From Evidence to Foresight:

How ONEMODEL™ Agent-Based Analytics is Redefining Community Foresight

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CANADIAN CENTRE FOR ECONOMIC ANALYSIS

About the Canadian Centre for Economic Analysis

The Canadian Centre for Economic Analysis (CANCEA) is a premier socio-economic research and data firm, distinguished for its unwavering commitment to delivering objective, evidence-based analysis. Anchored in a holistic understanding of market shifts, policy implications, and economic behaviors, CANCEA's research transcends traditional boundaries to offer a panoramic view of the socio-economic landscape.

Driven by modern data science techniques, including the pioneering use of agent-based modelling, CANCEA's analytical spectrum encompasses a diverse range of services. The cornerstone of CANCEA's analytical prowess is its state-of-the-art agent-based platform, the largest in North America, that is a meticulously crafted data-driven model that encapsulates over 58,000 distinct regions across Canada. This platform facilitates in-depth, multidisciplinary analyses, empowering stakeholders with unparalleled insights into the interplay of various socio-economic parameters.

Embracing a systems-centric approach, CANCEA uniquely adopts a single-model strategy. This integrated approach allows for the seamless fusion of multiple disciplines and stakeholder perspectives, culminating in holistic, collaborative, and quantitative analyses that inform and guide pivotal market, policy, and economic decisions.

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Moreover, as champions of data integrity and comprehensiveness, CANCEA offers robust Canadian data services, ensuring that stakeholders are equipped with the most accurate and up-to-date information for informed decision-making.

In essence, CANCEA is at the forefront of socio-economic research, transforming complex data into actionable insights for a diverse range of sectors and stakeholders.

About this Report

Paul Smetanin is Founder, President and CEO of CANCEA. A 35-year veteran of systems modelling, risk management and complex-systems economics, he leads Canada's largest, integrated socio-economic simulation platform to produce decision-grade evidence for governments and industry. His work spans infrastructure, housing, labour markets, healthcare, impact analysis and more, with over 100 publications. Paul has served as a C-suite executive at ANZ and Algorithmics, before building CANCEA's ONEMODEL™ paradigm and its explainable 5W Attribution™ method. These capabilities are productized as an enterprise SaaS that bridges agent-based simulation with modern AI/LLM workflows—advancing trustworthy, transparent, machine-assisted policy and strategy.

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Contents

From Evidence to Insight: How One-Model Agent-Based Analytics is Redefining Community Foresight ... 3
A New Paradigm in Analytics ... 3
Causality-Protected AI: The VECTOR Framework ... 3
From Burlington's Experience to a Broader Model ... 3
Entering A New Age of Analytics ... 4
Burlington, Demonstrated: What A One-Model Lens Sees That Dashboards Miss ... 4
5W Attribution in Practice — Who, What, When, Where (and Why Safeguarded by VECTOR) ... 5
Policy Rehearsal, Not Just Forecasting ... 5
Indicator Loops: Feedback, Not Fragments ... 5
From analytics to action: a causally coherent portfolio ... 6
Why This Matters to Burlington ... 6

FROM EVIDENCE TO INSIGHT: HOW ONE-MODEL AGENT-BASED ANALYTICS IS REDEFINING COMMUNITY FORESIGHT

A New Paradigm in Analytics

The City of Burlington's forward-looking socio-economic projections and trend indicator analysis illustrate a pivotal shift in how municipalities can understand and shape their futures. At the heart of this transformation is CANCEA's one-model platform, the largest agent-based socio-economic simulation system in North America. Unlike traditional statistical models, which aggregate outcomes into averages and categories, this platform captures the lived realities of individual people, households, and businesses. It is a bottom-up lens that traces the dynamic interplay between demographics, housing, employment, and health at a hyper-local scale.

This approach is not merely descriptive; it is causal, evidence-based, and adaptive. By embedding the 5W attribution framework, the who, what, when, where, and why, the platform provides a comprehensive picture of evolving communities. This means policymakers and businesses are no longer constrained to static indicators but instead interrogate the drivers of change: Who is being affected? What behaviours are shifting? Where are the pressures emerging? When will these forces materialise? And why are they taking the shape they do?

