

Quality and Credibility of Economic Evaluation Methods in the Canadian Defence Industry

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CANADIAN CENTRE FOR
ECONOMIC ANALYSIS

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About the Author

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1. Purpose and Context

This commentary provides an assessment of the report titled “Lockheed Martin Economic Contribution in Canada: Socioeconomic Impact Assessment” (May 2026), prepared by Deloitte Consulting LLP for Lockheed Martin Canada. The report was published on May 26, 2026, as part of Lockheed Martin Canada’s public communications about its contribution to Canada’s defence and industrial base.

CANCEA has reviewed this report as part of its ongoing analytical interest in the quality and credibility of economic evaluation methods applied to Canadian defence and industrial policy. The assessment responds to the increasing use of commissioned economic contribution studies in defence-procurement communications and the corresponding need to scrutinize their methodological foundations.

This review assesses the methodology, interpretation, and disclosures contained in the public report. It does not constitute an audit of Deloitte’s underlying calculations or the client-supplied data used in the analysis.

The assessment draws on:

- The Deloitte report itself (28 pages, publicly available).
- CANCEA’s methodological framework, including ONEMODEL’s agent-based approach to economic and social value measurement.
- Published academic and institutional critiques of input-output (I/O) methodology, including from Statistics Canada, the Australian Productivity Commission, the University of Calgary School of Public Policy, and peer-reviewed literature.
- Government of Canada publications on the defence industry and the Industrial and Technological Benefits (ITB) policy.
- ISED’s State of Canada’s Defence Industry report series and their underlying methodological documentation.
- The S4CI integrity framework for complex system representation (Smetanin, 2025; 2026).

2. Executive Summary of Findings

The Deloitte report presents Lockheed Martin Canada’s activities as contributing \$3.6 billion to Canadian GDP, supporting 4,561 average annual jobs, and generating \$831 million in government revenues over the 2021-2025 period. These headline figures are derived entirely from a standard input-output (I/O) multiplier methodology using Statistics Canada’s 2022 I/O tables.

Our assessment identifies the following categories of weakness and concern:

Area of Concern	Summary
Methodology	Standard I/O model with well-documented structural limitations; the least sophisticated class of economic model.
Contribution vs. Impact	Report conflates “contribution” language with causal impact claims; I/O accounting cannot establish what would change if Lockheed Martin were absent.
Missing Counterfactual	No baseline scenario; no assessment of what Canada’s economy would look like without Lockheed Martin’s presence.
No Supply Constraints	Assumes unlimited labour, capital, housing, and infrastructure availability.
No Displacement or Crowding-Out	Treats all spending as purely additive; no assessment of whether activity displaced other economic activity.
Multiplier Implausibility	Implied GDP multiplier of ~2.77x exceeds published benchmarks for all defence-adjacent sectors; inconsistent with ISED industry-wide estimates.
No Social or Well-being Value	Measures only spending flows; no assessment of whether people’s lives improved.
Commissioning Bias	Commissioned by the subject of the study and released amid active public discussion of defence procurement and industrial benefits.

The sections below examine each of these concerns in detail, with reference to published sources and CANCEA’s own methodological standards.

3. Methodological Critique

3.1 The Input-Output Model: Structural Limitations

The Deloitte report relies on what it describes as “Deloitte’s internal Input-Output Model,” leveraging Statistics Canada’s 2022 I/O impact multipliers. Input-output models are comparatively simple, fixed-coefficient accounting frameworks. They are useful for tracing gross inter-industry activity but are not designed to estimate behavioural responses or net causal effects.

The core assumptions of I/O models include:

- **Fixed technical coefficients:** if you spend \$1 in sector X, exactly Y cents flow to sectors A, B, and C, regardless of the scale or context of that spending.
- **No supply constraints:** the economy is assumed to have unlimited labour, capital, housing, infrastructure, and materials available to absorb any new activity.
- **No price or wage adjustment:** there is no mechanism for costs, wages, or interest rates to respond to changes in demand.
- **No behavioural response:** people and firms do not change their behaviour in response to the economic activity being modelled.
- **No substitution or displacement:** new activity is treated as purely additive; it does not crowd out or replace existing economic activity.
- **No distinction between an expense and an investment:** a dollar spent on consumables is treated identically to a dollar invested in long-lived capital.

These are not minor technical caveats. Statistics Canada’s own documentation of its I/O model states explicitly: *“There are no limits on input supply and thus no bottlenecks occur in the model. The lack of relative prices means that there is no economic behaviour responding to scarce or limited resources.”* (Statistics Canada, Input-Output Division, Cat. No. 15-602-XIE.)

