

**ACHIEVING RESOURCE EFFICIENCY
BY CUSTOMS ADMINISTRATIONS
IN A CONSTRAINED ECONOMIC
CLIMATE:
A CRITICAL EXAMINATION**

by

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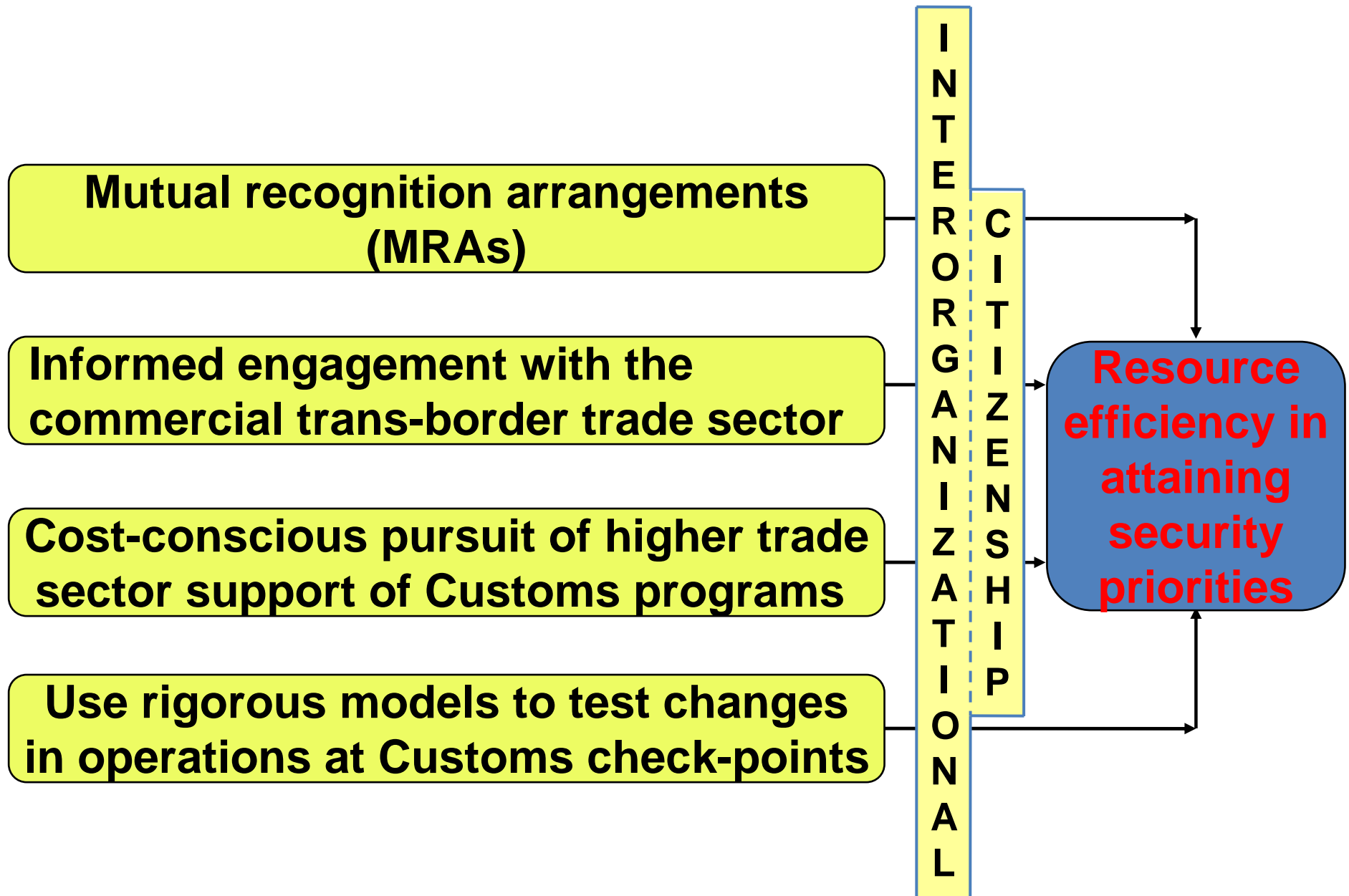
Wilfrid Laurier University