Causality-Protected AI: The VECTOR Framework

Where most machine learning excels at pattern recognition, it often falters when asked to respect cause-and-effect relationships. CANCEA's VECTOR framework, a method for embedding artificial intelligence inside large-scale probabilistic simulations, was designed to resolve this tension. By ensuring that statistical inference remains causally coherent, VECTOR provides the best of both worlds: the predictive adaptability of machine learning, and the explanatory reliability of structural modelling.

In Burlington, this meant moving beyond projections of population growth to show how international immigration interacts with affordability and suitability pressures in housing, or why transit-oriented development might mitigate some of the risks of fragmentation and inequity. By running simulations under multiple scenarios, VECTOR protects the integrity of causal relationships while revealing non-linear feedback loops that would otherwise remain hidden.

From Burlington's Experience to a Broader Model

The Burlington socio-economic projections (2025–2051) forecast a community shaped by immigration-driven growth, ageing populations, and intensifying housing challenges. In parallel, the Trend Indicator Analysis highlights thematic risks such as multi-generational overcrowding, declining family-centred growth, and affordability stress, alongside opportunities like active travel, transit intensification, and age-friendly development.

The ability to track these outcomes at the level of individuals and families transforms policy and planning. Instead of broad averages, Burlington now has evidence of how low-income renters, new immigrants, or ageing seniors will each uniquely experience the city's evolution. This elevates the planning conversation from "what might happen" to "how do we protect resilience and inclusivity under each possible path?"

Entering A New Age of Analytics

CANCEA's one-model platform, integrated with VECTOR, signals a new age of analytics; one where machine learning is placed within a causal framework, and where community foresight becomes as much about protecting equity as it is about promoting growth.

This isn't simply forecasting. It is policy rehearsal, where the city can see how different interventions ripple through the lives of real residents, and where risks, such as labour force erosion or housing unsuitability, are identified before they materialise.

For Burlington, the insights are immediate. For the broader field of analytics, the lesson is lasting: the future belongs to causal, agent-based, AI-augmented evidence systems that scale across thousands of variables while never losing sight of the individuals at the core.

Burlington, Demonstrated: What A One-Model Lens Sees That Dashboards Miss

CANCEA's single, agent-based model follows individual people, households, and businesses across Burlington, letting us see cross domain effects. By capturing housing, labour, health and mobility in one coherent system, insights don't conflict across silos. Here are the killer facts that fall out when you look at Burlington this way:

- Population grows, dependency climbs: ~265,000 residents by 2051 with immigration as the main driver; dependency ratio rises from ~50 to the mid 60s; people in fair/poor health grow ~54% vs ~34% population growth.
- Immigration reshapes demand: Immigrant share increases ~25% → ~45%; recent immigrants (<10 yrs) more than triple to ~15%; yet the 20–39 cohort's share slips from ~25% → ~22%, a labour force warning.
- Form, tenure, and fit diverge: Renters +88% vs owners +20%; apartments' share increase from ~27% → ~43% while single detached homes decrease from ~49% → ~35%; unsuitable dwellings rise from ~4% → ~7.4%.
- Affordability bifurcates: Renter unaffordability reaches ~45% vs owners ~16%; core housing need rises ~61% (~1.5% → ~2.4%).
- Mobility shifts are real (and bounded): Transit doubles in ~10 years and triples by 2051; vehicle share decreases from ~37% → ~31%; work from home (~13%) persists; legacy neighbourhood patterns cap mode share change.

- Economy grows, participation drifts: GDP ~$14.3B (2025) grows ~30.6% by 2051; annual fed prov taxes increases from ~$4.5B → $5.9B+; requires ~$522M more private capital each year (≈ 30,800 jobs); growth lags population as non-participation rises (~45% → ~47%).
- Households crowd in: households with 3+ adults increase from ~14% → ~27%; 4 adult households triple; a structural signal that "small unit" supply isn't matching real needs.