The Policy School at the University of Calgary has characterised I/O models as treating new spending as “mana from heaven”: demand shocks that “need not come from anywhere” and carry no acknowledgement of the opportunity cost that may be associated with redirecting resources (Fellows, 2018). The Australian Productivity Commission has described the use of I/O multipliers for project evaluation as “abused,” and the Australian Bureau of Statistics has called them “biased.”

3.2 Contribution Analysis vs. Impact Analysis: A Critical Distinction

The Deloitte report is titled a “Socioeconomic Impact Assessment” but is methodologically an economic contribution analysis. These are materially different exercises. Academic literature (Watson et al., 2007; Henderson, 2020; IMPLAN documentation) distinguishes them clearly:

Economic contribution analysis measures the gross economic activity associated with an existing entity’s current operations. It answers: “How much of the economy’s current activity can be traced back to this entity?” It is an accounting exercise.

Economic impact analysis measures the net change to a regional economy resulting from a specific event, entry, or exit. It answers: “What would be different if this entity were not here?” It requires a counterfactual scenario.

The Deloitte report performs the former but frequently implies the latter. For instance, the press release accompanying the report states that Lockheed Martin Canada “delivers \$3.6B boost to GDP”: language that implies additionality (a net increase) rather than accounting attribution (a gross share). This distinction is widely recognized in the economic-analysis literature because gross attribution and net additional impact answer different questions. In a contribution analysis, the resources (workers, capital, supplier capacity) attributed to Lockheed Martin would not necessarily vanish if Lockheed Martin were absent. Many of those workers would find employment elsewhere; supplier firms would serve other clients; capital would be redeployed. The net economic loss from Lockheed Martin’s hypothetical departure would almost certainly be substantially less than \$3.6 billion.

3.3 The Missing Counterfactual

A credible impact assessment requires a clearly defined counterfactual: what would Canada’s economy look like in the absence of Lockheed Martin’s operations? The Deloitte report contains no such analysis. There is no baseline scenario, no examination of alternative uses of resources, and no consideration of what Canadian suppliers, workers, or capital would be doing in Lockheed Martin’s absence.

As Professor Trevor Tombe of the University of Calgary wrote in his review of Deloitte’s Calgary 2026 Olympic economic impact study: *“Strictly speaking, input-output models are at best useful for accounting. To reconcile them with a model able to perform counterfactuals requires one make extreme assumptions about the nature of the economy. Namely, that prices, wages, and interest rates are fixed, that there is an unlimited supply of workers and capital available, and that funds [do] not come at the expense of lower spending elsewhere.”*

This absence is not a minor oversight. Without a counterfactual, it is impossible to determine whether the economic activity attributed to Lockheed Martin is genuinely additional to the Canadian economy or whether it represents activity that would have occurred in other forms through other channels.

3.4 No Displacement, No Crowding-Out, No Opportunity Cost

The I/O framework used in the report assumes that all spending is purely additive. This means:

- If Lockheed Martin hires an engineer in Ottawa, the model does not represent whether that engineer was previously idle or employed by another firm.
- If a supplier redirects capacity to serve Lockheed Martin, the model does not represent whether that capacity was previously unused or serving other customers.
- If government procurement funds flow to Lockheed Martin, the model does not represent alternative uses of those funds, including healthcare, education, infrastructure, or other defence procurement.

In a labour market context where Canada's defence and aerospace sector faces well-documented skills shortages, the assumption of unlimited labour supply is particularly problematic. The 4,561 "jobs supported" figure represents gross employment supported rather than net new employment. In reality, many of these workers were already have been employed, meaning that Lockheed Martin's activity may have redirected labour from other productive uses rather than create an equivalent number of net new jobs.

The Canadian Global Affairs Institute has noted this problem in the context of Canada's Defence Industrial Strategy: *"The economic indicators are based on data from Statistics Canada Input-Output model, a valid approach for assessing economic impact, but one that does not actually factor in the opportunity cost for investments not made as a result of spending on defence rather than health care, education and other areas."*

3.5 Induced Effects: Highly Sensitive to Specification

The report includes "induced" effects: the economic activity generated when workers spend their wages on consumer goods and services. The report attributes \$674 million in GDP and 956 annual jobs to induced effects.

Induced effects in I/O models are widely criticized as poorly specified and essentially arbitrary in their magnitude. Professor Tombe's review of Deloitte's Calgary Olympic study recommended: *"Remove induced effects. They are too poorly specified to be taken seriously and allow for results as large as one might wish, depending on the modelling assumptions made."*

The fundamental problem is that induced effects are calculated by "closing" the household sector: treating household spending as endogenous to the model. This creates a feedback loop where spending generates income which generates more spending indefinitely. The magnitude of this effect depends on modelling choices (marginal vs. average propensities to consume, savings rates, import leakages) that are rarely disclosed in applied I/O studies. Different but equally defensible assumptions can produce wildly different induced-effect estimates.