(School of Business and Economics)
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Rica

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HIGH-LEVEL CONCEPTUAL OVERVIEW



RESEARCH METHODS: Qualitative

SAMPLE DATA SOURCE OR ORGANIZATION	DATA (Examples of archived documents, meetings, and interviews)
CAIE (or just IE Canada)	<i>Tradeweek</i> (fortnightly); <i>I.E. Global</i> (bi-annual); <i>I.E. Today</i> (daily); Conferences and seminars/workshops
CTA and OTA	<i>Supply Chain Focus Quarterly</i> , <i>Annual OTA Report</i> , <i>OTA Annual Convention</i> ; Other OTA/CTA web-based documents
CSCB and CIFFA	<i>Customs Today</i> (CSCB newsletter); <i>The Forwarder Magazine</i> ; CSCB Annual Fall Conference; Other
CMEA	CSCB/CIFFA web-based documents <i>20/20 Magazine</i> (published 6 times yearly); Other web
CBSA	documents Web-site links to research-relevant topics; e.g., "Facilitating
Commerce Chambers + Think Tanks	Trade" Advocacy-oriented reports
Institutes + Think Tanks	University of Virginia Centre for Survey Research
Article databases	Post-9/11 practitioner articles from, e.g., JoC and WTM
Border stakeholder meetings; e.g., BTA	Presentations by stakeholders (e.g., firms with trans-border supply chains) at meetings of groups such as BTA, SALEO,
Interviews and a survey	CAIE Interviews with stakeholders such as border officials; on-line survey

RESEARCH METHOD: Modeling

- **SPREADSHEET MODELING**

 - Speculative models of the structure of Customs costs*

- **COMPUTER SIMULATION WITH Arena[©] :**

 - Examine the potential of an appointment system for trucks arriving at border crossings*

