment; Israel's experience is a valuable reference, especially for handling labor union challenges and ensuring efficiency gains reach consumers. Additionally, the reform's success (or struggles) will inform ongoing Israeli policy (e.g. regulatory oversight of port fees in a competitive setting). Given the central role of ports in commerce (99% of Israel's trade by volume) ¹⁴, evidence on this competition reform is highly sought by policymakers.</p>

Fixed-Line Telecom Liberalization (2000s)

Criterion	Score	Justification
A. Data Feasibility	4	We have extensive telecom data from the Ministry of Communications and OECD telecom indicators. Key outcomes like fixed-line subscriptions, call prices, broadband uptake, and the market shares of Bezeq vs. HOT are recorded annually. Labor data: Bezeq's headcount and HOT's telecom division staff are known from financial reports. The period 1999–2006 can be tracked to see the effect of HOT's entry in telephony (from 0 to ~20% market share by late 2000s). Additionally, we have quality measures (fault rates, etc.) and consumer price index for communications. A challenge is disaggregating fixed-line from mobile influences, but feasible with careful data use. Overall, data availability is strong (score 4).
B. Identification	3	The introduction of infrastructure competition was somewhat gradual: cable internet (~2000) then cable telephony (~2004). However, discrete policy events can be leveraged: e.g. 2004 licensing of HOT for voice is a sharp change. One identification strategy is to compare regions with cable coverage vs. not (initially some peripheral areas lacked cable) – a form of cross-sectional treatment when telephony opened. Alternatively, use time-series: before 2004, Bezeq had 100% of fixed lines; after, HOT captured share – yielding a clear structural break in fixed-line penetration and prices. We'd need to control for mobile substitution trend. Not perfect, but with supportive evidence (like price cuts coinciding with HOT entry) identification is moderate (3).
C. Capital Deepening	4	Liberalization forced both Bezeq and HOT to invest heavily in network upgrades to compete. In early 2000s, Bezeq rolled out DSL internet and digitized exchanges (capital expenditures spiked), while HOT invested in two-way cable modem and telephony infrastructure. Essentially, two parallel fixed networks were active by 2005, doubling capital relative to a single-network world. Each company also introduced new technologies (e.g. Bezeq's NGN fiber-copper network later). The duplication of infrastructure and tech upgrades mean capital per telecom worker increased substantially. One caveat: some overcapacity likely reduced capital utilization, but from a K/L standpoint, deepening occurred. Score 4 (strong evidence of increased capital intensity as a result of competition).
D. Novelty & Lit.	2	The scenario of a telecom incumbent vs. cable entrant has been studied in other countries (e.g. US, Europe). Israel's case (small duopoly market) is not especially novel conceptually. Some local analyses exist (e.g. OECD communications outlook notes Israel's slow broadband initially), but academically it's not been deeply explored. However, given the later allegations of regulatory capture (the "Bezeq affair"), revisiting the liberalization with data could yield new insights. Still, relative to broader literature, novelty is limited – it would mainly add a country case to known competition effects. Score 2.

Criterion	Score	Justification
E. Policy Relevance	4	Early 2000s telecom liberalization in Israel set the stage for today's broadband market. Evaluating it has current relevance : policymakers can learn which measures succeeded (e.g. infrastructure competition did improve services) and where it fell short (broadband prices remained high until further reforms). The findings also connect to ongoing policy - e.g. the necessity of the 2015 wholesale reform was partly due to limited competition from this duopoly. For other countries, Israel's experience underscores the importance of parallel networks in driving innovation. Given the continuous evolution (now fiber deployment), understanding the impact of the initial liberalization remains relevant to telecom regulation strategy.

Wholesale Broadband Access Reform (2015)

Criterion	Score	Justification
A. Data Feasibility	4	The wholesale reform's impact can be measured using detailed market data collected by the regulator. We have monthly/quarterly data on broadband subscriptions by provider, wholesale line rentals, and retail price trends. The Ministry's 2015 press releases and reports provide before-and-after snapshots (e.g. number of customers on independent ISPs rose sharply) ²³ . Quality metrics like average download speed also improved post-2015 (Ookla speedtest data shows inflection). We can also use OECD data to compare Israel's broadband price index before vs. after 2015. Data on Bezeq's investment and fiber rollout delays are available qualitatively (e.g. Bezeq's capex dipped after 2015). In sum, rich data exists on market outcomes , supporting a solid analysis (score 4).
B. Identification	3	The reform's timing (Feb 2015 start) is a clear policy introduction, and it applied across the country at once. A before-after analysis will capture its effect on outcomes like consumer prices (which fell as Partner/Cellcom entered broadband). For identification, one could compare Israel to other OECD countries as a control (differences-in-differences on broadband indicators). Another approach: examine Bezeq vs. HOT – HOT wasn't subject to wholesale unbundling initially (since it already had competition), so Bezeq (treated) saw subscriber losses to wholesale ISPs while HOT (control) trends provide a counterfactual. There is reasonable plausibility in attributing changes in 2015–2016 to the reform, though concurrent factors (e.g. mobile data usage growth) must be accounted for. Overall moderate (3).

Criterion	Score	Justification
C. Capital Deepening	1	<p>Interestingly, this reform likely reduced capital investment incentives for the incumbent. By design, it let new ISPs piggyback on existing infrastructure rather than building their own. In the short run, capital per line may have <i>decreased</i> as more service providers shared the same physical network. Bezeq, anticipating low returns on new fiber under wholesale price controls, largely froze its fiber capex until the framework changed in 2020 ²⁶. While eventually competitors like Partner responded by laying some fiber (a form of new capital), that was minimal during our study period. Thus, the wholesale access reform was about better utilization of existing capital (increasing competition without new K), not deepening. We score 1 – little direct capital deepening, possibly even a dampening of capex by the incumbent.</p>
D. Novelty & Lit.	3	<p>Wholesale broadband markets and unbundling have been studied in telecom economics (with mixed findings on investment vs. competition). Israel's case provides a useful data point, particularly because it's an example of late implementation of a wholesale regime and its interplay with a subsequent fiber push. While not conceptually new, an analysis could contribute to the debate on how unbundling affects incumbent investment – Israel offers a quasi-natural experiment where investment slowed, supporting certain theories ²⁶. It's moderately novel to document this in Israel (score 3) as academic literature specifically on Israel's broadband is scant.</p>
E. Policy Relevance	4	<p>Understanding the effects of the 2015 wholesale reform is very relevant to Israeli policymakers. It directly influenced the next stage of policy (the 2020 fiber reform was partly to correct unintended consequences). Evaluating 2015 teaches lessons on balancing competition and investment – a live issue in many countries' telecom policy. Even today, the wholesale market exists (and the ministry monitors its success), so evidence on consumer benefits (lower prices, improved service) versus any costs (slower infrastructure upgrades) is valuable. Internationally, Israel's case can inform regulators in markets with dominant incumbents. Thus, policy relevance is high (4).</p>

Fiber Broadband Deployment Reform (2020)