Government of Canada publications on defence industry economic impact (ISED's State of Canada's Defence Industry report) note that I/O "economic impact estimates are not comparable to older

estimates reported in previous publications as past foundational data are regularly updated”: an implicit acknowledgement that the results are sensitive to technical choices that change over time.

3.6 Provincial Allocation: Mechanical, Not Behavioural

The report provides detailed provincial breakdowns of economic contribution. However, these provincial allocations are generated mechanically by the I/O model based on the industrial structure of each province’s economy, not on observed project-specific data about how Lockheed Martin’s spending flows between provinces.

Notably, Quebec is attributed \$1.1 billion in total GDP contribution and 1,509 average annual jobs, substantially more than Ontario (\$903 million, 1,128 jobs), despite Ontario housing more of Lockheed Martin’s direct workforce. This distribution reflects the I/O model’s allocation of supplier spending through Quebec’s industrial structure, but the report provides no transparency on how supplier expenditure data was assigned geographically, nor whether inter-provincial trade flows were validated.

ISED’s own methodology documentation for defence industry economic impact states that “economic impact estimates are reported at the national level and cannot be broken down at the regional level.” Deloitte’s provincial estimates therefore warrant additional scrutiny and disclosure regarding geographic allocation, particularly because ISED does not report regional estimates from its own application of the I/O methodology.

3.7 The Multiplier Magnification Problem

The headline figures in the report depend heavily on the multiplier effect: the ratio of total (direct + indirect + induced) contribution to direct contribution. Based on the report’s own figures:

- Direct GDP contribution: \$1.3 billion over five years (~\$260 million per year).
- Total GDP contribution: \$3.6 billion over five years (~\$720 million per year).
- Implied total multiplier: approximately 2.77x.

A GDP multiplier of 2.77x means that for every dollar of direct value added, the model attributes an additional \$1.77 in indirect and induced effects. This is at the upper end of credible multiplier ranges for the Canadian economy. Statistics Canada’s own I/O documentation cautions that multipliers provide only a “summary statistic” and should not be treated as precise measures of economic impact.

More importantly, a high multiplier in an I/O context is not evidence of high value. Under I/O logic, industries with long domestic supply chains produce high multipliers regardless of whether the underlying activity produces enduring economic or social benefits. Smetanin and Stiff (2015) illustrate this limitation by showing that traditional multiplier analysis can attribute a greater economic impact to \$1 billion in ice cream consumption than to the same investment in critical infrastructure—not because ice cream creates greater long-term value, but because the framework traces expenditure flows without capturing infrastructure’s lasting contribution to productivity and prosperity. In this sense, the multiplier measures the volume of activity generated, not value in the broader welfare sense.

4. Quantitative Assessment and Parameterisation

4.1 Cumulative Presentation Inflates Perception

The report presents all figures cumulatively over five years (2021-2025). Presenting results cumulatively can make their annual scale difficult to interpret, particularly when cumulative financial values are presented alongside average annual employment. The annualised figures provide the corresponding annual scale:

Metric	Cumulative (5 years)	Annualised
GDP Contribution	\$3.6 billion	~\$720 million
Labour Income	\$2.4 billion	~\$480 million
Government Revenue	\$831 million	~\$166 million
Employment	4,561 avg annual jobs	4,561 avg annual jobs

For context, ISED’s State of Canada’s Defence Industry 2026 report estimates that the entire Canadian defence industry contributed \$11.1 billion in GDP and 81,800 jobs in 2024. Lockheed Martin’s claimed annual GDP contribution of ~\$720 million would represent approximately 6.5% of the total Canadian defence industry GDP. This is a meaningful share for a company with approximately 1,100 direct employees out of the industry’s approximately 37,700 direct workers (2.9% of the workforce) and warrants scrutiny of the multiplier assumptions that drive total contribution to more than double the workforce share.

4.2 The ITB Attribution Gap

The report contains an important footnote: *“The share of impact attributable to Canadian procurement contracts under the Industrial and Technological Benefits (ITB) policy has not been estimated in this current report. Further details will be made available in a future iteration of this analysis.”*

This is a significant omission. The ITB policy is the primary mechanism through which defence procurement generates domestic economic activity. Without separating ITB-driven activity from other commercial operations, it is impossible to determine how much of the reported economic contribution reflects commercial activity that would occur independently of procurement obligations and how much is attributable to mandatory ITB requirements. The distinction matters for evaluating Lockheed Martin’s claimed economic partnership: ITB obligations exist because the government requires them, not because the contractor chose them.