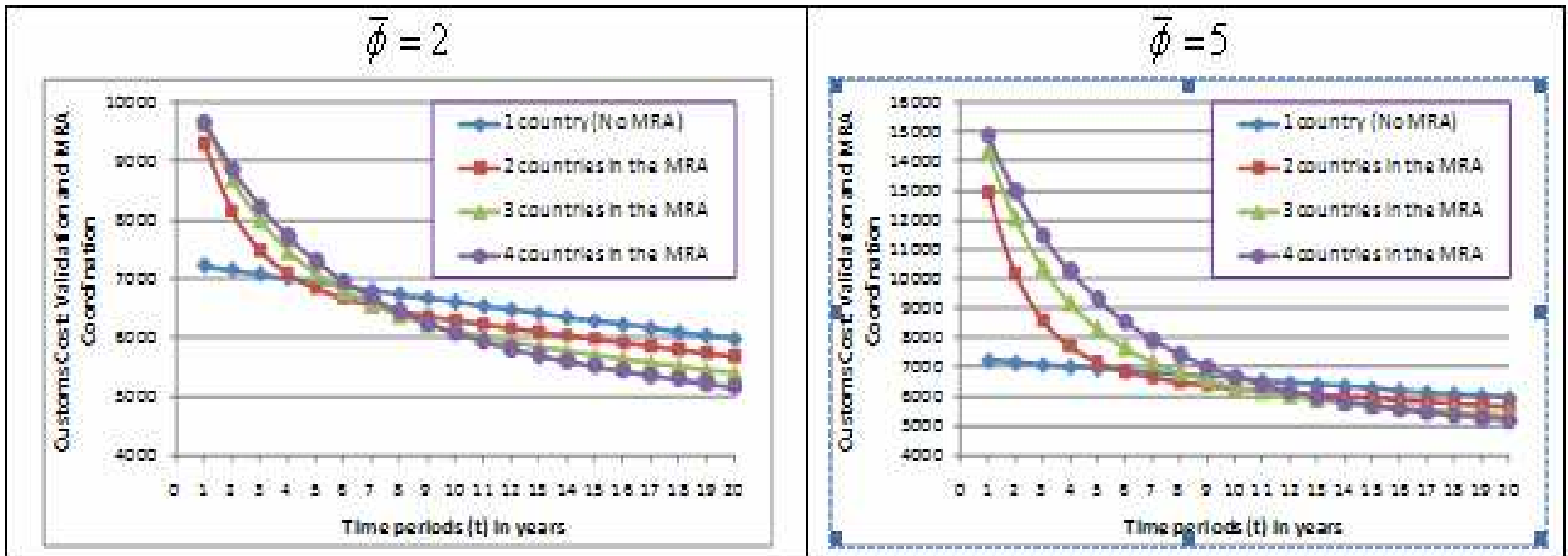
INITIATIVE #1 (MRAs): Notes/Formulae

VARIABLE/FACTOR and SYMBOL	ESTIMATE (or illustrative value)
Number of countries in the MRA the Customs agency participates in: n	no reliable estimate found; value of 3 used for illustration
Validation cost as a multiple of secondary inspection cost in year $\bar{\theta}_t$	no reliable estimate found; values of 2, 4, 8, 10 used for illustration
If a country joins an MRA, each country's validation cost multiple falls by 100x(1 - $\bar{\omega}$)%	$\bar{\omega} = 0.95$ used for illustration.
A parameter (0 < $\nu < 1$) for the rate of increase in coordination costs as countries join an MRA	$\nu = 0.50$ used for illustration
