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Beyond certifications: Questioning the design and economic effects of the canadian ethical diamond policy

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ABSTRACT

This paper investigates the design, signaling effectiveness, and economic impacts of the Government of the Northwest Territories' ethical diamond certification. Employing a sequential exploratory mixed-methods approach, the study combines a longitudinal institutional analysis with a macro-panel econometric evaluation of value-chain upgrading across key diamond-producing and processing countries. Qualitative evidence shows that compliance burdens, rigid chain-of-custody protocols, and subsequent policy relaxations undermined both the industrial feasibility and the credibility of the territorial signal. Quantitative findings indicate that the certification is linked to a significant negative effect on downstream value retention. By contextualizing the Canadian case within broader debates on resource-based industrialization, global value-chain governance, and credence-goods signaling, the paper reveals how ethical certifications can inadvertently reinforce structural constraints instead of promoting upgrading. These results underscore the need for certification architectures that balance credibility with operational feasibility in globally fragmented and cost-sensitive industries.

1. Introduction

The global diamond market is characterized by structural complexity and persistent opacity, arising from the heterogeneous nature of gemstones, the emotional and symbolic dimensions associated with their consumption, and the difficulty of reconstructing their provenance (Teichmann and Falker, 2024; Onifade et al., 2024). In response to growing transparency demands driven by sustainability standards and the ecological transition, a variety of certification and tracking systems have been introduced (Sumkin et al., 2021; Thakker et al., 2021). These certifications seek to reassure consumers regarding product quality, origin, manufacturing processes, and compliance with environmental and labor standards. Ethical certifications, in particular, are designed to guarantee that diamonds are free from slavery, smuggling, and links to armed conflict (Saab, 2025; Armano and Joy, 2022; Le Billon, 2006; Dolan, 2024). As such, they act as signals of otherwise unobservable attributes in a market characterized by pronounced information asymmetries (Zerbini, 2017; Adams et al., 2001), consistent with the "credence goods" nature of natural diamonds (Armano and Bosco, 2024).

The Canadian government—notably in the Northwest Territories (NWT)—launched an extensive campaign to promote Canadian diamonds, even proposing "Canadian" as a fifth (Bell, 2017) or sixth "C" (Schuetze, 2014).[1] This branding strategy emphasized their ethical origin (Canada being a democracy free from armed conflict) and their pristine Arctic provenance (Bell, 2023; Palmer, 2020), thereby enhancing the perceived value of these high-quality gems in contrast to African "blood diamonds" (Hamilton and Cavello, 2023; Armano, 2023).

This article investigates the signalling properties and effectiveness of the Canadian diamond policy by contrasting the certification procedure and its associated communication strategy with an analysis of the broader branding policy and an empirical assessment of certification efficacy. The central research question concerns the extent to which certification supports upgrading in the mid- and downstream segments of the global diamond value chain (GVC), with particular emphasis on the cutting and polishing phases, which represent the most profitable stages (Morris et al., 2012). The theoretical contribution lies in illustrating how certifications can influence the allocation of value added within GVCs (Gereffi et al., 2005; Antràs, 2020; Antràs and Chor, 2018). This issue of upstream value retention is especially salient for natural-resource-rich economies (Sigam and Garcia, 2012) and directly

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[1] Diamond Color, Clarity, Cut and Carat weight are collectively termed the "4Cs" – the factors that, when combined, define a diamond's quality and ultimately determine its value (GIA, 2016).

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engages with the literature on resource-based industrialization (Auty, 1994) and country positioning within GVCs (Mancini et al., 2024).

To explore these dynamics, the study adopts a sequential exploratory mixed-methods design. It begins with an in-depth institutional policy analysis and qualitative framework review to identify structural frictions and weakening mechanisms within the Canadian ethical diamond certification. These qualitative insights then inform a macro-panel econometric analysis across major diamond-producing and processing countries, enabling an empirical assessment of the policy's systemic effects on value-chain upgrading.

The article is structured as follows. Section 2 reviews the theoretical foundations motivating the study. Section 3 provides an overview of the global diamond market. Section 4 outlines the methodological approach. Section 5 analyzes the institutional features of the NWT Government Diamond Policy Framework. Building on the qualitative findings, Section 6 empirically estimates the economic impact of Canadian certification using panel data analysis. Section 7 discusses the results and concludes.

2. Theoretical framework and conceptual architecture

This article draws on four interconnected bodies of literature to develop an integrated theoretical framework for analyzing the economic consequences and effectiveness of ethical certifications in the case of Canadian diamonds. These domains are: (1) Resource Economics and Resource-Based Industrialization (RBI); (2) Global Value Chains (GVCs) and value-retention dynamics; (3) Signaling Theory under asymmetric information; and (4) Sustainable Luxury Consumption as a driver of ethical certification demand. The specific relevance of each domain to this study is outlined below.

2.1. Core theoretical foundations: Resource Economics and RBI

The availability of raw materials lies at the center of debates on the resource curse, whereby countries or entire regions become structurally dependent on resource extraction, hindering industrial development and relegating them to the role of suppliers of raw materials and biomass for more advanced economies. This vulnerability is exacerbated by terms-of-trade volatility, enclave extraction patterns, and the tendency of free trade to lock countries into low-value-added, high-environmental-footprint production (Auty, 1994).

RBI strategies seek to counteract these dynamics by leveraging resource extraction to support domestic processing activities that capture downstream value, thereby improving a nation's industrial development trajectory (Sigam and Garcia, 2012). However, RBI models often assume frictionless markets. Domestic content protection theory suggests that imposing standards, local content requirements, or processing mandates in contexts where extraction costs are already high (Ali, 2017, p. 120) introduces rigidities into production chains (Grossman, 1981). When domestic processing costs exceed those of global hubs, rigid regulatory provisions become economically punitive.

This article contends that the high compliance costs associated with the Canadian diamond certification program contributed to the initiative's stagnation and hindered the development of a competitive diamond processing sector in the NWT.

2.2. Global Value Chains (GVCs) and value retention

The GVC framework (Gereffi et al., 2021; Antràs, 2020; Kaplinsky, 2000; Ponte and Sturgeon, 2014) provides a foundation for understanding how value is generated, captured, and retained across geographically fragmented production networks. In the diamond industry, cutting, polishing, logistics, branding, and marketing constitute the most profitable segments of the value chain (Morris et al., 2012).