4.3 The \$3.2 Million Per Aircraft Claim

The report states that F-35 production involves “approximately \$3.2 million in Canadian content per aircraft.” This figure is presented without comparison to the per-unit cost of the F-35 (approximately US\$80-100 million depending on variant), which would place Canadian content at roughly 3-4% of the aircraft’s flyaway cost. In the context of a program where Canada is purchasing 88 aircrafts at a total estimated cost exceeding CA\$19 billion, this Canadian content share is modest.

Furthermore, The Hill Times reported in June 2026 that “Lockheed Martin makes no promises on extras for F-35 deals, despite feds’ push for ‘more’ economic benefits,” with defence experts noting that the partnership agreement “sets out rules about industrial participation that limit a lot of the normal traditional tools.”

4.4 Benchmarking Against ONEMODEL-Derived Multipliers

CANCEA used ONEMODEL to derive defence-adjacent GDP multiplier ranges. These ranges were derived using ONEMODEL’s representation of firm-, person-, and institution-level pathways in the Canadian economy rather than relying solely on fixed I/O coefficients.

The ONEMODEL-derived Type II GDP multiplier ranges for defence-adjacent sectors are:

Sector	ONEMODEL-Derived Type II GDP Multiplier
Transportation equipment manufacturing (includes aerospace)	2.0 - 2.3x
Computer and electronic products	1.9 - 2.0x
Defence services	1.8x
Deloitte’s implied multiplier (Lockheed Martin)	~2.77x

Deloitte’s implied GDP multiplier of approximately 2.77x exceeds the top end of every one of these derived ranges. For transportation equipment manufacturing (which includes aerospace, the sector most directly comparable to Lockheed Martin’s primary activity), the ONEMODEL-derived ceiling is 2.3x. The gap between 2.3x and 2.77x represents either an unusually favourable sector mapping by Deloitte, an overstatement of the domestic supply-chain linkages, or both.

The ONEMODEL-derived multipliers account for actual supply-chain leakage, import penetration, and the distinction between consumed inputs and invested capital. They therefore represent a more conservative and structurally grounded benchmark than raw I/O table multipliers, which assume all intermediate inputs are sourced domestically through fixed channels.

4.5 The ISED Cross-Check

ISED's State of Canada's Defence Industry report provides an independent estimate of the defence sector's economic contribution using the same underlying I/O methodology. ISED's data sources section states: "ISED economic model estimates based on Statistics Canada's 2022 Input-Output multipliers (Tables 36-10-0013-01 and 36-10-0594-01)."

This is a critical observation. Both the Deloitte report and the ISED report draw from the same multiplier tables. The comparison is therefore multiplier-vs-multiplier, not multiplier-vs-ground-truth. Neither study provides an independent empirical validation of the I/O results; both are downstream applications of the same fixed-coefficient accounting framework.

I/O multipliers are fundamentally inappropriate for supply-chain-dependent and regionally-dependent activities, like defence contracting, for several structural reasons:

- Defence supply chains cross provincial and international boundaries in patterns the I/O model's fixed coefficients cannot represent. A fighter aircraft component may be designed in Ontario, machined in Quebec, tested in Alberta, and integrated in the United States, but the I/O model assigns flows based on sectoral averages, not actual procurement routing.
- Regional allocation depends on firm-level procurement decisions, not sectoral averages. Whether a subcontract goes to Halifax or Montreal is determined by specific industrial capacity, ITB obligations, and corporate relationships, not by the average spending pattern of the transportation equipment sector.
- Defence is not a standard industrial classification. There is no NAICS code for "defence." Mapping defence activities to the "closest related" I/O sectors introduces systematic bias and material mismatches between the related sector-average coefficients and the input structure of defence-specific production.
- The methodology overweights costs (spending flows) and underweights investments (long-term capital formation, R&D, capability building) because I/O models treat every dollar identically regardless of whether it is consumed or invested. A dollar spent on office supplies is treated the same as a dollar invested in a 30-year manufacturing capability.
- I/O models cannot distinguish between an expense and an investment. This is a structural flaw that systematically undervalues capital-intensive defence activities relative to consumer-facing sectors. Defence programs that build sovereign capability, train workforces, or create exportable technology are measured at their cost, not their long-term productive value.

ISED itself acknowledges these limitations. Its methodology documentation notes that "there is no single statistical/industrial classification for defence activities" and that "economic impact estimates are reported at the national level and cannot be broken down at the regional level."