A parameter to indicate the size of coordination cost relative to inspection cost	$\phi = 5$ used for illustration

Coordination cost as a multiple of inspection cost = $\phi = \bar{\phi} \left(\frac{n-1}{n-\nu} \right)^t$; $0 \leq \nu < 1$

Sum of validation and coordination cost multiples = $\theta + \phi = \bar{\theta}_t \bar{\omega}^{n-1} + \bar{\phi} \left(\frac{n-1}{n-\nu} \right)^t$

INITIATIVE #1 (MRAs): Cost over time



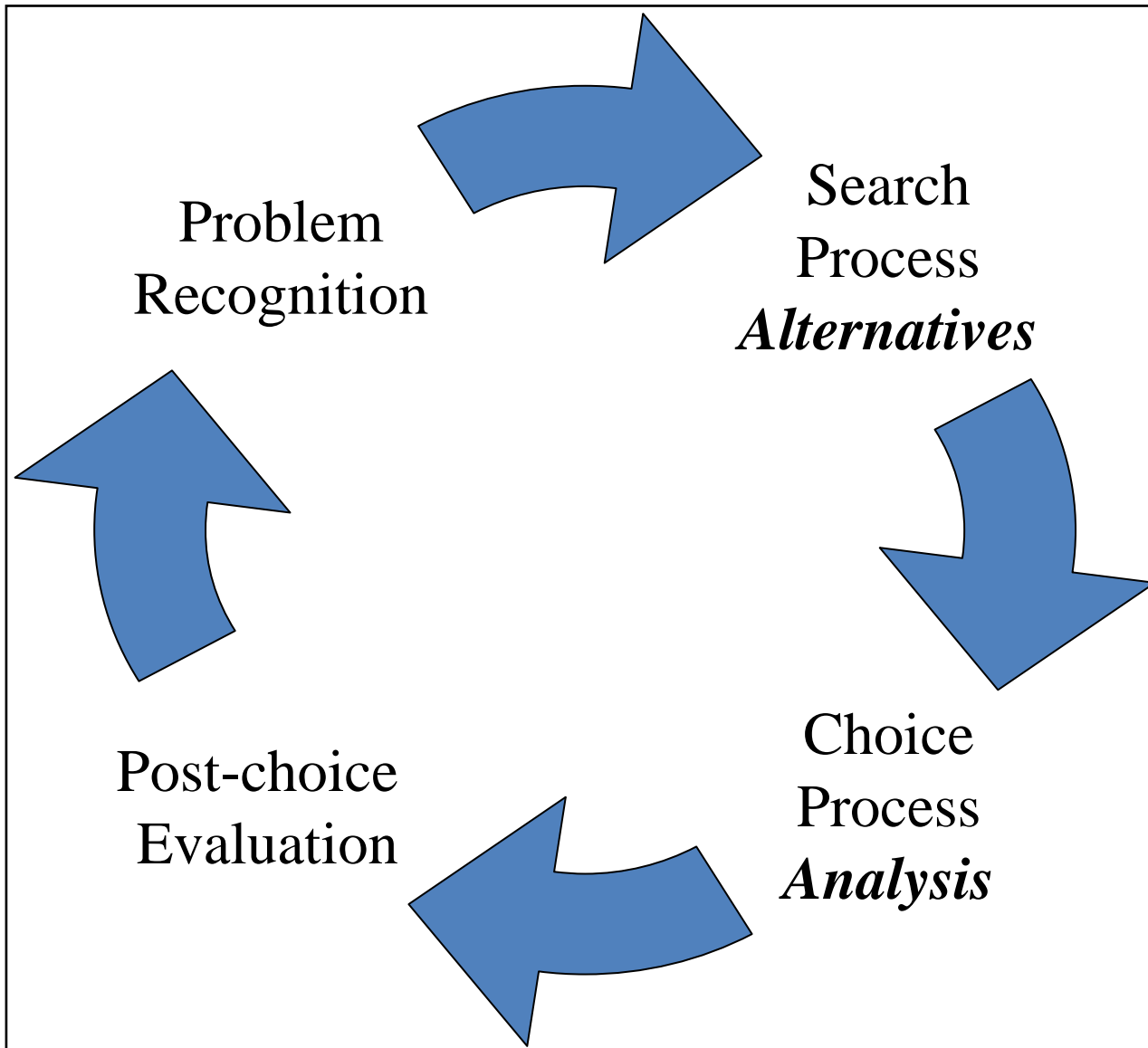
$$\bar{\phi} = 2, 5; \nu = 0.5; \bar{\theta}_1 = 10; \bar{\theta}_t = 0.99\bar{\theta}_{t-1}; \omega = 0.95.$$