Criterion	Score	Justification
A. Data Feasibility	4	<p>There is excellent data granularity for this reform. The Communications Ministry provides quarterly reports on fiber rollout – number of homes passed, connected, uptake rates per region ²⁹ ⁵⁶. We can map which locales got fiber when (Bezeq published rollout schedules) and use that for a staggered treatment analysis. Data on internet speeds, plan prices, and even firm-level revenues (Bezeq vs others) are available to gauge effects. Outcomes like **household fiber subscriptions (670k by mid-2022) and coverage (1.6M homes)] are documented ⁵⁷ ²⁷. A potential complication is the overlap with COVID-19 (which boosted internet demand), but we have data to control for that trend (e.g. comparison to previous years or non-fiber users). Overall, data support a robust analysis (score 4).</p>
B. Identification	4	<p>The fiber reform creates a strong quasi-experiment: some areas got fiber early (treatment), others later (control in interim). We can exploit this staggered deployment using an event study or Callaway-Sant'Anna DID, comparing outcomes (like broadband adoption, perhaps even business performance via regional statistics) between early-fiber towns and not-yet-fiber towns over time. The assignment of who got fiber when was driven partly by profitability (Bezeq chose where to deploy first) – not purely random, but we can control for factors like urbanity. Also, the establishment of the universal fund and tenders provides an instrument (e.g. towns selected in the subsidy tender could be considered quasi-random). Given multiple time periods and groups, identification of fiber's impact on various outcomes is quite strong. Score 4.</p>
C. Capital Deepening	5	<p>This reform explicitly aimed at massive capital deepening in telecom. In two years, fiber cables replaced or augmented decades-old copper in most of the country – an enormous increase in network capital. Over ₪1 billion was invested by Bezeq alone in 2021–2022 to roll out fiber (not counting Cellcom/Partner investments) ²⁷ ³⁰. The labor force did not increase commensurately; in fact, one fiber can carry far more data with similar maintenance staff. The result is a sharp rise in K/L in fixed communications infrastructure. This is evidenced by the jump from ~20% to 70% fiber coverage with relatively small crews of technicians. Thus, capital deepening plausibility is certain (5).</p>

Criterion	Score	Justification
D. Novelty & Lit.	3	Many countries have undertaken fiber programs, and studies exist on broadband's economic impacts. Israel's situation (late mover going from laggard to leader quickly) provides a notable case, but the general narrative of fiber improving outcomes is known. Still, the specific policy mix – removing universal service obligations and creating a cross-subsidy fund – is somewhat unique and could be documented for knowledge sharing. The literature hasn't yet caught up to Israel's 2020–2022 fiber expansion, so an empirical study would be fresh, though it will likely confirm known benefits of broadband. We assign 3 (moderately novel empirically, but conceptually aligned with existing work).
E. Policy Relevance	5	Extremely high. Within Israel, the fiber rollout is a flagship initiative – policymakers want to know its effects on digital inclusion, business productivity, and whether further intervention is needed for the remaining 30%. Evaluating this reform informs regulation (e.g. is the subsidy fund effective?) and future tech deployments (5G uses, etc.). Internationally, as countries strive for universal fiber, Israel's approach offers a valuable case study in regulatory innovation and rapid implementation. The COVID-19 pandemic underscored the importance of broadband; evidence from Israel's experience is thus highly relevant to global telecom policy. Score 5.

Natural Gas Sector Law (2002)

Criterion	Score	Justification
A. Data Feasibility	3	Data on the gas sector is somewhat fragmented. We have macro-level indicators : annual natural gas consumption (which soared after 2004) ⁵⁸ , percentage of electricity generated from gas (went from 0 to ~60% by 2010s) ^{49 59} , and INGL's reports on pipeline length and capacity. Labor data: INGL's employee count is small (~200), and IEC's generation workforce shrank as gas plants require less staffing than coal/oil units. We can measure productivity improvements in electricity generation (MWh per worker) as gas came online. However, isolating the transmission law's effect is tricky, and detailed firm-level data (e.g. plant efficiencies) may need to be compiled. Feasibility is medium (3) – sufficient for broad trends, but micro-data on capital stock and labor by segment would improve it.

Criterion	Score	Justification
B. Identification	3	The staggered rollout of gas supply provides some identification potential. For example, different power stations were connected to the gas pipeline in phases (2004, 2006, 2007...). One could compare plants or industrial firms that got gas vs. those waiting longer as a treatment-control scenario. The gas law itself is one piece of a larger puzzle (it enabled infrastructure, while upstream supply depended on discoveries), so an instrument could be the pipeline proximity or timing of hookup. This approach could identify the impact of switching to gas (cheaper fuel, more capital-intensive generation) on productivity. While not straightforward, it's plausible to isolate productivity jumps coincident with gas adoption (e.g. the sharp efficiency gain when a factory switches from diesel generators to pipeline gas). Given these possibilities, we score 3.
C. Capital Deepening	5	Absolutely – the gas reform resulted in huge capital projects. INGL invested heavily in pipeline networks, compressor stations, etc. ³² . Power producers built new gas-fired combined-cycle plants to use the fuel (capital-intensive, high-tech facilities). The process effectively replaced labor-intensive processes (importing, transporting, and handling heavy fuel oil/coal) with an automated pipeline delivery system. For instance, one pipeline can feed multiple plants with minimal personnel, whereas previously fuel unloading at each plant was laborious. The capital-labor ratio in fuel supply and power generation increased markedly as gas infrastructure came online. Given the clear, successful build-out and adoption of gas, capital deepening is very evident (score 5).
D. Novelty & Lit.	3	While natural gas market reforms are not new globally, Israel's case has unique angles: it built a gas system from scratch in the 2000s and then dealt with a monopoly upstream (leading to the 2015 Gas Framework). The literature on gas in Israel mostly covers regulation and export policy, not productivity. A study focusing on productivity via fuel switch (how gas improved electricity generation efficiency) would add a microeconomic perspective that is under-explored. It's moderately novel, bridging energy and productivity literature. Score 3.
E. Policy Relevance	4	Domestically, the gas sector law is a past reform, but its outcomes continue to influence policy – e.g. ongoing discussions about expanding distribution to more industries or using gas infrastructure for hydrogen in future. The success of the gas market reform (reducing electricity costs, emissions) makes it a reference point in Israeli policymaking. Internationally, countries developing gas infrastructure can learn from Israel's phased liberalization (competitive downstream licensing with state-run transmission). Also, ensuring that new resource wealth translates into productivity gains (as in Israel's case) is highly relevant to resource-rich nations. Thus, policy relevance remains high (4).

Water & Sewage Corporations Reform (2001)

Criterion	Score	Justification
A. Data Feasibility	4	<p>We have substantial data from the Water Authority and State Comptroller on the performance of water corporations. Metrics include investment levels, water loss rates, service quality, and financials ³⁸. Crucially, the staggered adoption (some municipalities corporatized earlier, some much later) provides panel data. For instance, by 2008 dozens of cities had corporations, while others still hadn't – we can obtain their annual water supply volumes, workforce, and finances from national datasets (the Water Authority monitors each utility's indicators). Labor productivity can be measured as cubic meters distributed per employee or revenue per employee. While not all data may be pre-compiled, the audit reports give key figures (e.g. 56 corporations serving 95% population by 2020) ³⁶ ³⁷. Overall, data are available and structured for analysis (score 4).</p>
B. Identification	5	<p>The reform's staggered rollout and partial compliance offer a near-ideal identification scenario. Some local authorities incorporated water services in, say, 2003, others only by 2010 or not yet by 2019 ³⁶. This variation can be treated as a quasi-experiment: one can implement a difference-in-differences comparing outcomes in early adopters vs. late adopters before and after incorporation. The timing was influenced by local politics and incentives (grants) ³⁶ ⁶⁰, arguably exogenous to short-term performance. We can test parallel trends in outcomes like leakage or cost recovery pre-reform. Additionally, since the law was national, external factors (climate, regulations) affected all, isolating the effect of governance change. This yields strong identification (score 5) for causal analysis of corporatization's impact on efficiency and investment.</p>
C. Capital Deepening	5	<p>The reform explicitly sought to boost infrastructure investment, and it delivered: water corporations invested ₦8.6 billion in 2011–2018 alone ³⁸. Previously, municipal water departments under-invested (often diverting funds elsewhere). With corporatization, capital spending surged – new pipes, treatment plants, and desalination connections were built. Many corporations also modernized operations with SCADA systems and meters. Meanwhile, they inherited roughly the same workforce from municipalities initially, meaning capital per worker jumped as new projects came online. Over time, some workforce efficiencies were also realized (e.g. shared services in regional corporations), further raising K/L. The evidence of substantial capital deepening (pipe network expansion, etc.) due to the reform is very strong ³⁵ ³⁸. Score 5.</p>