Despite these shared limitations, the ISED data remains a useful cross-check for a specific reason: ISED uses mandatory Statistics Canada survey data (the Canadian Defence and Marine/Civil Aircraft and Major Components Industry [CDAMCI] survey, legally required under the Statistics Act) rather than self-reported client data, and covers the entire defence industry rather than one firm. The data inputs are therefore more comprehensive and less subject to specification bias.

Metric	Deloitte/Lockheed Martin (Implied)	ISED Industry-Wide
GDP per direct employee	~\$236K	~\$148K
Implied GDP multiplier	~2.77x	~2.1x
Jobs supported per direct employee	~4.1	~2.2
Revenue per direct employee	~\$445K	~\$294K
CAVEAT	Both columns derive from the same I/O multiplier tables. Neither represents empirically observed ground-truth. Discrepancies reflect differences in direct input specification and sector mapping, not independent validation.	

The difference in Deloitte’s implied ratios is notable precisely because both studies draw from the same multiplier tables. The discrepancy cannot originate in different multiplier values; it must originate in how the direct inputs were specified (what counts as Lockheed Martin’s “direct” activity) or how activities were mapped to I/O sectors. Deloitte’s results reflect either a mapping of Lockheed Martin’s activities to sectors with unusually high multipliers, or a specification of direct activity that amplifies the multiplier arithmetic.

5. What the Report Cannot See

Beyond the methodological limitations of the I/O approach, the Deloitte report is silent on dimensions of value that decision-makers and policymakers increasingly require. These omissions are not data gaps; they are structural impossibilities of the methodology chosen.

5.1 No People, No Well-being, No Social Value

The report measures spending flows. It does not measure changes in individual or community well-being. There is no assessment of:

- Health outcomes for workers or communities.
- Housing security or affordability effects.
- Educational attainment or skills development beyond anecdotal spotlights.
- Community well-being or quality of life.
- Distributional effects: who gains, who loses, by age, income, region, or household type.

The report mentions community investments (\$2.1 million over five years) and STEM partnerships, but these are presented as narrative spotlights, not as measured outcomes within the analytical framework. There is no quantification of social value, no measurement of well-being change, and no tracing of consequences to individual people or communities.

5.2 No Individual-Level Resolution

The I/O methodology operates at the level of aggregate sectors. It cannot represent individual people, households, businesses, or communities. This means the report cannot answer questions such as:

- Which workers are affected and how does their situation change?
- Which communities bear the costs of industrial activity?
- Which households benefit from the wages earned?
- Which small and medium enterprises are genuinely sustained by the supply chain?
- How are benefits distributed across income groups, demographics, or geographies?

Without individual-level resolution, the report cannot identify unintended consequences, distributional inequities, or feasibility constraints that would be visible in a person-centred analytical framework.

5.3 No Feasibility Testing

The framework attributes the reported effects without testing whether labour, supplier, housing, infrastructure, or institutional constraints would limit their realization. It does not examine whether the supplier network has capacity to absorb the demand attributed to it without displacing work for other clients. It does not assess whether the fiscal revenues claimed are consistent with the tax system's actual response to this pattern of economic activity.

5.4 No Unintended Consequences

Because I/O models trace spending through fixed coefficients, they cannot reveal unintended or indirect consequences. For example:

- A concentration of high-wage defence employment in Halifax or Ottawa may raise local housing costs, reducing affordability for other residents.
- Redirecting skilled engineers to defence programs may create labour shortages in other knowledge-intensive sectors.
- Supplier dependence on a single prime contractor may create industrial fragility rather than resilience.

These are consequences that matter to government, communities, and competing industries. The chosen methodology is structurally incapable of revealing them.

6. R&D Investment Scale

The report cites \$23 million in R&D investment over 2021–2024, equivalent to approximately \$5.75 million per year, and notes a 35.1% increase in annual investment. Reported direct value added indicates Canadian operations on the scale of hundreds of millions of dollars annually, making the R&D level appear modest relative to the scale of activity – particularly with the context that ISED identifies aerospace as Canada’s leading manufacturing industry for R&D. The report frames a 35.1% increase in annual R&D investment positively, but the percentage change should be interpreted alongside the absolute level of investment and an appropriate benchmark.

7. Commissioning Context and Framing Bias

The report was commissioned and paid for by Lockheed Martin Canada and prepared by Deloitte Consulting LLP for that client. The report was released on May 26, 2026, strategically timed alongside Lockheed Martin’s public positioning on F-35 industrial benefits and during a period of active government discussions about defence procurement policy.

Self-commissioned economic impact reports by defence contractors are a well-documented phenomenon in the policy literature. Research by the Action on Armed Violence (AOAV) organisation describes such reports as “sophisticated lobbying documents” that “reinforce notions that defence spending is both economically justifiable and socially beneficial.” The Royal United Services Institute (RUSI) has characterised similar reports as “public relations on a strong data base”: acknowledging the data quality while noting the advocacy purpose.