Over time, the MRA must be viewed as a forum to continuously detect promising cost reduction initiatives

KEY INSIGHTS FOR INITIATIVE #1:MRAs

1. Over time, the MRA must be viewed as a forum to continuously detect promising cost reduction initiatives
2. The Canada-US MRA exhibits signs of sound Inter-organizational Citizenship Behaviour (ICB); e.g., *social trust, interpersonal synergies, altruism, constructiveness, advancement*
3. The scholarly literature considers ICB as crucial in enabling fruitful collaborative pursuit of continuous cost reductions
4. Clear understanding of how a proposal might impact cost is essential for objective discussion of proposals made within an MRA.

The managerial decision cycle: Discussing MRA proposals



Based on Herbert Simon's conceptual model of decision making

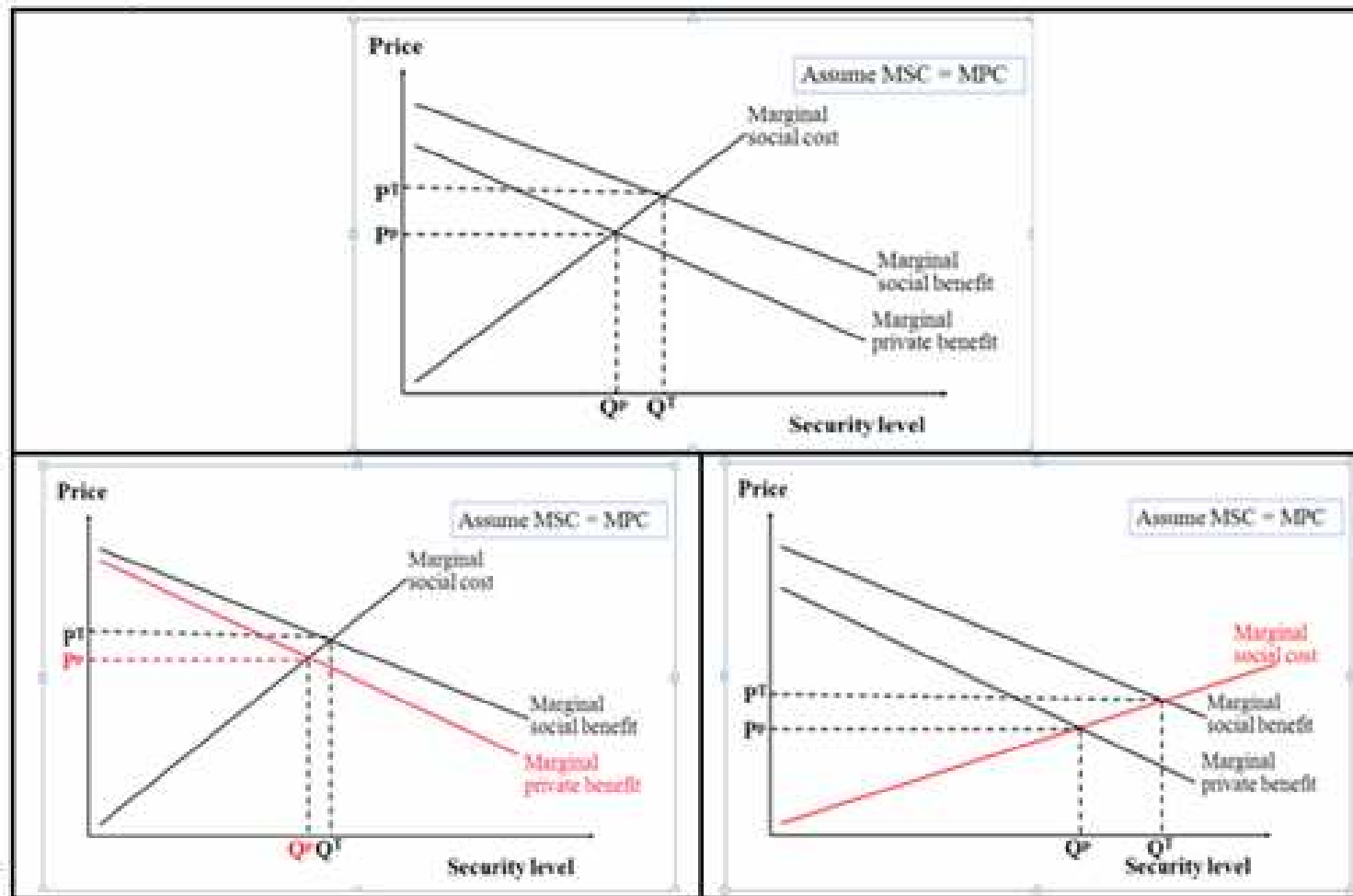
INITIATIVE #2 (Informed Engagement)

Despite the many means of customs-trade engagement, the following sample of headlines highlight the persistence of the trade sector's concerns

1. **"Canadian Border Crossings: From Bad to Worse?":** April 17, 2009
2. **"Border U.S. Regulatory Barriers Mean Increased Costs for Canadian Industry and Its Customers":** April 15, 2009
3. **"Stuck at the Border":** April 6, 2009
4. **"Overlapping Security Hurting Truckers At U.S. Border, Canadian Officials Say":** March 3, 2008
5. **"Border Bottlenecks, Regulations Top Concerns for Ontario Shippers, Carriers":** November 5, 2007.
6. **"We need harmony in U.S. border security":** May 23, 2007.
7. **"Panel: U.S.-Canada Trade Profitable, but Difficult ":** April 16, 2007.
8. **"Smart border vision blurred.":** March 2007.
9. **"FAST needs to become more transparent.":** February 2007
10. **"Border security is border absurdity.":** October 2006.
11. **"Border boondoggle":** November 2006.
12. **"Security bottlenecks snarl U.S.-Canada trade":** March 5, 2007

INITIATIVE #2 (Informed Engagement)

The qualitative data convey that current engagement features a strong (exclusive?) emphasis on convincing the trade sector' about security program benefits



INITIATIVE #3

(Cost-aware solicitation of support)

The qualitative data convey the trade sector's belief that Customs in seeking the sector's participation in Customs programs must try to better understand the commercial imperatives of trans border supply chains