Criterion	Score	Justification
D. Novelty & Lit.	5	<p>Little academic literature exists on Israel's water corporations reform, especially in English. Globally, cases of corporatizing municipal utilities have been studied (e.g. in Europe), but Israel's approach – legally mandating corporatization and aiming for regional mergers – is distinctive. Analyzing its effect on productivity and investment would fill a clear gap. It intersects topics of public-sector reform, infrastructure finance, and service delivery in a unique setting (high-income country with water scarcity). Novelty is high: it's a chance to contribute empirical evidence on a successful but under-researched reform. Score 5.</p>
E. Policy Relevance	4	<p>In Israel, the water sector reform remains relevant as policymakers debate further consolidation of the 56 corporations into larger regional entities for efficiency ⁶¹. Evaluating whether larger corporations perform better could directly inform that policy. Also, as desalination now provides most water, coordination between private desal suppliers and these corporations is key – productivity gains free up resources for challenges like climate change. Internationally, the model of ring-fencing water revenues for investment is highly relevant to developing and developed countries facing infrastructure gaps. It provides a middle path between municipal management and privatization. Given current interest in sustainable water management, evidence from this reform is valuable. (Score 4: very relevant domestically, and quite relevant globally in the water sector context.)</p>

Desalination PPP Program (2002–2015)

Criterion	Score	Justification
A. Data Feasibility	3	<p>Data on Israel's desalination program is readily available in terms of outputs (volumes of water produced each year by each plant) ⁶² ⁴¹ and contract details (capacity, costs). We know when each plant came online (Ashkelon 2005, Palmachim 2007, Hadera 2009, Sorek 2013, etc.) ³⁹. However, linking this to "labor productivity" needs careful framing – much of the labor is still in water distribution companies (who buy desalinated water). The desal plants themselves employ relatively few people (data on employees might be private, but likely <100 per plant). We can infer productivity gains by the fact that water supply increased dramatically without proportional workforce growth in Mekorot or water companies. Still, an empirical analysis would rely on sector-wide metrics (e.g. water produced per worker nationwide), which also reflect other changes. Hence, data feasibly shows broad trends, but micro labor data at plants is scarce. Score 3.</p>

Criterion	Score	Justification
B. Identification	2	The desalination rollout was phased in over a decade, but its effect was essentially to augment water supply rather than reorganize an existing workforce (since private operators were new). Identifying its impact on labor productivity in water supply is challenging because it coincided with the 2001 corporatization and other efficiency measures. One could compare periods of drought (pre-desal) with post-desal periods: post-2005, water output rose while sector employment grew slowly, suggesting productivity gains. However, other factors (rainfall, tech improvements in irrigation) confound that. Alternatively, consider a synthetic Israel without desal (using countries with no desal as comparison for trends in water utility productivity). This is not straightforward, and attribution would be speculative. Thus, identification strength is low (2).
C. Capital Deepening	5	The desal program epitomizes capital deepening: Israel invested in five large industrial plants that dramatically increased the capital base of the water sector. Each plant's output replaced labor-intensive alternatives (like pumping dwindling aquifers or building small local projects). By 2015, ~500 million m ³ /year of water came from these high-capital facilities ³⁹ ⁴¹ . The labor to operate them is minimal, meaning output per worker in water production skyrocketed. Additionally, desal's presence induced more capital spending on connecting pipelines (National Water Carrier upgrades in 2009) ⁶³ . Given the scale (some of the world's largest desal plants) and their automation, the increase in K/L is unequivocal. Score 5.
D. Novelty & Lit.	4	Israel's desalination success is discussed in policy circles (and environmental engineering literature), but rarely in terms of productivity economics. Studying it as an economic reform (PPP competition and capital deepening) would be a novel angle. It contributes to literature on how technology adoption (desal tech) and private-sector participation can overcome natural resource constraints and boost productivity. The topic intersects development economics, but in a developed country setting. Given widespread interest in desal as climate adaptation, providing empirical evidence from Israel is quite novel. Score 4.
E. Policy Relevance	4	This is highly relevant for policymakers worldwide dealing with water scarcity. Israel's approach – competitive tenders yielding low-cost desal water ⁴⁰ – is held up as a model. Understanding the broader economic impact (like productivity of water utilities and cost per cubic meter trends) informs debates on scaling desalination elsewhere. Domestically, while the program is established, it still evolves (e.g. the tender for a new big plant Sorek 2 in 2020 at record low prices ⁴⁰). Assessing how effectively capital was translated into efficiency gains can guide future contracts and integration with the national grid. Thus, both for Israel's ongoing water strategy and other countries, the lessons are pertinent (score 4).

Postal Sector Reform (2006 & Ongoing)

Criterion	Score	Justification
A. Data Feasibility	3	<p>Israel Postal Company and the Communications Ministry publish data on mail volumes, delivery times, workforce size, and financial results. We know, for example, that Israel Post has ~5,000 employees as of 2021 ⁶⁴ and the volume of letters has been declining steadily. Competition was introduced in bulk mail in 2006, so one could track market share of private bulk mailers (some data available via licensing info). Customer complaint statistics are also published (indicating service quality). However, linking these to labor productivity is tricky: overall labor productivity (items per postal worker) has likely fallen due to e-substitution, masking any efficiency from reform. We could measure <i>specific segments</i> (e.g. bulk mail productivity improved as private firms entered?) but data by segment is limited. Thus, data exist but signal-to-noise is an issue, giving a moderate score (3).</p>
B. Identification	1	<p>Identifying the effect of the postal reform is extremely difficult. The reform coincided with the global digital mail collapse, a dominant trend unrelated to competition policy. Any before/after change in Israel Post's productivity around 2006 is likely overwhelmed by falling mail volume and rising parcels.</p> <p>There's no obvious control group (the whole country's postal service was affected). One might attempt to compare Israel's postal performance to other countries' trends as a counterfactual, but variations in internet adoption complicate that. Given the confounding factors and gradual nature of changes (partial privatization in 2020 is another factor), a credible causal identification is virtually impossible. Score 1.</p>
C. Capital Deepening	2	<p>The postal reforms aimed to improve efficiency, but capital deepening has been modest. The Postal Company did invest in some automation (sorting machines, IT systems for tracking) post-corporatization ⁴⁷, which raises capital per worker slightly. They also downsized staff, which mechanically increases K/L if capital stays same. However, the core business (letter delivery) is inherently labor-intensive and shrinking, and the company has struggled to invest enough to modernize (hence service issues persist) ⁴⁴. The latest 2021 plan emphasizes digitization (which would be capital deepening), but those investments are just starting. Overall, only minor K/L gains so far – score 2.</p>
D. Novelty & Lit.	2	<p>Postal liberalization/privatization has been studied in other contexts (Europe, US). Israel's case, while not widely documented academically, follows a similar pattern of struggling state post in the digital age. It doesn't present an entirely new scenario, except perhaps examining the interplay of partial privatization and competition in a small market. There is some novelty in documenting Israel Post's specific outcomes (few outside Israel would know them), but insights are likely to align with known issues (e.g. need to downsize, diversify services). We assign 2 – a contribution, but not a large gap in literature.</p>

Criterion	Score	Justification
E. Policy Relevance	3	The topic is moderately relevant . In Israel, fixing the postal service is on the policy agenda – the 2021 reform plans full privatization and expanding competition ⁴⁵ ⁴⁶ , so understanding what has/hasn't worked since 2006 is useful input. For consumers and regulators, measuring productivity could justify or reshape the reform. Globally, many countries face similar postal dilemmas; Israel can offer lessons on cautious liberalization (e.g. opening bulk mail didn't prevent decline). However, given that the postal sector is less economically critical than electricity or water, the urgency is lower. So relevance gets a 3 (meaningful but not top-tier policy priority).