This context does not mean the report’s data is invalid; it means that the results should be interpreted carefully. The I/O framework is well suited for gross contribution totals, which can produce large headline totals for the most favourable legitimate presentation of Lockheed Martin’s economic footprint, but it cannot by itself test additionality, opportunity cost, displacement, or alternative procurement scenarios.

8. Assessment Summary

The Deloitte report for Lockheed Martin Canada is a competently executed input-output contribution analysis. Within its narrow methodological scope, the arithmetic is likely sound. The data provided by Lockheed Martin (revenues, employee counts, supplier expenditures) appears to have been processed through standard I/O multipliers in a conventional manner.

However, the report's value as evidence for policy or procurement decisions is severely limited by the structural constraints of its methodology:

- The headline figures (\$3.6B GDP, 4,561 jobs) are gross accounting attributions, not net causal impacts. They should not be interpreted as the net economic consequences of Lockheed Martin's presence because the analysis does not account for displacement, opportunity cost, or alternative uses of resources.
- The absence of a counterfactual means the report cannot answer the question that matters to government: "What would Canada lose if this contractor were not here?"
- The implied GDP multiplier (~2.77x) exceeds ONEMODEL-derived benchmarks for all defence-adjacent sectors and exceeds ISED's industry-wide implied multiplier (~2.1x).
- The methodology cannot see people, well-being, distributional effects, feasibility constraints, behavioural response, or unintended consequences.
- The report was commissioned by its subject and released strategically amid active policy discussion. This does not invalidate the data but establishes the framing context.
- The omission of ITB attribution means the report cannot distinguish between activity initiated independently by Lockheed Martin and activity attributable to mandatory ITB requirements.

9. What a Comprehensive Assessment Would Require

9.1 The Many-Model Problem

Defence economic evaluation typically involves multiple disconnected models: population projections, labour market models, housing demand models, fiscal impact calculators, infrastructure capacity tools, and supply-chain tracers. Each of these can be locally credible within its own domain, while the combined picture is globally incoherent.

This fragmentation produces structural consequences that are not merely inconvenient but analytically fatal:

- **Double counting:** the same worker, dollar, or activity is claimed by multiple models because none enforces a shared accounting identity.
- **Omitted flows:** transactions that cross model boundaries disappear entirely because no single model is responsible for tracking them.
- **Inconsistent categories:** one model's "defence employment" does not map to another model's "manufacturing labour force" because definitions, units, and classification systems differ.
- **Assumption-dependent linkages:** where models cannot communicate, bridging assumptions are difficult to distinguish from model-derived findings in the final output.

The Deloitte report is a single-model exercise (I/O only), but the broader practice of defence economic evaluation routinely combines disconnected tools in this way. The result is analysis that cannot be audited as a coherent whole because it was never constructed as one.

Reference: Smetanin, P. (2025). One system, one model: S4CI integrity conditions for lawful system representation. CANCEA. See also: Smetanin, P. (2026). Decision-Grade Modelling: The S4CI Integrity Framework. CANCEA.

9.2 Minimum Standards: The S4CI Integrity Framework

Any defence economic evaluation that aspires to decision-grade credibility should satisfy the following structural requirements, articulated in the S4CI framework (Smetanin, 2025) as necessary conditions for lawful representation of complex systems:

- 1. Single-system structure.** One accountable architecture rather than disconnected models combined after the fact. The representation must be auditable as a unified system, with every component operating within a shared accounting identity.
- 2. Typed consistency.** Definitions, units, categories, and accounts must be jointly admissible. If one part of the model defines a "job" as a full-time equivalent and another counts headcount, the results cannot be combined without violating consistency.

3. Causality. Changes must arise from represented mechanisms, not inserted assumptions. If a model claims that defence spending creates jobs, the mechanism by which spending becomes employment must be explicitly represented, not assumed via a coefficient.

4. Conservation. Scarce quantities must be tracked without duplication or leakage. Workers, dollars, hours, and physical capacity cannot be created or destroyed by the model; they can only be allocated, transformed, or transferred.

5. Invariance. Conclusions must be stable under legitimate changes of frame, scale, or aggregation. If the result changes when shifting from annual to quarterly reporting, or from national to provincial scope, the change indicates a structural inconsistency rather than a difference in underlying evidence.

6. Closure. Pathways, transactions, and boundaries must be completed or explicitly externalised. If the model traces spending into the supply chain but stops at the border without accounting for import leakage, the result is incomplete, not conservative.