Within GVC theory, economic upgrading (Humphrey and Schmitz 2002)—particularly functional upgrading (moving to higher-value tasks) and process upgrading—enables countries to increase local value retention (Gereffi et al., 2005). Yet global lead firms and dominant midstream hubs (e.g., India, Antwerp, Hong Kong) exert governance power over processing networks. When a region attempts to enforce downstream value retention through regulatory mandates without possessing cost advantages in midstream activities, lead firms adjust sourcing strategies, resulting in value leakage rather than retention (Ponte and Ewert, 2009). For instance, this dynamic was evident in Botswana's attempt to retain midstream diamond processing: when global diamond prices fell around 2015, local beneficiation became uncompetitive relative to India (Fessehaie et al., 2016).

The article contends that efforts to retain polishing and cutting activities in the NWT similarly clashed with the structural segmentation of the diamond value chain and India's dominance as a global polishing hub, producing negligible gains in upstream value retention.

2.3. Signaling Theory in credence markets

Certifications function as corporate or geographical branding tools, positioning firms and countries within markets increasingly shaped by informed and ethically conscious consumers (Schulte et al., 2021; Van Bockstael, 2018; Van de Ven, 2008). They become “ethical certifications” when they verify adherence to moral principles, social values, and responsible conduct beyond formal quality standards.

In credence markets—where consumers cannot verify key product attributes ex-post—certifications aim to correct information asymmetries (Spence, 1973; Akerlof, 1978; Darby and Karni, 1973). In the diamond sector, consumers cannot observe a polished stone's geographic origin, labor conditions, or environmental footprint. Unlike organic food, where ex-post verification is possible (Meijaard and Sheil, 2019; Browne et al., 2000), diamond buyers cannot ascertain whether Indigenous communities were adequately represented in mine development and decommissioning (Dolan, 2024; Armano and Bosco, 2024; Amupanda, 2020), nor can they verify environmental impacts (Furberg, 2018) or rule out contraband and money-laundering risks (Teichmann and Falker, 2024; Thakker et al., 2021).

Canadian ethical certification is therefore intended to signal hidden attributes and reassure ethical luxury consumers of the distinctiveness of NWT diamonds.

However, the analysis below argues that the certification design constitutes a weak signal: baseline requirements and evolving trademark rules have impaired its credibility. Moreover, despite awareness campaigns—including endorsements by public figures—ethnographic research documents persistent socioeconomic and environmental challenges in extraction processes (Hamilton and Cavello, 2023).

2.4. Sustainable luxury and consumers' behavior

Ethical and sustainable luxury consumption models represent a major driver of certification systems, reflecting the preferences of increasingly discerning consumers attentive to sustainability. Research shows that, when adequate differentiation exists (Zerbini, 2017), buyers are willing to pay a premium for genuinely ethical diamonds (Prikshat et al., 2024; Steinhart et al., 2013; Van Bockstael, 2018; Chatterjee et al., 2022; Schulte et al., 2021)[2]. Contemporary luxury consumers seek alignment between personal ethical values and high end purchases (Essiz and Senyuz, 2024; Moraes et al., 2017). Ethical provenance,

[2] Empirical evidence on the motivations driving specific diamond buyers is scarce. In general, it appears that the need to adopt sustainable behaviors might make paying a price premium acceptable. However, also considering the presence of more ethical alternatives, such as lab-grown diamonds, the verification of the hypothesis regarding a generic willingness to pay more for ethical products, specifically in the case of diamonds, is inconclusive (Schulte et al., 2021).

conflict-free guarantees, and social licensing thus become critical differentiators (Vanhamme et al., 2023; Demuijnck and Fasterling, 2016).

Although luxury consumption often reflects tensions between hedonism and socio-environmental responsibility, durability, uniqueness, and the absence of fast fashion dynamics constitute points of convergence between luxury and sustainability (Athwal et al., 2019). In the diamond sector, this convergence appears in the growth of second-hand markets and the adoption of synthetic diamonds as environmentally friendlier alternatives.

Synthetic diamonds have emerged as a credible ethical substitute (Sun et al., 2024; Bilham, 2021). Yet despite competition—even in high jewelry—the aura of rarity, naturalness, and emotional resonance continues to sustain demand for natural diamonds (Ali, 2017). Synthetic diamonds, while cheaper, may not confer equivalent status and are often perceived as inferior goods when buyers are indifferent to authentic origin (Sipe, 2022).[3]

This study draws on this literature to highlight how ethical certifications help firms signal sustainability to conscious luxury consumers, partially resolving tensions between luxury as resource waste and luxury as investment in durability and environmental stewardship (Athwal et al., 2019).

2.5. An integrated theoretical framework

Synthesizing these four perspectives, the integrated framework establishes the conceptual basis for analyzing how government-backed territorial certifications operate within global buyer-driven value chains. Rather than functioning in frictionless markets, ethical certifications generate complex interactions among compliance costs, global cost disparities, and signal credibility. Their empirical effectiveness—and their capacity to foster regional value retention amid market shocks and technological disruptions—remains uncertain and requires systematic evaluation. Table 1 summarizes the relevant literature streams, their core assumptions, and the research gaps addressed in this study.

This study engages with a key debate in the GVC literature: whether ethical certifications and sustainability standards genuinely promote functional upgrading and upstream value retention in resource-rich economies. While traditional models see ethical labels as simple tools for securing price premiums, recent scholarship highlights that high compliance costs, governance asymmetries, and global cost differentials often lead to value leakage, trapping extraction regions in low-margin activities.

Bridging these perspectives, this article empirically examines how territorial certification schemes in the diamond market, designed to retain value locally, face structural barriers. Stringent chain-of-custody protocols raise processing costs above global benchmarks, while policy relaxations and performative governance undermine the credibility of certification signals, as supported by ethnographic evidence.

These tensions—between compliance costs, credibility, and global disparities—frame the analysis of the Canadian case in Section 5.

3. Methodology

To investigate the economic viability, design, and actual market efficacy of the GNWT ethical diamond certification, this study employs a Sequential Exploratory Mixed-Methods Design (*QUAL → QUAN*) (Edmonds and Kennedy, 2017). The analytical architecture operates across two sequentially linked research strands whose relationship is explicitly inferential:

[3] However, synthetic diamonds are expanding their market share (Statista, 2026), and the accompanying price reduction poses a genuine profitability challenge for natural stones (Pellegrino, 2026).

Table 1
Literature domains, core focus and research gaps.