Note: The scoring above reflects the weighted rubric (with identification and data viability given slightly higher weight in overall rankings, as implied). Each score is justified with references to official data or analyses, emphasizing how well each reform fits the criteria.

Top Reform Candidates – Comparative Memo (~1000 words)

Overview: Among the identified reforms, several stand out as particularly strong candidates for an in-depth productivity study. We compare the top five reforms in terms of **identification strength, data viability, and expected contribution** to knowledge. These are: (1) **Water & Sewage Corporations (2001)**, (2) **Ports Competition Introduction (2013–2021)**, (3) **Electricity Market Reform (2018)**, (4) **Fiber Broadband Deployment Reform (2020)**, and (5) **Natural Gas Sector Law & rollout (2002)**. Each offers a compelling “natural experiment” or policy shock, but they differ in data richness and the clarity of causal inference. We also discuss potential risks and challenges for each.

Identification Strength

From an econometric standpoint, the **Water Corporations reform** provides the clearest identification. The **staggered implementation** (some municipalities corporatized water services years before others) creates a quasi-experimental setting ³⁶. We can perform a difference-in-differences: cities that incorporated early serve as treatment, late incorporators as controls. The assumption of parallel trends is plausible – prior to 2001, all cities managed water similarly, and the timing of reform was driven by political decisions and incentive grants more than by underlying water efficiency ³⁶ ⁶⁰. This yields a strong identification of the reform's impact on outcomes like infrastructure investment and labor productivity in water provision. The effect is likely **sharp and immediate** (once a corporation is formed, revenue ring-fencing and professional management kick in), simplifying event windows. With 50+ entities over nearly two decades, we have enough cross-sectional and time variation to apply **Sun & Abraham (2020)** event-study methods to check for dynamic effects and anticipation. In short, Water Corporatization scores highest on identification (as reflected in its score of 5). A potential risk is **heterogeneous treatment effects** – larger cities vs. smaller towns might respond differently – but modern DID methods can handle varying adoption timing and effect sizes.

The **Ports competition reform** also offers a reasonably strong identification, albeit with fewer units. The opening of two new private ports in 2021–2022 is a **discrete shock** that can be tied to performance changes at Haifa and Ashdod ports ¹⁸ ¹⁹. We expect a sudden drop in ship wait times and an uptick in productivity (containers per hour, etc.) at the incumbents as soon as competition begins. With monthly

operational data, we could run an event study around September 2021 for Haifa, for example. The challenge is the **small-N problem**: effectively two treated units (Haifa, Ashdod main ports). However, we can bolster identification by using the fact that each port's competitive exposure increased on a known date and possibly comparing to **Eilat port** (unaffected by these entrants). Using Eilat as a control in a DID, while imperfect, gives some contrast – e.g., if Haifa and Ashdod saw efficiency improve relative to Eilat at the time of new port entry, that's evidence of the reform's effect. We must be cautious: Eilat's cargo mix (cars, bulk) differs from Haifa/Ashdod's container focus, potentially violating parallel trends. Another identification approach is a **synthetic control** using international data (e.g. construct a synthetic "Haifa port" performance from similar Mediterranean ports that did not get new competition). This could isolate what Haifa's productivity would have been without Bay Port. Overall, identification is **moderately strong** and centered on a sharp, exogenous policy event (government decision to introduce competition) – improving confidence in causality. A risk is **confounding global factors**: the reform coincided with COVID-19 supply chain disruptions. Port metrics in 2021–22 were volatile globally; teasing out the competition effect requires careful control for those external shocks (perhaps by differencing with trends in other ports).

The **Electricity 2018 reform** has a clearly defined intervention (June 2018 government approval, followed by plant sales)⁵, but the identification is somewhat weaker than the above two. It's a single-sector nationwide reform, so we lack a within-country control group that was unaffected. We can still exploit the phased implementation: IEC's generation share fell gradually as specific plants were sold (Alon Tavor in 2019, others in 2020–21). This allows comparisons like **before vs. after each plant sale** in terms of efficiency or prices, using unaffected plants as pseudo-controls. For instance, one could compare operational efficiency changes at power plants that moved to private hands vs. those still under IEC over the same period. If privately operated plants show larger gains in output per worker or capacity factor improvements post-sale, that bolsters identification of the reform's effect (assuming assignment of which plants sold first was quasi-random or not correlated with their performance potential – which might hold since political and financial considerations drove the sequence). Another angle is comparing trends in Israel's electricity outcomes to other countries' over 2015–2022 – a **difference-in-differences with international data** (OECD's productivity or prices in electricity sector as a comparator). The risk here is that Israel's sector might differ systematically (e.g. fuel mix shifts to gas, or demand growth) – but controlling for those (perhaps via synthetic control with similar countries) could isolate the reform impact. The identification is aided by the fact that the reform's goals (increase competition, reduce costs) translate into measurable KPIs – e.g., generation reserve margin, prices, and labor costs – which we expect to move around the reform date. However, some effects (like improved reliability or new investments) might materialize over a longer horizon, complicating short-term identification. In summary, electricity reform identification is **moderately challenging** but feasible with creative strategies. The main risk is **simultaneous shocks**: e.g., natural gas price drops or demand changes in 2018 that might coincidentally improve productivity, needing to be controlled for.

The **Fiber broadband reform** offers strong identification due to **geographic and temporal variation**. Essentially, by design, some towns got fiber immediately after 2020 while others await subsidized rollout^{27 30}. This is a textbook setting for a staggered adoption DID. One can measure outcomes like internet subscription rates, average download speeds, or even business formation rates in treated vs. untreated localities over time. The Ministry's data on where fiber is deployed each quarter is publicly available, letting us construct an "exposure" variable (% of households fiber-connected) by locality. Early-deployed areas could be matched with later ones on pre-existing characteristics (population, income) to ensure a fair comparison. One identification caveat: the rollout order wasn't random – Bezeq focused on profitable dense areas first. This means treated localities might have systematically different trends (e.g. faster-growing or

more urban) than those treated later. To address this, we can control for baseline differences or use an instrumental variable: for example, the presence of an alternate network (like IBC's pre-existing footprint or HOT's cable quality) might instrument how quickly a locality got fiber. Another approach is leveraging the **universal fund tender** outcomes – the government essentially randomly (through auction) allocated certain peripheral areas to IBC for deployment in 2021–22. Those areas could serve as a quasi-random treated group. With these methods, identification for fiber's effects on outcomes such as broadband adoption, and indirectly on firm productivity (if data allow), is quite solid. The main risk is **contamination**: even areas without fiber might see some spillovers (e.g. VDSL upgrades) or businesses using mobile internet as a substitute. We'd need to differentiate the fiber-specific effect. But overall, fiber reform provides a fertile ground for causal inference given its staged rollout and measurable impact.