7. Coherence. The audit of whether the six preceding checks compose into one intelligible whole. A model can satisfy each condition individually yet still produce incoherent or uninterpretable results if the conditions are not jointly enforced.

Reference: Smetanin, P. (2025). Foundational Requirements for the Representation of Complex Systems: S4CI. Canadian Centre for Economic Analysis.

9.3 Operational Consequences of S4CI Compliance

When applied to defence economic evaluation, S4CI compliance produces the following operational requirements. Each is a consequence of the structural conditions above, not an independent wish-list item:

Defined counterfactual (from Causality). What would happen to the workers, suppliers, capital, communities, and government revenues if this contractor were not present? What alternative uses of resources are foregone? Without a counterfactual, the model cannot distinguish causation from coincidence.

Supply and feasibility constraints (from Conservation). Can the economy actually absorb the activity being attributed? Are the workers available, the housing sufficient, the infrastructure adequate? Conservation requires that the model not create resources that do not exist.

Behavioural response (from Causality and Invariance). How do firms, workers, and markets adapt to the contractor's presence? Does the contractor crowd in or crowd out other activity? A model that assumes fixed behaviour violates both causality (changes without mechanism) and invariance (results change if you adjust the time horizon).

Social and well-being value (from Typed Consistency). Beyond spending flows, are people's lives improved? Health, housing security, educational attainment, community participation, quality of life? If the model measures only dollars, it is type-inconsistent with questions about human welfare.

Distributional analysis (from Closure and Conservation). Who gains and who loses? By income, age, region, community, household type? If the model cannot disaggregate, it has not closed the accounting at the level where decisions are made.

Person-level resolution (from Single-System Structure). Individual people, households, and businesses traced through the system, not aggregate sectors assumed from a coefficient table. A single-system architecture must represent agents at the granularity required by the questions being asked.

Transparency and reproducibility (from Coherence). Full disclosure of assumptions, sensitivity analysis, and the range of results under alternative specifications. If the model cannot be audited, coherence cannot be verified.

9.4 ONEMODEL as Implementation

CANCEA's ONEMODEL platform is one implementation that satisfies the S4CI requirements. It represents 40+ million individuals, 15 million households, 2.6 million firms, and 56,000+ Canadian regions within one connected architecture. It does not use multipliers; it produces them as emergent properties of the system's represented structure.

Under appropriate assumptions, ONEMODEL can recover the same direct, indirect, and induced results that I/O models produce. However, I/O models cannot recover ONEMODEL's results. This asymmetry is structural: ONEMODEL contains the I/O framework as a special case (one in which all behavioural, distributional, feasibility, and conservation constraints are switched off). The I/O framework cannot represent the mechanisms that ONEMODEL makes explicit.

In direct comparison, ONEMODEL value tracing identified 74% more value than traditional I/O methods applied to the same activity (CANCEA, 2026). This is not because ONEMODEL inflates results; it is because I/O methods systematically omit value pathways (human capital formation, health outcomes, housing stability, fiscal sustainability, intergenerational transfers) that the I/O framework is structurally incapable of representing.

CANCEA considers it necessary to distinguish between models that produce multipliers by assumption and models that produce multipliers by derivation. The Deloitte report applies pre-existing multipliers to client-supplied inputs. A decision-grade evaluation derives its multiplier-equivalent results from the represented structure of the economy, subject to conservation, causality, and coherence checks that prevent the arithmetic from producing impossible outcomes.

10. Implications for Defence Economic Evaluation

The Deloitte report illustrates a recurring limitation in defence economic evaluation: I/O based gross contribution estimates may be presented as evidence of economic value even though the underlying methodology does not estimate net additionality, opportunity cost, distribution, or alternative outcomes. The resulting figures may be useful for favourably describing economic footprint, but their relevance to procurement and policy decisions is narrower than the “impact” terminology suggests.

This practice has consequences beyond the individual report:

- **It sets a low methodological floor for the industry.** If one prime contractor publishes I/O-derived figures without challenge, competitors face pressure to commission similar studies using similar methods, creating an arms race of multiplier-inflated claims that progressively debases the evidentiary standard.
- **It misinforms government decision-makers.** Without a clear distinction between gross contribution and net impact, the figures may influence procurement or industrial-policy discussions beyond what the methodology supports.
- **It crowds out rigorous evaluation.** Resources spent on advocacy-grade analysis are resources not spent on decision-grade analysis. The proliferation of contribution studies reduces the market demand for comprehensive assessment.
- **It obscures the questions that actually matter.** The relevant questions for defence economic evaluation are not “how much GDP can be attributed to this contractor?” but rather: “What changes if this contractor is present vs. absent? Who benefits and who bears costs? Is the outcome feasible given real constraints? Does the activity create lasting capability or temporary throughput?”