VARIABLE/FACTOR and SYMBOL

Rate of inspection of a FAST-certified truck: α

Rate of inspection of an uncertified truck: β

Unit cost to Customs for a secondary inspection: c

Volume of traffic (trips) for per year for the i^{th} trader: q_i

Unit cost to the i^{th} trader for a secondary inspection: $\delta_i c$

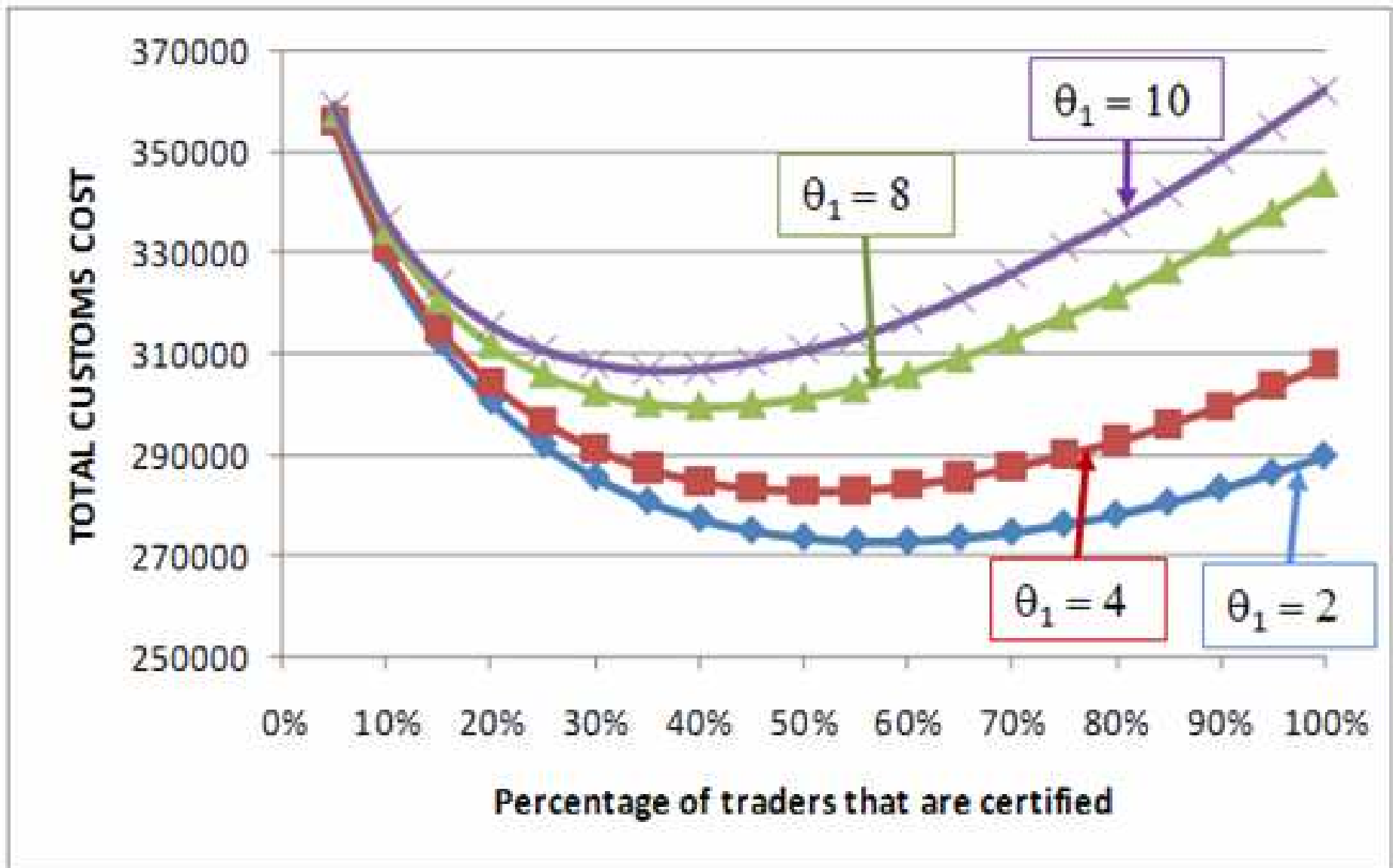
Unit cost of triennial validation for the i^{th} trader: $\varepsilon_i \theta c$

The i^{th} trader will seek validation if:

$$\delta_i c q_i \alpha + \frac{\varepsilon_i \theta c}{3} < \delta_i c q_i \beta; \text{ i.e., } \frac{\varepsilon_i \theta}{3} < \delta_i q_i (\beta - \alpha) \text{ OR } q_i > \frac{\varepsilon_i \theta}{3 \delta_i (\beta - \alpha)}$$

INITIATIVE #3

(Cost-aware solicitation of support)