Literature Domain	References	Core Focus	Identified Research Gap
Resource Economics & RBI	Auty (1994), Grossman (1981), Sigam and Garcia (2012)	Resource curse dynamics; RBI strategies to capture downstream value.	Assumes frictionless domestic processing; overlooks prohibitive costs and rigid standards.
Global Value Chains & Value Retention	Kaplinsky (2000), Humphrey and Schmitz (2002), Gereffi et al. (2005, 2021), Ponte and Sturgeon (2014), Fessehaie et al. (2016)	Functional/process upgrading; governance by global hubs.	Rarely considers how regional certification interacts with global cost disparities and sourcing shifts.
Signaling Theory in Credence Markets	Spence (1973), Akerlof (1978), Darby and Karni (1973), Zerbini (2017)	Certifications as signals resolving information asymmetry.	Generally neglects how baseline dilution and operational friction weaken signal credibility.
Sustainable Luxury & Consumer Behavior	Steinhart et al. (2013), Ali (2017), Athwal et al. (2019), Essiz and Senyuz (2024), Sun et al. (2024)	Ethical luxury demand; competition between natural and synthetic diamonds.	Focuses on micro-level consumer behavior; lacks macro-level trade and export implications.

3.1. Phase 1. institutional, policy, and qualitative analysis (QUAL)

This phase conducts a longitudinal policy review of the GNWT Diamond Policy Framework (2018–2019), synthesized alongside secondary trade data, industry reports, official documentation, and existing findings regarding community impacts. Inferentially, this phase serves to deconstruct the policy mechanism and identify the qualitative drivers of regulatory friction and signal weakening. Specifically, Phase 1 formulates three core qualitative propositions (Propositions).

- P_1 (Compliance Friction & Industrial Leakage): High administrative compliance costs and rigid lot-segregation protocols imposed by territorial ethical certification increase processing overheads above international benchmarks, disincentivizing local downstream transformation and triggering industrial leakage toward unconstrained global hubs.
- P_2 (Signal Dilution & Policy Relaxation): Subsequent policy relaxations (e.g., permitting offshore processing) disempower the territorial signal's credibility, eroding the relative economic returns of certified local upgrading.
- P_3 (Defensive Margin-Defense under Disruptive Synthetic Sourcing): Plummeting prices of lab-grown diamonds pose a challenge to natural diamonds aiming to position themselves as genuinely ethical.

3.2. Phase 2. quantitative macro-panel econometric analysis (QUAN)

The qualitative propositions from Phase 1 directly specify the empirical hypotheses, model structure, and variables tested in Phase 2. Phase 2 evaluates whether these qualitative mechanisms and structural frictions are empirically observable across international trade flows along the GVC of the diamond sector, using a macro-panel dataset.

4. Global diamond market overview

The global diamond market is largely controlled by a few major corporations, including Alrosa, De Beers, and Rio Tinto, which collectively produce over 65% of global diamond mine output (Statista, 2026),

exerting significant control over extraction and distribution. In the past, diamonds were primarily associated with Sub-Saharan Africa and European luxury hubs, with Canada missing from the market. This shifted significantly with the 1991 discovery of kimberlite in Canada's NWT, leading to the 1998 opening of the Ekati mine and reshaping the global diamond narrative (Table 2).

Canadian mines were notably developed on ancestral Indigenous lands, often as open pits in pristine lake areas. Extraction conditions in remote Arctic areas have made mining operations particularly costly (Shigley et al., 2016; Smith, 2004). Three diamond mines were opened in the NWT: Diavik, on Lac de Gras, a remote lake 140 miles south of the Arctic Circle owned by Rio Tinto, Ekati (owned by Burgundy) and Gahcho Kue (joint venture, De Beers and Mountain Province). The Diavik mine has ceased its activity (March 2026) after producing 150 million carats during its lifetime (Jeffay, 2026).

The diamond industry has had a significant impact on the economy of the NWT. According to official statistics, diamond mining accounted for up to 22% of the entire region's GDP between 1999 and 2024 (Fig. 1).

Other sources, however, cite significantly different figures. According to the World Diamond Council report, "*At its peak, the diamond industry's direct contribution to the NWT's GDP reached as high as 30 percent, although if one factors in associated procurement contracts for diamond mining companies and associated bodies, it has reached as high as 48 percent*" (World Diamond Council, 2025).

Though, it should be emphasized that the major diamond processing hubs are not typically located in the countries that host the mining sites. On the contrary, countries such as Belgium, Israel, Hong Kong, and the United Arab Emirates have historically ranked among the leading exporters of polished diamonds, despite completely lacking domestic production (Table 3).

Over the past decade, India has become the global leader in diamond trade, importing and exporting the most diamonds. Given that cutting and polishing are labor-intensive activities, approximately 90% of the world's diamonds are now processed in India due to its comparative advantage in labor costs (Rao, 2016; Statista, 2025; UNDP, 2009). This dominance has undercut traditional centers and may have influenced the GNWT branding policy evolution.

5. Institutional, policy, and qualitative analysis. The canadian case

5.1. The canadian diamond certification

Several companies began marketing Canadian diamonds through distinctive brands even before the NWT government launched its own certification program. The market debut of Canadian diamonds dates back to 1999, when Sirius Diamonds became the first company to promote stones mined and cut entirely in Canada. These "branded" diamonds were distinguished by a laser-engraved serial number and a polar bear, accompanied by official certification. Following this success, other brands emerged using iconic symbols such as the maple leaf, the snowflake, or the beaver to attest to their Canadian origin (Kjarsgaard and Levinson, 2002).

Seizing the opportunity to differentiate itself from other countries, the GNWT began labeling locally sourced stones as ethical diamonds in 1999 (Armano, 2022). In 2018, the GNWT launched the Diamond Policy Framework to support and encourage the development of diamond manufacturing in the NWT. The program was launched in conjunction with the opening of the Ekati and Diavik mines and was designed to transform an undifferentiated mineral product into a high-value-added territorial brand. It granted 'certified company' status to those firms that adhered to the rigorous standards mandated by the certification program (GNWT, 2018). This positioning bolstered the narrative of Canadian diamonds as inherently conflict-free and ethically sourced, sharply contrasting them with stones from regions associated with opaque, illicit, or violent origins[4] (Bell, 2017).

The program is managed by the Secondary Diamond Industry Division within the Department of Industry, Tourism and Investment of the GNWT (GNWT, 2025). This policy committed the GNWT to.