The **Natural Gas sector reform** sits between the above cases. Identification can be attained by focusing on *when and where* gas was introduced. For instance, major power plants converted to natural gas on specific dates (the Reading plant near Tel Aviv in 2006, Haifa in 2013, etc.). Each conversion can be seen as a treatment event that should improve that plant's efficiency (lower fuel costs, higher thermal efficiency) and possibly allow labor reductions (less handling of solid fuel). If we had plant-level performance data, a **panel analysis of plant efficiency** pre/post gas connection vs. yet-to-be-connected plants would be persuasive. Similarly, industrial enterprises that got pipeline connections could be compared with similar firms still using LPG or diesel generators. Israel's gas rollout was influenced by pipeline routing and capacity – arguably exogenous to individual firm performance – which strengthens identification. A complication is that the 2002 law isn't a single shock to outcomes; it enabled a process (2004–2010 pipeline construction and gas adoption). So the treatment is diffuse over several years. We might instead use an instrumental variable: e.g., distance from the pipeline or whether a plant is on the coast (first to get gas via the marine pipeline) as an instrument for gas usage. That could separate the effect of switching to gas (which is a capital-deepening and cost-reducing treatment) on productivity. The risk is **confounding technological trends**: during the 2000s, IEC also introduced new combined-cycle turbines (which is interrelated with gas availability) and renewable energy slowly grew – need to isolate the gas effect specifically. Overall, identification is **achievable but requires detailed data**, which is a moderate challenge.

Data Availability and Quality

All top candidates fortunately come with relatively robust data sources, but differences exist. The **Water corporations reform** benefits from **regulated utility data**: the Water Authority collects standardized info from each corporation (financials, investments, staffing). The **State Comptroller's report** explicitly provides key figures (total investments, number of corporations, etc.) ³⁸ ³⁶. We likely can obtain panel data of water tariffs, leakage rates, etc., by city. The granularity and reliability are high, given regulatory oversight. Also, Bank of Israel and CBS data can supply labor and output in "water supply & wastewater" industry. A potential limitation is that municipal water workforce data pre-reform might not be neatly recorded (we'd have to reconstruct from municipal employment records), but this is surmountable with some effort or by using proxies (e.g. water delivered per capita as a baseline, improving after reform).

For the **Ports competition reform**, data are more bespoke. We have port authority operational stats: cargo throughput, number of ship calls, average wait times, and workforce size for the port companies (from annual reports). The **Israel Ports Company** likely has statistics publications, and the Competition Authority might monitor port performance after declaring the duopoly a concern in 2013 ¹⁵. We can also use external sources: e.g. the World Bank's port performance index or dwell time data for Haifa (if available). Given ports are strategic, a lot of data is reported publicly (some in financial statements, some in Ministry of

Transport reports). The main challenge is integrating different data sources and ensuring consistency (different definitions of productivity, etc.). Still, the data volume is manageable and largely **public/open**, albeit with some need to manually collect pre- and post-competition metrics.

The **Electricity reform** has **excellent data**. The Electricity Authority's annual reports (in Hebrew and some English summaries) detail generation by IPPs vs IEC⁶⁵, reliability indices, and tariffs. IEC's annual financial reports provide employee counts, sales, etc. Bank of Israel's reports discuss the reform's progress and often include charts of market share⁵⁹ or price trends. If needed, unit-level data like plant efficiency might require outreach to IEC or using government documents (e.g. an environmental report listing generation per plant). Overall, the sector being so central means data quality is high. We might even use smart meter data or consumer-level data for certain analyses (though not necessary for productivity). The only caution is that initial post-reform years (2019–2021) data might include anomalies (for instance, in 2020 electricity demand dipped due to COVID lockdowns), which we'd need to adjust for.

For the **Fiber broadband reform**, we have very **granular, recent data**. The Ministry of Communications, under Minister Hendel, was quite transparent – press releases in 2021–2022 gave figures on households passed and connected by fiber⁵⁷. There's also a public "fiber deployment map" online that could be scraped for data by location. ISPs' subscriber numbers are reported in financial statements (Cellcom, Partner, Bezeq all break down fiber subs in investor presentations by 2022). International comparisons (speed, price) are available from sources like Speedtest Global Index and the ITU. In short, we can quantify the improvement in service quality (speed went from ~20 Mbps averages to 100+ Mbps for fiber users) and the increase in capital (kilometers of fiber laid). Data on the *indirect outcomes* (like business productivity in fiber-served areas) would be the trickiest – possibly requiring merging fiber data with firm-level data from CBS (if accessible) or using proxies like property values or new business registrations in those areas. That introduces complexity and maybe privacy hurdles. However, the core analysis of telecom sector productivity (e.g. revenue or traffic per employee) pre and post fiber is straightforward with company data. The fiber reform's data are very **fresh**, which is both a pro (little has been done with it) and a con (series are short, though growing quickly).

The **Natural Gas reform** data situation is decent but perhaps the weakest of the five. We have good macro data: % of electricity from gas (tracked in Ministry of Energy reports)⁵⁹, total gas consumption, etc. But micro-level data (like firm labor productivity in IEC's gas vs. coal plants) might require constructing measures from multiple sources. The Israel Electric Corporation might have internal reports on improved efficiency due to gas (heat rate improvements are sometimes cited). The **OECD Economic Survey 2011** provides context for gas regulatory changes³¹. If needed, the **Rand Corporation and Israeli academy studies** (like the Shaffer 2011 paper on Israel's gas) could give some figures on workforce impact. We might also incorporate environmental data (emissions per kWh dropped with gas – an indirect efficiency metric). The data is there to tell the story, but it might not be as tidy as, say, the telecom data. We should anticipate spending effort to compile a consistent time series of electricity sector labor productivity from, say, 2000 to 2010, to capture the gas transition. Given that, data viability is acceptable but not plug-and-play. On balance, all five candidates have sufficient data; none are "black boxes" requiring proprietary data (like some private sector productivity analyses). This strengthens the case that a thorough quantitative study is doable for each.

Expected Contribution and Novelty

Each reform offers a distinct contribution:

- **Water Corporations (Top candidate):** This would be the *first rigorous quantitative evaluation* of Israel's water sector corporatization. It contributes to public economics and development literature by showing how governance reform (corporatization without privatization) can unleash infrastructure investment and productivity gains. It's especially relevant for countries grappling with underinvestment in municipal utilities. The novelty is high: we'd provide empirical evidence on outcomes (investment up by X%, labor productivity up by Y%) where previously only anecdotal or financial accounts existed. It also complements literature on "corporatization vs. privatization", an area of active debate. A risk is that results might be hard to generalize if they're very context-specific (Israel had unique drivers like a water crisis and strong regulation). But even as a case study, it fills a gap.
- **Ports Competition:** Studying this will extend literature on port productivity by examining a rare event of direct competition injection in an established developed economy port system. It can validate theories: e.g., does introducing competition truly reduce costs for end-users in a sector often considered a natural monopoly? We'd potentially quantify improvements (like a drop in container handling cost per box, or improved ship turnaround time) attributable to competition. That's valuable to policymakers weighing port privatization. The findings might also have significance for trade economists (port efficiency affects trade flows). A risk here is that given the short time since implementation, data might show only initial adjustments, and longer-term effects (like labor negotiations, eventual price changes for shippers) are yet to unfold. There's some uncertainty on whether the full benefits have appeared or if transitional issues (labor strikes in old ports, etc.) cloud the short-term data. Nonetheless, documenting the *early impact* is still a contribution, and follow-up research can track longer term.
- **Electricity Reform:** A rigorous analysis here would contribute to a well-established literature on electricity market reforms, but with a fresh case that has some unique elements (state-owned incumbent partially competing with private IPPs, substantial union constraints, and an isolated grid). We could test, for instance, if splitting generation ownership actually improved productivity and by how much, or if most gains were from workforce reduction vs. genuine efficiency. It also could quantify any indirect effects – e.g., did competition lead to more renewable generation integration or not? While not groundbreaking theoretically, it serves a practical contribution by offering evidence to other late-reformers: e.g., many countries (in Asia, Middle East) still have vertically integrated electric monopolies and are watching cases like Israel. One risk is that the reform is still mid-stream (not all changes done until 2026); our analysis in 2025 might capture initial effects but not full equilibrium. However, initial effects (like improved generation utilization at sold plants, reduction in reserve margin due to new capacity markets) are important early signals. We can complement results with robustness checks or partial-equilibrium modeling to forecast full effects.
- **Fiber Broadband Reform:** This study would highlight how removing regulatory barriers can catalyze capital deepening in tech infrastructure and what that means for productivity. A successful fiber rollout's effect on productivity is often assumed but not always measured (especially not within just a couple of years). We might examine outcomes like increased remote work adoption, or higher productivity in IT services, as indirect benefits. It merges telecom policy analysis with broader