The methodological gap between what these reports provide and what decision-makers require is not a matter of incremental improvement. It is a structural gap between accounting (tracing existing flows through fixed coefficients) and evaluation (determining whether an activity creates net value for a society, accounting for alternatives, constraints, distribution, and sustainability).

Closing this gap requires evaluation methods that address the S4CI integrity conditions: single-system structure, typed consistency, causality, conservation, invariance, closure, and coherence. Under the S4CI framework, these are treated as minimum conditions for decision-grade evidence rather than advocacy grade arithmetic.

Any organisation commissioning or consuming defence economic evaluations should ask whether the analysis satisfies these conditions. Where it does not, the outputs should be treated as indicative accounting, not as evidence for resource allocation, policy design, or strategic decision-making.

Bibliography

1. Action on Armed Violence (2024). "The Myth of Military Prosperity: Why Oxford Economics' Report Fails to Convince." AOAV.
2. Australian Bureau of Statistics. Limitations of I/O Multipliers. Various publications.
3. Australian Productivity Commission. Use and Abuse of Multipliers. Various publications.
4. Canadian Global Affairs Institute (2024). "Canada Finally Has a Defence Industrial Strategy." Policy Perspective.
5. Crompton, J.L. (1995). "Economic Impact Analysis of Sports Facilities and Events: Eleven Sources of Misapplication." *Journal of Sport Management*, 9, pp. 14-35.
6. Deloitte Consulting LLP (2026). Lockheed Martin Economic Contribution in Canada: Socioeconomic Impact Assessment. May 2026.
7. Desjardins Economic Studies (2026). "How Much Is Defence Spending Really Boosting the Canadian Economy?" March 2026.
8. Fellows, G.K. (2018). "Input-Output Models and Their Limitations." Presentation to School of Public Policy, University of Calgary.
9. Global Economics (2005). "A Review of Input-Output Multiplier Estimates for Use in Program Evaluation." Prepared for Treasury Board of Canada Secretariat.
10. Henderson, J. et al. (2020). "Impact Factors: Methodological Standards for Applied Input-Output Analysis." *Journal of Regional Analysis and Policy*, 50(1).
11. Humphreys, B.R. (2018). Referee Report on Calgary 2026 Olympic Economic Impact Analyses. City of Calgary.
12. IMPLAN Group LLC. Economic Impact, Economic Contribution, and Export Base. IMPLAN Documentation.
13. ISED (2025). ITB Annual Report 2025. Innovation, Science and Economic Development Canada.
14. ISED (2026). State of Canada's Defence Industry 2026. Innovation, Science and Economic Development Canada.
15. Lockheed Martin Canada (2026). Press Release: "Lockheed Martin Canada delivers \$3.6B boost to GDP." May 26, 2026.
16. Peltier, H. (2020). "The Camo Economy: How Military Contracting Distorts the Economy." Costs of War Project, Watson Institute, Brown University.
17. Taylor, T. (2022). "BAE Systems in the UK Economy: Public Relations on a Strong Data Base." Royal United Services Institute, January 31, 2022.

18. Canadian Centre for Economic Analysis (CANCEA). (2015) "Investing in Ontario's Public Infrastructure: A Prosperity at Risk Perspective, with an Analysis of the Greater Toronto and Hamilton Area."
19. Smetanin, P. (2025). Foundational Requirements for the Representation of Complex Systems: S4CI. Canadian Centre for Economic Analysis.
20. Smetanin, P. (2025). One system, one model: S4CI integrity conditions for lawful system representation [Unpublished manuscript]. Canadian Centre for Economic Analysis.
21. Smetanin, P. (2026). Decision-Grade Modelling: The S4CI Integrity Framework - A Practitioner's Guide for Economic and Government Policy. Canadian Centre for Economic Analysis.
22. Canadian Centre for Economic Analysis (CANCEA). (2026). "The public housing dividend: Social and economic impacts of public housing in the GTHA."
23. Statistics Canada. Input-Output Division: Concepts, Definitions and Methods of the Input-Output Accounts. Catalogue No. 15-602-XIE.
24. Statistics Canada (2024). Supply, Use and Input-Output Tables. National/Provincial Input-Output Multipliers.
25. The Hill Times (2026). "Lockheed Martin makes no promises on extras for F-35 deal." June 11, 2026.
26. Tombe, T. (2018). A Review of Two Economic Impact Studies of Calgary Hosting the 2026 Winter Games. City of Calgary.
26. Watson, P. et al. (2007). "Determining Economic Contributions and Impacts: What is the Difference and Why Do We Care?" *Journal of Regional Analysis and Policy*, 37(2).