INITIATIVE #3

(Cost-aware solicitation of support)

ACTS OF INTER-ORGANIZATIONAL

CITIZENSHIP

Company

Efficiently facilitate
Customs personnel
performing validation
audits

*More efficient facilitation
can automatically
translate to more
efficiency for the*

*company itself
Customs benefits directly
from more efficient
facilitation by company*

*Provides solid empirical data for
un-validated companies to seek validation.*

Customs

Disseminate companies' cost-
effective best practices for **both**
validation audits and supply chain
security

*Efficient facilitation practices can be
adopted by validated companies for
future audits and by other
companies for the first audit.*

*Successfully encouraging un-
validated companies to become
validated will raise a Customs
agency's experiential learning and
competence in doing cost-effective*

validation audits

OUTCOME

Reduction in
company's
validation cost
($\epsilon, \theta c$)

Reduction in
Custom's
validation cost
(θc)

Larger
proportion of
firms becoming
validated (p^2)

INITIATIVE #3

(Cost-aware solicitation of support)

VARIABLE/FACTOR and SYMBOL	ESTIMATE (or illustrative value)
Proportion of traffic that is certified under Customs trade security programs: p	0.14-0.27 ; range based on a formula and CAIE conference discussion
Proportion of traders that are certified (assuming that high volume traders tend to be certified earlier than low volume traders): p^2	0.07 ; based on field notes covering discussions about PIP
Number of importers: N	31343 ; using notes from CAIE conference
Mean volume of traffic (trips) per year per trader: q	28 ; using notes from CAIE conference

Customs total cost

$$\begin{aligned}
 & cqN(p\alpha + (1-p)\beta) + cNp^2 \left(\frac{\bar{\theta}_t \bar{\omega}^{n-1}}{3} \right) + \bar{\phi} cNp^2 \left(\frac{n-1}{n-\nu} \right)^t \\
 & = cN \left((p\alpha + (1-p)\beta)q + p^2 \left(\frac{\bar{\theta}_t \bar{\omega}^{n-1}}{3} \right) + p^2 \bar{\phi} \left(\frac{n-1}{n-\nu} \right)^t \right)
 \end{aligned}$$

INITIATIVE #4 (Border operations modeling): Choice of Ambassador (Windsor) Bridge

FACTOID: Of the estimated 140 truck crossings on the 4,000 mile border, the six major ones typically handle nearly 90% of trade value and over 70% of tonnage and trips



Exports to U.S., 2005
(\$ billion)

Windsor Bridge/Tunnel	83.2	Pacific Highway	11.8
Sarnia	56.6	Lansdowne	9.1
Fort Erie/Niagara Falls	49.3	North Portal	6.6
Lacolle	16.8	Philipsburg	6.0
Emerson	12.7	Woodstock	2.3

Note: Circles indicate relative size of exports by port.

Table 1
Truck Crossings by Port, 2005
(millions)

	Crossings	Share
Windsor Bridge	3.60	27.0
Sarnia	1.78	13.4
Fort Erie	1.26	9.4
Niagara Falls	0.96	7.2
Lacolle	0.76	5.7
Pacific Highway	0.73	5.5
Lansdowne	0.46	3.4
Emerson	0.40	3.0
Philipsburg	0.30	2.2
Rock Island, QC	0.26	2.0
Coutts, AB	0.25	1.9
Aldergrove, BC	0.20	1.5
Windsor Tunnel	0.15	1.2
Woodstock	0.14	1.1
North Portal	0.13	1.0
Total	13.33	100.0

Sources: The Conference Board of Canada, Transport Canada.

INITIATIVE #4

(Rigorous border operations modeling)