productivity questions (digital infrastructure as a growth driver). The contribution is moderately novel because while broadband's importance is known, Israel's scenario – rapid catch-up due to a targeted reform – provides a quasi-experiment to measure the *acceleration* effect. It's also policy-relevant to the global discussion of how to structure fiber deployment (utility-led vs. competition-led). One possible issue is that broad economy impacts (like on GDP or total factor productivity) might take longer to materialize or be hard to isolate, but sectoral impacts (telecom sector output per worker, internet prices per megabit) are immediate and valuable. Ensuring we connect the fiber rollout to labor productivity via capital deepening might require a two-step analysis: show that capital (fiber kms) increased per worker in telecom, and separately that better internet led to productivity increases in user industries – possibly using an IV (fiber availability as instrument for usage, then usage to productivity). That's ambitious for one paper, but even focusing on the telecom sector's own productivity improvement (more output with similar labor) is a worthy contribution.

- **Natural Gas Reform:** This offers a cross-sector angle: it's about how energy infrastructure can improve productivity in electricity (and potentially manufacturing). The contribution lies in quantifying benefits of fuel switching not just in cost or environmental terms (which is often done) but in labor productivity terms – e.g., showing how many jobs were effectively saved or reallocated because one pipeline replaced dozens of fuel logistics jobs. It also can highlight the complementarity between natural resource development and productivity (a counterpoint to some "resource curse" narratives, since in this case domestic gas clearly boosted efficiency and growth). For energy economists, it underscores the value of infrastructure regulation enabling rapid utilization of resources. A risk in terms of contribution is that it might appear more straightforward – "gas is cheaper and cleaner, of course it improved productivity" – but the magnitude and mechanism (capital deepening vs. TFP gain) are interesting to pin down. We could find, for instance, that a big chunk of labor productivity growth in Israel's electricity sector in late 2000s was due to capital-for-labor substitution in fueling, which is an important decomposition.

In comparing these, **Water Corporations** reform emerges as the top candidate on identification and data – a robust setting to make causal claims – and also high on contribution (filling a gap in understanding public utility reform). **Ports and Fiber** reforms are also compelling: ports have huge policy relevance and novelty, fiber has strong identification and clear link to capital deepening with broad implications. **Electricity reform** is extremely policy-relevant and has decent (though not perfect) identification possibilities; plus, results would be widely cited in utility reform debates. **Natural gas** is perhaps slightly behind in identification clarity, but still manageable and quite relevant to the energy transition discussion.

Given the goal – to study reforms that increased competition and raised productivity via K/L – **Water Corporatization** and **Port Competition** both directly check those boxes and offer probably the clearest narratives to isolate. **Electricity 2018** is a heavyweight reform with large impacts, and a careful analysis could yield influential findings despite some identification challenges. **Fiber reform** is a very current story with strong data and will show a vivid example of capital deepening in action (though linking to economy-wide productivity might be more complex). On balance, I would rank:

1. **Water & Sewage Corporations Reform (2001)** – Top choice due to clean DID identification, excellent data, and clear mechanism of capital deepening improving service.
2. **Electricity Sector Reform (2018)** – Second, for its scale and policy importance; identification less clean but still doable and outcomes highly valuable.

3. **Ports Competition (2021)** – Third, very sharp natural experiment and novel; slight data unit limitations but manageable.
4. **Fiber Broadband (2020)** – Fourth, strong design and extremely relevant, minor concern that full productivity effects need more time but sector analysis is feasible.
5. **Natural Gas (2002)** – Fifth, relevant and with some identification instruments, but effects are more diffuse and entwined with other trends.

These top candidates provide a mix of “safe” analysis (**water, where we’re confident in methods and outcome**) and high-impact analysis** (electricity, ports, fiber, which are a bit more complex but potentially very insightful).

Risks and Challenges

Data and Measurement Risks: Even with good data, we must ensure consistent definitions. For water, one risk is that accounting changes happened when corporations formed (e.g., capital expenditures that were off-books in municipalities became explicit on corp books), so productivity calculations need careful handling of measurement (avoid attributing an accounting change to a real efficiency gain). Similarly, for ports, measuring labor productivity is tricky: do we count only port authority employees or also dock labor from private contractors? We’ll need to define the boundaries clearly. In electricity, attributions of changes to the reform vs. other factors (like the continuation of gas substitution or introduction of renewables) pose a risk of overstating or understating reform effects. We should incorporate control variables (fuel prices, demand growth, etc.) in any regression.

Identification Assumption Risks: For water DID, a potential risk is violation of parallel trends – perhaps cities that corporatized later were systematically different (maybe more rural or poorer, which could affect water loss rates trends). We will address this by checking pre-reform trends and possibly doing subgroup analyses (urban vs rural). For fiber, as noted, rollout was not random – we may need instrumental variables to strengthen causality. For ports, small sample issues mean results could be sensitive to outliers or particular assumptions; we might complement quantitative analysis with qualitative evidence (e.g. reports of how Bay Port forced changes at Haifa, to bolster causal interpretation). Electricity reform identification could be confounded by simultaneous regulatory changes (for instance, tariffs were adjusted in 2018 due to gas royalties issues) – we need to control for that in analysis to isolate the competition effect.

Attribution and Mechanism: We aim to measure productivity gains via capital deepening. In practice, productivity (output per worker) can improve also due to TFP gains or other factors. A risk is that we find a positive effect but need to prove it came “via K/L”. For example, ports might improve because of better management (TFP) *in addition* to new cranes (capital deepening). To address this, we’ll attempt to decompose the effect: e.g., in a production function framework or via instrumental variable mediation (discussed in the next section). The risk is that data on capital inputs at a granular level may be limited (e.g. how to quantify “capital” for ports? Possibly by crane count or asset value from financials). We will likely use proxies (investment spending as a % of revenue, etc.) to show capital increased. Similarly, for fiber, we should separate increased capital (fiber network length) from pure efficiency (like if people just work harder). This risk is manageable by focusing on clear cases where capital dramatically rose relative to labor (all our top picks have that feature inherently).

Generalizability: Each reform is context-specific. A study might be criticized: “Will this apply elsewhere?”. While not exactly a risk to the analysis, it affects the perceived contribution. We will mitigate this by

situating each in broader context – e.g., Israel’s water reform echoing trends in other OECD countries’ municipal service reforms, making lessons broadly applicable. Still, there’s a risk that some results (like exact magnitudes) are context-bound (Israel has certain institutional strengths that aided these reforms, etc.). We’ll be cautious in claiming external validity, focusing instead on the existence of a causal improvement in each case.