- Provide guidance that assists in the startup of Diamond Manufacturers where there is the potential for significant employment, business activity and investment as well as training opportunities for NWT residents;
- Assist in the marketing of diamonds produced and manufactured in the NWT through such activities as the certification of branded diamonds and other marketing strategies;
- Monitor the production and manufacturing process to ensure that the diamonds received from a Diamond Producer are manufactured in a manner that maximizes benefits to the people of the NWT;
- Certify NWT diamonds as being mined, cut and polished in the NWT to verify the origin of the diamond; and
- Actively support other diamond related value-added activities such as jewelry, manufacturing and tourism (GNWT, 2018)

Among the core principles of the program was the introduction of Approved NWT Diamond Manufacturers. These are NWT Diamond Manufacturers that have been approved by the GNWT as authorized to access rough diamonds made available through agreements with Diamond Producers—the entities operating the mines within the territory. Approved NWT Diamond Manufacturers (ANDM) were to be designated by the Minister of Industry, Tourism and Investment.

ANDM may access a wide range of GNWT programs and services to support their business activities. These activities would include, in addition to startup and technical-operational support, diamond marketing efforts. In particular, the GNWT committed to providing a license to ANDM that permitted the manufacturer to use certain GNWT trademarks, including the Four-Legged West Facing Polar Bear design trademark and the Polar Bear Diamond™ wordmark. The GNWT would establish minimum standards that must be met by an ANDM for its polished diamonds to be associated with GNWT-licensed trademarks.

To become an ANDM under the 2018 Diamond Policy Framework, an applicant was required to submit a comprehensive business plan demonstrating the company's financial and operational viability while maximizing local benefits. Specifically, the enterprise had to prove the reasonableness of its business assumptions, the depth of its management team's experience, and a commitment to locating that team within the NWT. The proposal needed to detail a clear strategy for capital

Table 2
Top diamond producing countries, 2024.

Country	Million carats	*Country*	Million carats
Russia	37.32	Sierra Leone	0.57
Botswana	18.13	Ghana	0.33
Angola	14.03	Tanzania	0.33
Canada	13.32	Guinea	0.11
Democratic Republic of the Congo	9.79	Central African Republic	0.11
South Africa	5.34	Brazil	0.05
Zimbabwe	5.29	Guyana	0.05
Namibia	2.32	Liberia	0.05
Lesotho	0.70	Cameroon	0.01

Source: Statista (2025).

[4] During the 1990s, Global Witness's Fatal Transactions Campaign exposed human rights abuses and environmental damage in diamond mining, especially in Africa. This campaign warned consumers about complicity in violence, pressuring the diamond industry to address trade-conflict links and influencing consumer preference towards ethical and sustainable practices (Le Billon, 2006; Zerbini, 2017; Baek, 2010).

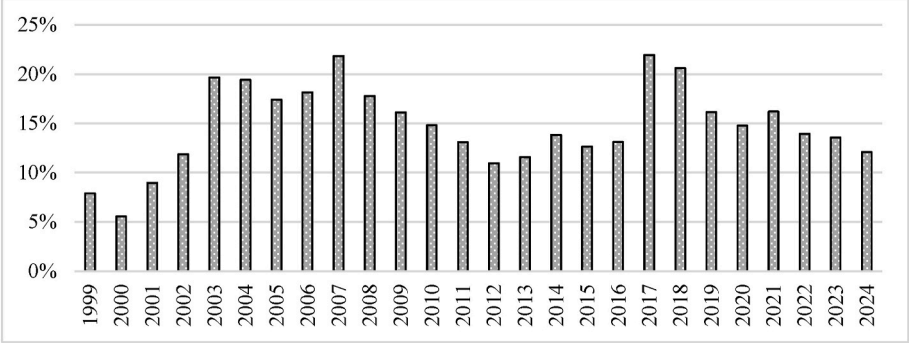

Fig. 1. Diamond mining as a % of NWT GDP.
Source: NWT Bureau of Statistics.

Table 3
Top polished diamond exporting countries, 2025.

Country	USD Thousands	Country	USD Thousands
India	12468865	United Kingdom	861055
Hong Kong, China	10098746	China	686009
United States of America	7709484	Botswana	578377
Israel	3525026	France	242512
Belgium	2969772	Namibia	203272
United Arab Emirates	2477227	Singapore	197437
Switzerland	1215950	Italy	179318
Thailand	947203	Sri Lanka	120125
South Africa	882531	Angola	70317

Source: ITC (2026).

investment, manufacturing processes, and product marketing, including the potential use of GNWT-licensed trademarks like the Polar Bear Diamond™. Most importantly, the company had to provide a measurable analysis of how its operations would yield significant training and employment opportunities for NWT workers, create investment possibilities for residents, and foster collaborations with other local businesses or Aboriginal organizations. Once approved by the Minister, the manufacturer also had to agree to strict monitoring and annual reporting to ensure that the rough diamonds provided were utilized according to agreed-upon plans to benefit the people of the NWT.

To date, however, only two companies have been able to obtain the status of ANDM, due to the extremely strict requirements of the program. The first company to obtain such certification was Almod Diamonds in 2020, and the second was Diamonds de Canada in 2021 (Busch, 2020; Butterfield, 2021).

The identification of a second company suitable for certification, though, took place following the reformulation of the original certification program, which, since 2019, provides the opportunity for manufacturers to export a share of their NWT rough diamonds in exchange for alternative investments in the NWT economy. In particular, the new policy for ANDM (GNWT, 2019) allows not only access to rough diamonds, but to export more than half of what it procures, under certain conditions, to be cut and polished elsewhere. The problem lies in the low competitiveness of local labor costs employed in cutting and polishing, compared to the emergence of India as the undisputed leader due to its competitive advantage in labor costs.

Another technically relevant issue, but largely ignored in the advertising of Canadian diamonds, is that local diamond producers - i.e. mine operators - are committed to supplying 10% in value only of their annual diamond production to companies that have obtained the status of ANDM. Therefore, the remaining 90% enters the global chain of international diamond processing, and traceability stops from the moment the stones are exported to be cut and polished elsewhere.

Despite this limitation, online jewelers trading in Canadian gems do not fail to emphasize the ethical origin of the diamonds used,[5] even if they do not clearly demonstrate that they have used that fraction of the 10% of local annual production entirely processed by workers in the NWT. Table 4 reports some statistics on ANDM rough diamond purchases, manufacturing and exports.

As reported in Table 4, the percentage of diamonds that should actually be considered “ethical diamonds” decreased from 0,019% of total NWT diamond production in 2022 to 0,003% in 2024. The market signal conveyed by the certification is therefore subject to a distortion: only a minimal portion of the diamonds extracted in NWT mines are eligible for certification by the government; furthermore, jewelers generalize the use of the name "Canadian diamond" to attract consumers interested - at least formally - in purchasing diamonds from certain and acceptable sources with respect to the scale of values that informs the pervasive concept of sustainability in consumption habits.