INSIGHTS FROM SIMULATING AN APPOINTMENT SYSTEM FOR PRIMARY INSPECTION OF TRUCKS AT

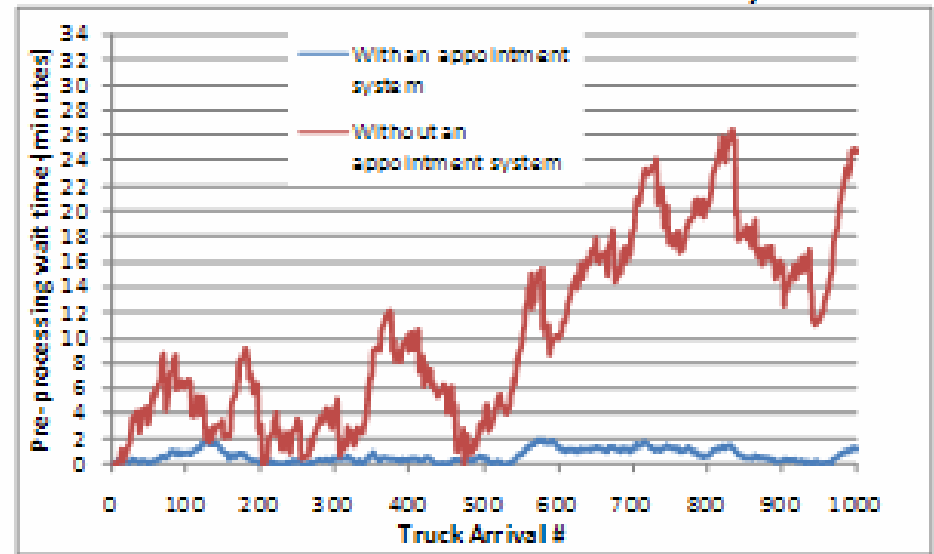
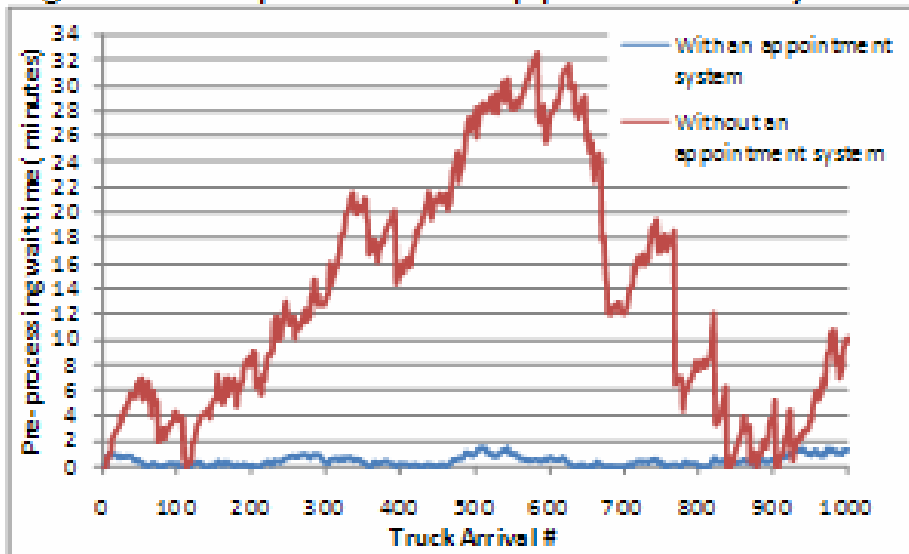
THE AMBASSADOR BRIDGE

	IMPROVEMENTS	APPOINTMENT SYSTEM BENEFITS
Average queue time of a truck	<i>Reduced from 9.74 to 0.53 minutes</i>	<i>Less time wasted at the border</i>
Upper limit of 95% confidence interval for waiting time	<i>Reduced from 18.63 minutes to 0.94 minutes</i>	<i>Significantly less uncertainty in freight delivery planning</i>
Average number of trucks waiting to be processed at any given time	<i>Reduced from 38 trucks to 2 trucks</i>	Significantly less truck congestion at the border crossing
Number of primary customs booths required to limit average wait time to 0.53 minutes (i.e., mean time attainable with an appointment)	Reduced from 8 booths to 4 booths	Significantly less border resources required to process trucks

INITIATIVE #4

(Rigorous border operations modeling)

Figure 6: Impact of an Appointment System on Wait Times for Two Simulated Days



CONCLUSIONS/INSIGHTS

- ✓ Quantitative (objective) modeling to understand how costs behave
- ✓ Greater focus on cost within an engagement framework of sound inter-organizational citizenship behaviours
- ✓ Rigorous border operations modeling with methodologies such as computer simulation and queueing

Thanks for Listening

Questions/Comments?