Political/Behavioral Responses: One often overlooked risk is that the measured productivity gains might not be purely due to efficiency – sometimes they come from externalizing work or using contractors (for instance, ports might outsource some work, reducing direct employees but not total labor in the sector). If that happens, the improvement in official labor productivity could be overstated relative to true economy-wide efficiency. We should check if, say, port companies reduced staff but trucking companies had to hire more, or if water corporations outsourced maintenance. Ideally, we capture the entire sector’s labor. For water, including contractors in headcount if significant will be important (though likely the bulk of labor stayed in-house). This risk means we must clearly define our productivity scope.

Timing and Dynamic Effects: Some reforms have a slow burn. Water corp benefits might have grown over a decade as investments accumulated. A static pre/post may underestimate full impact. Conversely, initial disruption could temporarily lower productivity (learning curve) before improvements kick in (this happened in some utility reforms). We must account for dynamic effects – event studies are useful here. The risk is mis-specifying when to expect effects. Our analysis should allow enough post-reform years to observe outcomes – which is fine for water (20 years of data), gas (15+ years), and manageable for electricity (we have ~5 years post, enough for immediate effects on generation efficiency though maybe not final retail competition yet). Ports and fiber have only ~2-3 years of data post, mostly capturing immediate effects – which is likely when the biggest changes occurred (infrastructure was ready and immediately used). Still, any conclusions on long-term effects must be tentative for these two due to short horizon.

In conclusion, while each candidate has specific considerations, none of the risks identified are insurmountable. By leveraging robust research designs and thorough data collection, we can mitigate these issues. The potential insights far outweigh the challenges – making these reforms rich ground for advancing our understanding of how competition and capital deepening interact to raise productivity.

Pre-Analysis Plan: Water Sector Corporatization Reform (2001)

Title: *“From Municipality to Corporation: Evaluating the Impact of Water Utility Corporatization on Capital Investment and Labor Productivity in Israel.”*

Introduction and Theoretical Framework

Hypothesis: The 2001 Water & Sewage Corporations Law, which shifted urban water services from municipal departments to state-owned corporations, led to significant **capital deepening** (higher capital-to-labor ratio) and thereby increased **labor productivity** in the water sector. We posit two channels: (a) **Direct:** Corporatization ring-fenced water revenue for infrastructure investment, expanding capital (pipelines, treatment facilities) per worker, directly raising output per employee. (b) **Indirect (efficiency):** Professional management improved operational efficiency (reducing water losses, optimizing workforce), which when combined with new capital, boosted productivity.

We will test whether treated municipalities exhibit higher growth in capital stocks (and service outputs) per worker relative to untreated ones, and whether productivity gains can be attributed to increased capital (vs. pure TFP improvements). **Labor productivity** is measured as cubic meters of water delivered (or revenue) per water-sector employee.

Data and Outcome Measures

Data Sources: We will compile a panel dataset of Israeli municipalities from 1997–2015 (covering pre- and post-reform periods). Key sources: - **Central Bureau of Statistics (CBS)**: Municipal-level data on population (for normalization) and possibly employment in water utilities (if available via labor force surveys or municipal budgets). - **Water Authority reports**: Annual performance of each Water Corporation (or municipality if not corporatized), including total water supplied (m^3), number of connections, non-revenue water (% lost), revenues, and investments ³⁸. - **State Comptroller 2020 Report**: Summary of corporate formation dates and aggregate investments ³⁶ ³⁸. - **Municipal Finance Databases**: Many municipalities publish financial reports – from these we can extract water department expenses and staff counts pre-corporatization. - **External**: OECD or World Bank data for context (though primary analysis is within-country).

Treatment Variable: For each municipality i and year t , define a binary `Corporatized_it` that equals 1 if water services are provided by a Corporation in that year, 0 if still under municipal management. We will document the **event year** when each obligated municipality actually incorporated (expected between 2003 and 2010 for most) ³⁶.

Outcomes: - **Labor Productivity (main)**: We will use two metrics: 1. *Water Delivered per Employee* – total m^3 supplied in municipality i per year divided by number of employees in water service (municipal water dept or corporation) ³⁵. 2. *Revenue per Employee* – a financial productivity measure (though tariff changes might affect this, so primary is physical output). - **Capital Intensity**: Capital deepening will be tracked by: - *Annual Investment per Employee* (flow measure): capital expenditures on water infrastructure in municipality i divided by employees. The Comptroller report provides aggregate 2011–2018 investment ³⁸; we will try to get annual investment by firm from Water Authority. - *Capital Stock per Employee* (stock measure): We may approximate this via cumulative investment or proxy by length of pipeline or number of treatment facilities in the municipality. Alternatively, use the infrastructure asset value reported in corp financials (if available). - **Water Loss Rate**: As an efficiency KPI – reduction in non-revenue water (leakage) indicates effective use of capital (pipe replacement) and labor. We expect this to improve with corporatization (more leaks fixed) ³⁵. - **Service Quality/Continuity**: e.g., hours of supply or compliance with water quality standards (to ensure productivity gains aren't at expense of quality).

Empirical Strategy

Baseline Estimator: A **difference-in-differences (DiD)** framework exploiting staggered adoption:

$$Productivity_{it} = \alpha + \beta \cdot Corporatized_{it} + \gamma_i + \delta_t + \mathbf{X}_{it}\Phi + \epsilon_{it},$$

where γ_i are municipality fixed effects (capturing time-invariant differences, e.g. baseline size or geographic factors), and δ_t are year fixed effects (common shocks like rainfall, economic cycles). β is the coefficient of interest, the average treatment effect on treated (ATT) – expected to be **positive** if corporatization increases productivity.

We will first verify **parallel pre-trends** by plotting average productivity for early-adopters vs late-adopters prior to reform. Additionally, we'll employ the **Callaway & Sant'Anna (2021)** DID estimator allowing for heterogeneous treatment timing, which estimates dynamic effects relative to the adoption time for each group. This will yield event-study coefficients:

$$Productivity_{i,t} = \sum_{\tau=-k}^K \theta_\tau \cdot 1\{t - t_i^* = \tau\} + \gamma_i + \delta_t + \epsilon_{it},$$

where t_i^* is municipality i's reform year. We expect θ_{-1} (year before reform) ≈ 0 (no pre-treatment jump) and $\theta_{+1}, \theta_{+2}, \dots > 0$ (post-reform increases in productivity).

Identification & Exogeneity: The identifying assumption is that, absent the reform, trends in productivity would have been similar across municipalities regardless of reform timing. This is plausible because prior to 2001, all water services were under similar constraints (and the major shock – drought – hit all uniformly). Variation in adoption timing was driven by local political will and incentive structures, not by sudden efficiency needs (some evidence: by 2020, 24 towns still hadn't corporatized despite being less efficient on average³⁶, implying resistance rather than proactive adoption, supporting exogeneity of timing with respect to performance). We will bolster this by controlling for any observable that might predict timing: e.g. municipality size or fiscal health (from Ministry of Interior data) – these in \mathbf{X}_{it} . If larger cities reformed earlier (Tel Aviv's Gush Dan utility formed in 2010, small towns resisted until forced), we include $\ln(\text{population})$ and maybe a dummy for "forum of large cities" membership to soak up such effects.

Instrumental Variable (IV) for capital deepening: To specifically link capital deepening to productivity, we plan an **IV strategy** as a form of mediation analysis: - First stage: Predict capital investment using reform status. Example:

$$Investment_{it} = \pi \cdot Corporatized_{it} + \gamma_i + \delta_t + \eta_{it}.$$

We expect $\pi > 0$ – corporatization led to higher investment rates³⁸. - Second stage:

$$Productivity_{it} = \alpha' + \beta' \cdot \widehat{Investment}_{it} + \gamma_i + \delta_t + \nu_{it}.$$

This IV regression tests if increased investment (instrumented by reform) raises productivity. β' would estimate the productivity return on capital when triggered by the reform (addressing reverse causality that productive utilities might invest more – the instrument breaks that by using reform as exogenous shock to investment). We might use **cumulative investment or capital stock** instead of one-year investment for a stronger signal. - Additionally, we could instrument K/L (capital per worker) directly, if we manage to quantify capital stock.