The GNWT branding policy has been effective in positioning Canadian diamonds within a price range 10-20% higher than other stones of equal quality (CJM, 2025). Such a premium price should reflect the rigorous ethical and environmental benchmarks and the comprehensive certification process required to verify their origin. “*By choosing an NWT-sourced stone, you gain the assurance that your diamond has been mined and manufactured according to the highest industry standards, ensuring both its quality and its positive impact on the local community*” (CJM, 2025).

Actually, when taking into consideration the impact on the local community, as diamond mines were opened in Indigenous territories, anthropologists, sociologists, and geographers extensively examined the intricate interactions between mining operations and local populations. The extant literature consistently highlights recurring challenges, including issues of territorial dispossession, environmental degradation, labor exploitation, and existential threats to traditional cultural identities (Bilham, 2021; Schlosser, 2013; Bebbington, 2012; Hilson et al., 2016; Acuña, 2015; Ali, 2009; Le Billon, 2008). Nevertheless, the marketing campaign for NWT diamonds successfully surrounded the gemstones with an aura of purity and ethical “unblemishedness”, vigorously promoted by gem traders and marketing campaigns and officially endorsed by the GNWT certification scheme, omitting to account for critical perspectives raised by researchers (Hall and Pryce, 2023). The discourse surrounding ethically certified Canadian diamonds paradoxically fostered an idealized perception of unspoiled Arctic environments (Hamilton and Cavello, 2023). This utopian depiction persisted even as substantial environmental degradation and threats to the cultural

[5] See for instance Ecksand, 77Diamonds, Diamond.Pro, Do Amore, Arctic Fame Diamonds, Canadamark.

Table 4
ANDM purchases, manufacturing and exports, carats.

Rough diamond purchases by ANDM	2022	2023	2024	Polished Diamonds Exports	2022	2023	2024
Total rough purchase	5214	5602.12	6272.87	Polar Bear Diamonds™	485	73.5	37.12
Local Manufacturing	2777	531.91	417.87	Government Certified Canadian Diamond™	204	66.7	2.13
				Polished-Others	442	210.38	190.79
Overall NWT annual volume of diamond production							
	14294769	14243025	12062699				
ANDM Local Manufacturing as a % of total production							
	0.019%	0.004%	0.003%				

Sources: GNWT Socio-Economic Agreement Report (2022, p.27, 2023, p. 27, 2024, p. 27); NWT Bureau of Statistics (2026).

viability of Indigenous populations were simultaneously being documented (Bielawski, 2004).

The case of Canadian diamond exploitation has several parallels across mining host countries, as contrasts with Indigenous communities are pervasive. The recent case of diamonds extracted in Botswana from areas previously occupied by the Indigenous San people, who were evicted for exploration and extraction activities, strongly clashes with the narrative through which the country has presented itself to the world as a champion of clean diamonds, human rights, and responsible investment (Mueller, 2024; DeLeon and Ventriss, 2010).

The attempt to position the country simultaneously as a primary producer and as a manufacturing hub for high-quality gemstones (as opposed to industrial diamonds) represents, on one hand, a commendable effort to generate and retain domestic manufacturing value. Given the critical elements emerging from the geographical and ethnographic research, one might argue that the regional government sought to grant a stamp of official approval to the narrative surrounding Canadian ethical diamonds through the certification program, aiming to implicitly recognize the role, importance, and significance of Indigenous communities.

On the other hand, the fact that this recognition has been primarily superficial rather than substantive is evident from how the adopted strategy clashes with the global logic of value chains, where a competitor with overwhelming labor cost advantages had already agglomerated the vast majority of downstream processing stages.

This dynamic overall is further intensified by the fierce competition exerted by lab-grown diamonds, which have become increasingly cost-effective and widespread, establishing themselves as an accessible and often more convincingly ethical alternative to natural diamonds.

5.2. Synthesis of qualitative findings and propositions

The qualitative analysis of the GNWT regulatory framework directly informs the three propositions (P_1, P_2, P_3) introduced in Section 3:

- Derivation of P_1 (Compliance Friction): The historical analysis of ANDM compliance requirements reveals that mandatory lot-segregation and high territorial operating costs created unsustainable administrative overheads. Comparing these burdens with low-cost global cutting hubs demonstrates how local regulatory friction disincentivizes domestic transformation, directly supporting. P_1.
- Derivation of P_2 (Signal Dilution): The evidence surrounding the 2019 policy relaxation—which permitted over 50% offshore rough export—highlights a structural compromise that eroded supply-chain traceability. The observed collapse of local certified manufacturing (falling to 0.003% of total NWT production by 2024) illustrates how brand dilution undermines value retention, providing the empirical rationale for P_2.
- Derivation of P_3 (Margin Defense): The industry data on lab-grown diamonds (LGD) has been challenging the margins of both natural and lab-grown diamond producers. As lab-grown diamond prices decrease (a trend observed in the natural gems segment as well), the relevant market share increases and challenges natural diamonds' attractiveness and profitability. This market disruption compels sovereign producers to reallocate margins along the diamond GVC, establishing P_3.

Grounded in this qualitative evidence, P_1, P_2, and P_3 provide the theoretical framework for the empirical econometric testing.

6. Empirical assessment: economic impact of canadian diamond certification

Building on the propositions (P_1, P_2, P_3) derived above, the quantitative phase operationalizes these insights into observable econometric variables. Suppose that a diamond-producing country extracts a given quantity of rough diamonds in year t. The producer must decide on the share of rough diamonds to export directly for subsequent offshore processing and the remaining share to allocate for domestic processing to export cut and polished diamonds. To assess the impact of Canadian ethical certification on locally created value added, let us define an index of exported polished diamonds intensity as a share of rough exported diamonds, Y_{it}:

$$Y_{it} = \frac{Value\ of\ polished\ diamonds\ exported}{Value\ of\ rough\ diamonds\ exported}$$

The ratio Y_{it} serves as an optimized proxy for value-chain upgrading rather than absolute downstream performance, as it standardizes the scale of extraction across heterogeneous producing nations. The formal baseline relationship is specified as follows:

$$\ln(Y_{it}) = f\left[\ln\left(P_t^W\right), \ln\left(P_t^{LG}\right), \ln(Imp_{it}), (Cert_{it}), \left(country\_risk_{it}\right)\right]$$

Where P_t^W is the average world price of polished gems. We expect that an increase in finished gems' world price should increase the intensity of export in polished diamonds as manufacturers would find it easier to obtain higher margins without having to export rough diamonds to low-cost cutting centers. P_t^{LG} is the price of lab-grown (LG) diamonds $\left(P_t^{LG}\right)$: a decrease in the price of lab-grown diamonds should reduce the demand and relative price of polished natural diamonds, disincentivizing domestic processing in favor of rough exports. Imp_{it} is foreign raw diamond imports: these provide a measure of the country's centrality as a third-party refining hub but also capture a market-size effect (not so relevant here, as rarely the largest diamond producers are also the largest gem-like consumers). $Cert_{it}$ is the policy variable detecting the introduction of the GNWT Diamond Programme in 2018. The variable *country_risk* was included to capture the rule of law prevailing in the country as a proxy for political stability. Table 5 details the mapping from qualitative propositions ($QUAL$) to quantitative metrics ($QUAN$).