5W Attribution in Practice — Who, What, When, Where (and Why Safeguarded by VECTOR)

- Who is most exposed? Renters (persistent ~45% unaffordability; core need up ~61%); recent immigrants (fast growth, not concentrated in younger working ages); seniors (CPP/OAS shares climb; transit reliance more than triples); multi adult households (sharp rise, unsuitability risk).
- What is changing? Built form shifts to apartments; tenure tilts to renting (~30% by 2051); mobility pivots to transit and active; participation edges down as population ages.
- When does it bite? Next decade: transit demand doubles; student population dips ~14% by 2036. By 2051: unsuitable stock increases to ~7.4%, work from home reaches ~13%, renter share at ~30%, non-apartment dwellings decreases from ~71% to ~54%.
- Where are pressures concentrated? Transit nodes attract growth and child free households; legacy areas retain car dependence; population living in households without children rises ~30% to ~41% (and households without children increases from ~48% to ~58% of all households).
- Why (VECTOR keeps causality intact): Households do not instantly re optimise when units appear; inertia and over housing persist. If today's bedroom mix continues, 1/0 bed units double and four adult households triple, pushing unsuitability +133% (Base) to +186% (High immigration).

Policy Rehearsal, Not Just Forecasting

With immigration shifted ±10% (and housing policy held constant), the simulation shows competition for suitable units lifting unaffordability and unsuitability in higher immigration paths. Because VECTOR embeds machine learning inside a structural, person-level model, these outcomes respect cause and effect (incomes, bedrooms, location, prices, travel) rather than extrapolating patterns that violate real world constraints.

Indicator Loops: Feedback, Not Fragments

These themes highlight how changes reinforce, or relieve, each other when viewed at person/place level.

- Active Travel Health Loop: Vehicle share decreases from ~37% → ~31%; active commuting increases ~2.1% → ~2.7%; health is stable, with room to improve if infrastructure meets revealed demand.
- Household Fragmentation: 1–2 person households rise from ~33% → ~37%, yet unsuitability trends upwards ~4% → ~7.4%; This pointing to a missing middle bedroom mix problem, not a simple "more units" issue.

- Ageing in Place & Accessibility: Seniors' transit use more than triples; seniors in single detached or tall apartments increases from ~56% → ~61%; fair/poor health ~10% → ~11.5%—an age friendly, transit oriented design imperative.
- Rental Affordability Stress: Renter share ~25% → ~30%, core need +61%, low income share edges down—signalling higher income in migrants outbidding incumbents unless non market and inclusionary supply scale with growth.

FROM ANALYTICS TO ACTION: A CAUSALLY COHERENT PORTFOLIO

Use the one model evidence to align approvals, capital, and programmes with how people actually live and move over time.

- Right size bedrooms: Tilt approvals/incentives to 2–3 bedroom rental and family sized condo in intensification areas to arrest unsuitability growth.
- Secure affordability where growth occurs: Pair density with inclusionary zoning, rental protection, and non market delivery to hold down displacement in transit nodes.
- Build for the mode shift we will get: Prioritise high frequency corridors, first/last mile, active networks, universal design—transit doubles in ~10 years, triples by 2051.
- Reinforce participation: Childcare access, bridges for internationally trained professionals, and targeted upskilling aligned to projected industry demand; note trades education grows ~2× population.
- Plan on real frictions: Budget for schools, health, and transit using persisting occupancy paths (not idealised re allocation), because households don't re sort overnight.

WHY THIS MATTERS TO BURLINGTON

Burlington's results show why one model + 5W attribution + VECTOR is a step change: you get machine learned foresight that protects causality, anchored to individual people and places. That turns planning into policy rehearsal—testing interventions before they land on real households—so choices are defensible, equitable, and resilient under the futures Burlington is most likely to face.

About the author:

Paul Smetanin is Founder, President and CEO of the Canadian Centre for Economic Analysis (CANCEA). A 35-year veteran of systems modelling, risk management and complex-systems economics, he leads Canada's largest, integrated socio-economic simulation platform—used across 58,000+ regions to produce decision-grade evidence for governments and industry. His work spans infrastructure, housing, labour markets, healthcare, taxation and more, with a publication record that includes major studies on congestion, surety bonding and pension impacts. Paul previously served as Global Head of Market Risk at ANZ, before building CANCEA's one-model paradigm and its explainable 5W Attribution method. Today, he's productising these capabilities into an enterprise SaaS that bridges agent-based simulation with modern AI/LLM workflows—advancing trustworthy, transparent, machine-assisted policy and strategy. Connect to collaborate on AI-ready, evidence-driven decisions.

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