Event-study diagnostics: We will examine the event-study plots for any pre-trend issues or anticipation (some towns might have improved a bit *before* formal corporatization, e.g. in preparation – if we see a rise starting 1 year before t_i^* , we'll note it). We'll also check for treatment effect heterogeneity* by subgroup: e.g. large cities vs small towns, to see if β differs, which might inform external validity (maybe large cities achieved bigger productivity jumps due to scale).

Robustness and Additional Analyses

- **Placebo tests:** We can do placebo reform dates for late adopters (assign them an arbitrarily early “fake” reform and ensure no effect pre-real reform). Or randomly shuffle reform implementation years among municipalities to confirm any detected effect is not spurious.
- **Control group validity:** If some municipalities never corporatized by 2015, they remain in control pool throughout. We should check if their trends diverge due to reasons unrelated to reform (if, say, those 24 holdouts are systematically poorer or had less growth). We might restrict analysis to those that *did* corporatize eventually (so all units get treated by end of sample, just timing differs) – this can strengthen internal validity by focusing on variation among adopters.
- **Spillovers:** Corporatization in one city doesn’t directly affect another (water systems are local), so SUTVA likely holds. One possible spillover: regional corporations serving multiple towns – but that’s the treatment unit essentially expanding, not a separate control being affected. We will treat those cases carefully (if two small towns form one corporation, we consider their reform date the same and possibly aggregate them as one unit to avoid double-counting effects).
- **Trend breaks:** We’ll also look at the reform’s impact on **non-output outcomes** like water tariffs. Tariffs were gradually unified nationally, partly as a result of corporatization. If tariffs increased, revenue per worker might rise even without efficiency; thus, focusing on physical output per worker is our main metric to reflect real productivity, but we will present both.

Expected Outcomes and Significance

We anticipate finding: - **Investment Jump:** Corporatization leads to a sizable increase in annual investment (our first stage). E.g., corporations invest, say, 2-3 times more (per capita) than municipalities did ³⁸. This validates capital deepening. - **Productivity Gain:** The DiD should show $\beta > 0$, meaning treated towns see higher water output/employee growth relative to control. For instance, if baseline was 100k m³/employee, this might grow to 130k in a treated city versus 110k in a control five years post-reform (illustrative). - **Timing:** Event study likely shows that these gains materialize progressively over a few years post-reform (as capital projects complete), rather than overnight, but some improvements (like reduced leakage due to quick fixes) might appear within 1-2 years. - **Mediation:** The IV results should indicate that a large portion of productivity gains can be explained by increased capital. We expect β (effect of investment on productivity) to be positive and significant, supporting the hypothesis that **capital deepening is a key driver**. If β accounts for most of the β from simple DiD, that suggests the reform worked mainly by boosting capital (as opposed to purely managerial efficiency). - **Other outcomes:** We foresee a decline in water loss rates in treated cities (as reported historically – non-revenue water fell in many cities after corporatization). Also possibly an increase in operating cost recovery ratios (financial efficiency), indicating improved sustainability.

We will interpret these results in light of policy: e.g., “Corporatization led to a X% increase in labor productivity, of which Y percentage points can be attributed to higher infrastructure capital per worker, and the remainder to operational efficiency gains.” We will also discuss any anomalies (if some towns didn’t improve, why? maybe governance issues).

Policy Implications

We plan to quantify not just the direct effects but also **cost-benefit** aspects: did the increase in capital investment yield proportional benefits? If data allow, we’ll look at unit costs of supply and consumer tariff effects to see if productivity gains translated into lower prices or just better service quality. The findings will

inform whether the corporatization model is achieving its aims and could justify further steps (like merging smaller corporations to achieve even greater scale economies – if we find larger corps had more productivity gain, for example).

We will also connect our micro findings to macro: The water sector in Israel is small relative to GDP, but highly essential. If labor productivity rose significantly, that contributes to overall productivity growth in non-tradables. We might estimate how much this reform contributed to Israel's aggregate productivity improvement since 2001 (likely modest but non-negligible in the utilities sector).

In summary, our pre-analysis plan for the water sector reform sets out to rigorously identify the causal effect of a competition/efficiency-driven reform on capital investment and labor productivity, leveraging a natural staggered experiment. We have laid out clear outcomes, a robust DID strategy with potential IV mediation, and checks to ensure validity. This will allow us to confidently answer whether increasing competition-like pressures (through corporatization) in a municipal service leads to capital deepening and productivity gains, as theory would predict.

(We will adhere to this plan and report any deviations. All data and code will be made available upon publication, and we will conduct the analysis in line with the best practices for causal inference in panel data.)

Backup Plan (Alternate Reform): Ports Competition Reform (2021)

In case data issues or unforeseen obstacles arise with the water sector study, our backup is the **Ports competition introduction**. We outline a brief plan for that analysis:

Hypothesis: Opening new private ports in Haifa and Ashdod in 2021 increased the competitive pressure on incumbent port companies, leading to **improved productivity (containers or tons per worker)** and reduced inefficiencies (shorter wait times, lower handling charges). This came via **capital deepening** – the new ports brought state-of-art equipment and forced incumbents to invest in modernization and better utilize existing capital.

Data & Identification: We'd use monthly or quarterly port performance data from 2018–2024. Outcomes: ship turnaround time, crane productivity, labor hours per ton, etc. **Treatment:** post-2021 period for main ports (treated) vs. pre-2021 and possibly vs. Eilat port (control). A **simple DID**: Haifa/Ashdod vs. Eilat, pre vs. post Q4 2021. Also within Haifa, compare **Carmel terminal** (old) performance pre vs. post Bay Port opening. For identification, we assume absent new entry, trends at all ports would follow general demand patterns (which we control via year effects or external trade volume indices). The shock timing is sharp and exogenous (government policy).

Empirical Strategy: - DID regression: e.g., $\$Y_{\{pt\}} = \alpha + \beta_{PostCompetition_t} \times MainPort_p + \gamma_{MainPort_p} + \delta_{t} + \epsilon_{\{pt\}}$, where p indexes port (Haifa, Ashdod vs. Eilat), t time, β expected negative for wait times, positive for productivity. - Event study at monthly level around Sept 2021. - Possibly use **synthetic control**: build a synthetic “no new port” outcome for Haifa using trends from similar ports worldwide (e.g. similar size Mediterranean ports) to isolate impact.

Capital Deepening Check: We'd gather data on number of cranes, berth length, or invest dollars at each port before and after. The new ports obviously add X cranes; the old ports also invested in some automation

after 2018 (some sources note purchases of new equipment ahead of competition). We'd examine changes in capital indicators per employee.

Risks: small sample (basically 3 ports). But port operations data are typically consistent and highly indicative. Another risk is external shocks like pandemic disruptions (we'd include global container index as control). We expect to find substantial improvements: e.g., average wait days dropping, throughput per worker rising in 2022 relative to trend, etc., attributable to competition.

Contribution: This backup study would showcase immediate productivity gains from introducing competition in a non-tradable infrastructure service, reinforcing how capital deepening (new terminals) and competition work together. It's slightly less ideal than water in identification, but still solid due to the clarity of the intervention.

We will proceed with the water sector analysis as primary and keep the ports plan in reserve, ready to execute if needed or potentially as a follow-up project given its importance.

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