A semi-log empirical equation can therefore be defined as:

$$\ln(Y_{it}) = \beta_0 + \beta_1 \ln\left(P_t^W\right) + \beta_2 \ln\left(P_t^{LG}\right) + \beta_3\ \ln\left(Imp_{it}\right) + \beta_4(Cert_{it}) + \beta_5\left(country\_risk_{it}\right) + u_i + \epsilon_{it}$$

Where u_i are country fixed-effects, capturing the specialization of the country as a manufacturing hub. To evaluate the robustness of our findings against potential global demand shocks, we implement an

Table 5
Operationalization mapping: From ***QUAL*** propositions to ***QUAN*** variables.

QUAL Proposition	*Qualitative Driver/Institutional Mechanism*	*Operationalized QUAN Variable*	*Theoretical Expected Sign & Rationale*
P1 & P2 (Compliance Overhead & Signal Dilution)	High administrative overheads, rigid lot-segregation, and policy relaxations permitting offshore export	$Cert_{it}$ (binary dummy = 1 for NWT certification post-2018)	Negative: regulatory friction and diluted brand signal decrease relative downstream value retention.
P3 (Defensive Margin-Defense vs. Substitutability)	Price erosion of lab-grown diamonds impacting natural rough value dynamics	P_t^{LG} (wholesale price of 1-carat lab-grown diamonds)	Positive: lab-grown diamonds act as substitutes; falling prices lower natural diamond demand/margins, discouraging domestic processing.
Baseline Market Incentives	Global demand and wholesale price dynamics of polished gemstones	P_t^W (world price index of polished diamonds)	Positive: higher polished prices expand downstream margins, encouraging domestic transformation.
Processing Hub Scale	Intermediate processing scale and reliance on external rough inputs	Imp_{it} (foreign rough diamond imports)	Control variable: captures reliance on imported rough inputs and third-party hub dynamics.
Institutional Quality	Governance, political stability, and rule-of-law standards	$country\_risk_{it}$ (World Bank Rule of Law Index)	Control variable: controls for country-level institutional risk and investment climate.

alternative specification where the international price index P_t^W is replaced by the total value of global polished exports X_t^W, capturing the aggregate macroeconomic absorption capacity of international luxury markets.

Given the configuration of the global diamond industry—a natural oligopoly concentrated among very few sovereign actors—the dataset is characterized by a small-N, relatively larger-T panel structure (N = 9, T = 18). Under these conditions, standard Fixed Effects estimations with traditional cluster-robust errors are inefficient and statistically invalid, as cluster-based inferences require $N \to \infty$. The equation is therefore estimated by the Driscoll and Kraay (1998) non-parametric covariance matrix estimator. While Driscoll-Kraay standard errors are

Table 6
Variable definition and descriptive statistics.

Variable name	Description	Years	Mean	Standard deviation	Min	Max	Data source
Y_{it}, Index of exported polished diamonds intensity as a share of rough exported diamonds	Exported polished gems in Millions of US Dollars, by country of export	2007-2024	2530	6660	0	31100	International Trade Center Trade Map, HS Code 710239 - Diamonds, worked, but not mounted or set (excl. industrial diamonds), US Dollars https://legacy.trademap.org/;
	Rough diamond exports in Millions of US Dollars, by country of exports	2007-2024	1660	1540	2.01280	6640	Kimberley Process Rough Diamond Statistics (KP, 2026), US Dollars, https://kimberleyprocessstatistics.org/public_statistics
P_t^W, Polished diamond world price indicator	Imported gem diamonds price indicator = 100 in 2007	2007-2024	105.739	5.0825	99	117.3	U.S. Bureau of Labor Statistics, (USBLS, 2026), Import Price Index (End Use): Gem Diamonds [IR42100], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/IR42100, May 26, 2026.
X_t^W, World finished gems export	World exports, Millions of US Dollars	2007-2024	80400	14900	50500	106000	International Trade Center Trade Map, HS Code 710239 - Diamonds, worked, but not mounted or set (excl. industrial diamonds), US Dollars https://legacy.trademap.org/
Imp_{it}, Rough diamond imports	Rough diamond imports in Millions of US Dollars, by country of imports	2007-2024	2050	4490	0	19000	Kimberley Process Rough Diamond Statistics (KP, 2026), US Dollars, https://kimberleyprocessstatistics.org/public_statistics
P_t^{LG}, Lab grown diamonds price	Lab grown diamond prices for 1 carat diamond.	2015-2024	2880.8	3276.495	110	11304	Years 2018-2024: https://www.edahngolan.com/diamond-statistics/#wholesale-lab-grown-diamond-rice. Years 2016-2017: https://www.naturaldiamonds.com/diamond-faqs/diamond-facts-full-report/#what-have-been-the-price-trends-for-laboratory-grown-diamonds. Year 2015: reconstructed from https://www.accio.com/business/diamond-price-trend-index-2015-to-2026 and https://markets.businessinsider.com/news/commodities/lab-grown-diamond-prices-engagement-rings-carat-value-outlook-jewelry-2024-2, both last accessed on July 24, 2026
$country\_risk_{it}$, Rule of Law	Rule of Law (RoL). Ranges between −2,5 and + 2,5. Risk increases if RoL decreases.	2007-2024	0.0140	0.7160	−1.1565	1.7329	Worldwide Governance Indicators, 2025 Revision, World Bank (2026) (www.govindicators.org), https://data360.worldbank.org/en/dataset/WB_WGI
Countries	Botswana, Brazil, Canada, China, India, Namibia, Russia, South Africa, Tanzania	Selection criterion: all the countries with rough production registered on the Kimberley Process website & polished diamond exports in the ITC database.					

asymptotically justified for $T \to \infty$, they represent the most reliable and conservative finite-sample correction available for our contemporary sub-sample (78 observations, because of missing data on lab-grown diamond prices before 2015). Furthermore, the highly integrated nature of the global diamond trade exposes the data to cross-sectional dependence driven by unobserved common shocks, alongside serial autocorrelation within individual country histories. The Driscoll-Kraay covariance estimator was therefore deemed necessary despite the data-driven restriction of the time window.

This setup allows us to test whether the traceability protocols of the 2018 GNWT diamond policy acted as a competitive catalyst or, conversely, were ineffective in retaining value added locally while allowing industrial leakage toward unconstrained global refining hubs.

The countries considered are those diamond-producing countries for which a flow of polished diamond exports also exists; that is, those countries more similar to Canada in its role of both producer and diamond polisher. Table 6 reports variable definitions, units, coverage, basic descriptive statistics, and sources.

In addition to the dummy variable for the introduction of the Canadian certification in 2018, the estimation of the equation includes a robustness check conducted by adding two further dummy variables to capture potential exogenous shocks that occurred during the observation period. Specifically, a dummy for the COVID-19 disruption (dummy = 1 for 2020 and 2021) and a dummy capturing the post-2022 geopolitical and economic shift (dummy = 1 from 2022 onwards) were included. Table 7 reports the estimates.

While the native panel spans the 2007–2024 horizon, the introduction of the lab-grown diamond price restricts the estimated econometric analysis to the contemporary window of market maturity (after 2015), with an effective sample size of 78 observations. Despite the reduction in T imposed by data availability, the Driscoll–Kraay estimator remains the optimal and most conservative choice compared to conventional cluster-robust standard errors, as it explicitly accounts for the cross-sectional dependence induced by global shocks in the luxury market.

The results across both baseline specifications (Model 1 with country-level global polished prices and Model 2 with world export value of polished diamonds) yield significant coefficients suggesting an original interpretation regarding downstream value retention and resource-based industrialization in the natural diamond sector.

The world price index of polished diamonds exhibits a positive elasticity of 3.045, indicating that a buoyant luxury market aggressively accelerates the domestic transformation rate as countries race to exploit high global margins. Similarly, in Model (2), world export value of finished gems yields a significant positive impact.

The variable capturing rough diamond imports displays a negative coefficient in both specifications, statistically significant at the 10% level. This negative sign reflects the structural footprint of a traditional manufacturing hub. In these jurisdictions, massive volumes of rough imports mechanically inflate the denominator of alternative value indexes or signify an intense reliance on thin-margin, high-volume intermediate processing, which can temporarily depress the relative export ratio of polished-to-rough values compared to pure primary extractors moving up the value chain. Conversely, the country risk proxy *Rule of Law* is statistically indistinguishable from zero in both models, indicating that macro-geopolitical risk factors do not exert a systematic, overriding friction on the microeconomic decisions governing vertical upgrading within this highly concentrated market.

The log price of lab-grown diamonds exhibits an unexpected negative sign and high statistical significance. Under a log-log specification, a negative elasticity indicates an inverse relationship: a collapse in the price of synthetic diamonds induces a statistically significant increase in the domestic transformation rate of natural diamonds. From a theoretical standpoint, this counterintuitive result could hint at an aggressive margin-defense strategy by sovereign producers. As the retail price of lab-grown alternatives plummets, the downward price pressure propagates upstream, severely devaluing natural rough diamonds (the denominator of our dependent variable). Selling unrefined diamonds becomes economically non-viable as raw extraction margins evaporate. To avert liquidating primary natural resources at distressed prices, producers may be incentivized to endogenize the resource, redirecting rough diamonds into domestic cutting and polishing facilities to capture the residual positional premium that high-end polished natural gems still command over synthetics.

The key variable of interest, Canadian ethical certification, provides the main insight from the analysis. The coefficient is negative and statistically significant at the 5% level in both specifications. This negative impact suggests that the GNWT certification program introduced severe regulatory encumbrances. While market forces and synthetic competition structurally incentivize producers within the panel to upscale local refining (as shown by the negative lab-grown diamonds coefficient), the stringent chain-of-custody protocols and physical lot segregation mandated by the GNWT policy overrode this mechanism. The administrative and logistical rigidities imposed by the certification framework raised the marginal cost of domestic compliance far above the ethical price premium recognized by international consumers. This result is in line with the subsequent change in policy adopted by the GNWT

Table 7
Fixed-effects regression with driscoll-kraay standard errors.

Dependent variable				
Y_{it}, (Log) value added of exported polished gems/ rough diamond exports	(1)	(2)	(3)	(4)
Independent variables (in logs)				
P_t^W, (Log) polished diamond world price indicator	3.045***		8.286***	
	(0.683)		(1.705)	
P_t^{LG}, (Log) lab-grown diamond world price	−0.074**	−0.139***	−0.272*	−0.05
	(0.031)	(0.036)	(0.139)	(0.097)
Imp_t^{LG}, (Log) local diamond imports	−0.135*	−0.156*	−0.150**	−0.157**
	(0.068)	(0.076)	(0.063)	(0.066)
$Cert_{it}$, Canadian ethical certification dummy	−0.441**	−0.504**	−0.557***	−0.481**
	(0.187)	(0.187)	(0.163)	(0.181)
$country\_risk_{it}$, Rule of Law	0.328	0.211	0.365	0.362
	(0.725)	(0.694)	(0.717)	(0.7249)
X_t^W, (Log) world export value of polished diamonds		0.642**		0.804***
		(0.209)		(0.179)
Covid years dummy (2020, 2021)			0.129	0.278
			(0.121)	(0.196)
Geopolitical shock dummy (post 2022)			−0.881	0.352
			(0.497)	(0.33)
constant	−14.940***	−15.946**	−37.447***	−20.804***
	(2.568)	(5.132)	(7.1619)	(4.65)
N	78	78	78	78
within R^2	0.1754	0.1434	0.2259	0.1691
F	F(5, 8) = 40.631	F(5, 8) = 16.92	F(7, 8) = 89.44	F(7, 8) = 32.81
p	0.0000	0.0000	0.0000	0.0000

Standard errors in parentheses.
*p < 0.10, **p < 0.05, ***p < 0.01.

between 2018 and 2019, which made it possible to maintain the certification even for part of the stones processed in other countries. The policy effectively triggered a phenomenon of industrial leakage, dampening Canada's capacity for resource-based industrialization and eroding its relative value-chain upgrading by approximately 40% to 50%.

The sign of the certification dummy variable remains negative and significant when the dependent variable is expressed as the log of the ratio between exports of polished gems and overall local production of rough diamonds.

Models (3) and (4) test for the robustness of these findings by introducing explicit time-shock controls for the COVID-19 pandemic and the post-2022 geopolitical and market shifts. Across all four empirical specifications, the coefficient for the certification remains negative, remarkably stable, and statistically significant at least at the 5% level. This confirms that the administrative burden associated with the Northwest Territories certification scheme exerts an independent negative impact on value added, which is resilient to alternative global market proxies and major macroeconomic disruptions. External shocks dummies in Model (3) and (4) are not statistically significant. This finding suggests that global market trends and price adjustments, already captured by the global price and volume regressors, sufficiently account for macroeconomic fluctuations during these periods.

An otherwise appropriate deterministic linear time trend was not included in the estimates due to multicollinearity issues: since lab-grown diamond prices have followed a continuous, near-linear downward trajectory since their market introduction, a linear time trend and synthetic prices act as near-perfect collinear mirrors. Including both artificially would inflate standard errors and misidentify the coefficients. Potential reverse causality is unlikely in this setup. Historical analysis of the legislative framework demonstrates that the launch of the 2018 Diamond Policy Framework was strictly independent from contemporary export shocks; it was driven by long-term socio-political agreements, administrative mandates for localized territorial development, and political pressures to recognize Indigenous economic agency, rather than immediate performance fluctuations in downstream polished markets.

7. Discussion and conclusions

The analysis presented in this paper points to a fundamental tension within the Canadian ethical diamond initiative: a policy designed to elevate territorial value ended up constrained by the very structures it sought to reshape. The GNWT certification emerged with ambitious goals—supporting local manufacturing, enhancing ethical branding, and positioning Canadian diamonds as a premium alternative in a market increasingly attentive to sustainability. Yet the empirical evidence shows that these aspirations collided with the realities of global production networks, producing outcomes that diverged sharply from the program's original intent.

The qualitative findings highlight how the certification's operational architecture became a source of friction. Compliance requirements were demanding, monitoring procedures were rigid, and chain-of-custody rules imposed costs that local manufacturers struggled to absorb. These burdens were not merely administrative; they shaped firms' strategic decisions, pushing them toward established global hubs where processing could be carried out more efficiently. The subsequent relaxation of certification rules—introduced to keep the program viable—had the unintended effect of weakening the territorial signal, blurring the distinction between genuinely local diamonds and those processed elsewhere.

The quantitative results reinforce this narrative. The negative coefficient associated with the certification variable suggests that the program did not support downstream upgrading; instead, it correlated with reduced value retention. This finding is not simply a statistical outcome but a reflection of deeper structural dynamics. In a value chain dominated by cost-competitive hubs and governed by global lead firms, territorial certifications must offer both credible differentiation and operational feasibility. The Canadian program struggled to deliver either consistently. The broader market context further complicated these challenges. The rapid expansion of lab-grown diamonds introduced a disruptive competitive force, eroding the value of natural rough and reshaping consumer perceptions of ethical luxury. For sovereign producers, this shift created pressure to capture residual value through domestic manufacturing. Yet the Canadian case shows that defensive strategies are unlikely to succeed when domestic processing costs are high, and certification signals lack clarity. In such circumstances, policy interventions can inadvertently amplify vulnerabilities rather than mitigate them.

This study contributes to a growing body of literature that questions the assumption that ethical certifications naturally promote upgrading. The Canadian experience demonstrates that certifications are not neutral tools; they are embedded in complex institutional and market environments that shape their effectiveness. When compliance architectures are misaligned with industry structure, and when signaling strategies fail to resonate with consumers, certifications may generate unintended consequences that reinforce existing patterns of value distribution. For policymakers, the implications are clear. Certification systems must be designed with careful attention to both global cost dynamics and the expectations of ethically oriented consumers. They must strike a balance between rigor and flexibility, ensuring that standards remain credible without imposing prohibitive burdens on domestic firms. They must also be resilient to technological disruptions, such as the rise of synthetic diamonds, that alter the competitive landscape in unpredictable ways. Looking ahead, future research could explore alternative governance models—such as multi-stakeholder certification schemes or digital traceability systems—that might offer more robust and adaptable frameworks. Comparative studies across resource-rich economies could also shed light on the conditions under which certifications successfully support upgrading. Ultimately, the Canadian case serves as a reminder that industrial policy in globally fragmented value chains requires not only ambition but also a nuanced understanding of the structural forces that shape economic outcomes.

Declaration of generative AI and AI-assisted technologies in the manuscript preparation process

During the preparation of this work, the authors used GEMINI for text editing and formatting. The authors reviewed and edited the output as needed and take full responsibility for the content of the published article.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix

The time-series for lab-grown diamonds was reconstructed as follows. The referral was the price for 1-carat lab-grown diamond.

Data for 2018-2024 were found in https://www.edahngolan.com/diamond-statistics/#wholesale-lab-grown-diamond-rice (Edahn Golan, 2026) Last accessed on July 27, 2026.

(We took data for Q4, extrapolated from the graph entitled "Wholesale Lab-Grown Diamond Price Trend")

Data for 2016-2017 were found in https://www.naturaldiamonds.com/diamond-faqs/diamond-facts-full-report/#what-have-been-the-price-trends-for-laboratory-grown-diamonds. The data belong to a Table originally found in Paul Zimnisky Diamond Analytics (2026) State of the diamond market March 2023. Last accessed on July 27, 2026.

Data for 2015 were reconstructed as follows: From here https://www.accio.com/business/diamond-price-trend-index-2015-to-2026 the statement saying "The average wholesale price of a 1.0-carat natural diamond (D/VVS2/3EX) decreased from approximately USD 12,560 in 2015 to an estimated USD 7050 in 2026" was confronted with the interview to P. Zimnisky here https://markets.businessinsider.com/news/commodities/lab-grown-diamond-prices-engagement-rings-carat-value-outlook-jewelry-2024-2, in the sentence "But prices for lab-grown diamonds have actually been declining since 2015, the year they first started to become mainstream. Back then, a man-made diamond was priced at around a 10% discount to a natural diamond. Today, they're priced at up to a 90% discount, Zimnisky estimates." Last accessed on July 27, 2026.

So, the price for 2015 was estimated as 90% of USD 12,560 at USD 11,304.

Data availability

Data will be made available on request.

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