

Capturing and Conveying the Essence of the Space Economy

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Presentation to the World Economic Forum
Global Agenda Council on Space Security
Workshop On Bringing Space Down to Earth
McGill Institute of Air and Space Law, McGill University
July 4, 2013



Presentation Outline

- 1. Problematic***
- 2. OECD Weighs In: Global Forum on the Space Economy***
- 3. Futron Space Competitiveness Index***
- 4. Economic Impact Analysis ➤ Recent Approaches and Findings***
- 5. Summary Observations***



***World Economic Forum defines
competitiveness as the set of institutions,
policies, and factors that determine the
level of productivity of a country.***



Problematic

- ***Not a straight line to calculations on space sector economic performance***
- ***Need to cast a wide net to find indicators, both classic and new that measure performance***
- ***No <space> NAICS codes remain a persistent challenge***
- ***Even the most basic metrics are difficult to calculate; international comparisons hindered***
- ***Definitions: what is included/excluded in the analysis; segmenting***
- ***Space Sector is a complex set of actors/activities ➤ need to look at segments separately ➤ increases demands for specialized databases and analytical frameworks***



CSA working on a number of fronts.....

- ***Annual survey of the Canadian Space Sector***
- ***On-going international environmental scan – roll up into Canada in Space – Global Analysis***
- ***Actively supporting the OECD Global Forum on the Space Economy; working on definitions, methodologies, metrics, case studies etc. ➤ fuller range of indicators***
- ***Examining the economic impact of CSA's and other investments in space – direct, short-term indirect, long-term indirect, induced etc. ➤ Economic Model developed for Canadian Space Sector complete with multipliers***
- ***Supporting studies of socio-economic impacts where budgets permit (PCW a recent example); Distinguishing and testing research methods for the measurement of range of commercial vs strategic (public good) space sector activities***



OECD: The space economy is larger than the space sector...

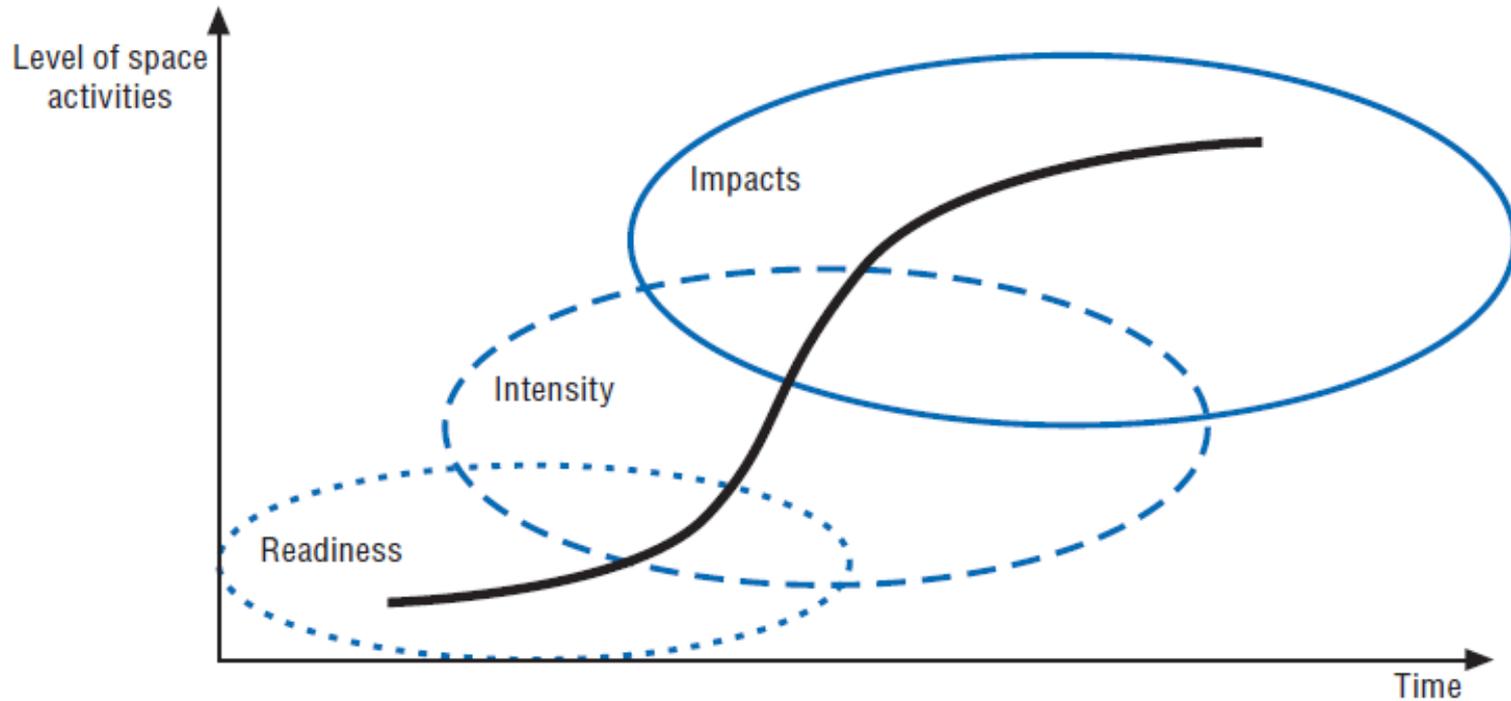
“The Space Economy is the full range of activities and the use of resources that create and provide value and benefits to human beings in the course of exploring, understanding, managing and utilising space. Hence, it includes all public and private actors involved in developing, providing and using space-related products and services, ranging from research and development, the manufacture and use of space infrastructure (ground stations, launch vehicles and satellites) to space-enabled applications (navigation equipment, satellite phones, meteorological services, etc.) and the scientific knowledge generated by such activities. It follows that the Space Economy goes well beyond the space sector itself, since it also comprises the increasingly pervasive and continually changing impacts (both quantitative and qualitative) of space-derived products, services and knowledge on economy and society.”*

•This robust definition has a significant impact on increasing the range of data and analytical framework required for analysis

***Source: OECD handbook on Measuring the Space Economy**

Development of Space Economy

Figure 1.1. Development of the overall space economy

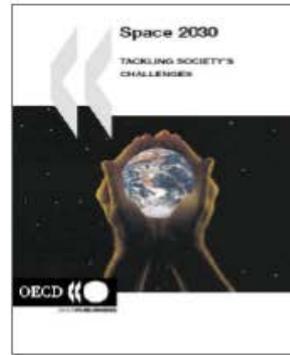


Source: Adapted from OECD (2011), *The Space Economy at a Glance 2011*, OECD Publishing, <http://dx.doi.org/10.1787/9789264111790-en>, p. 16.

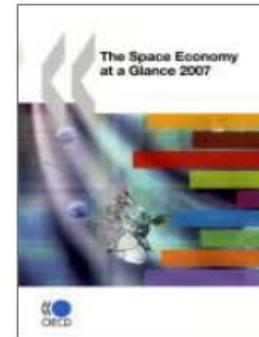
Growing body of OECD work on the space sector



2004
Prospective



2005
Policy & Regulations



2007 & 2011 (forthcoming 2014)
Economic Dimensions



2012
OECD Manual
(statistics, indicators)



2008



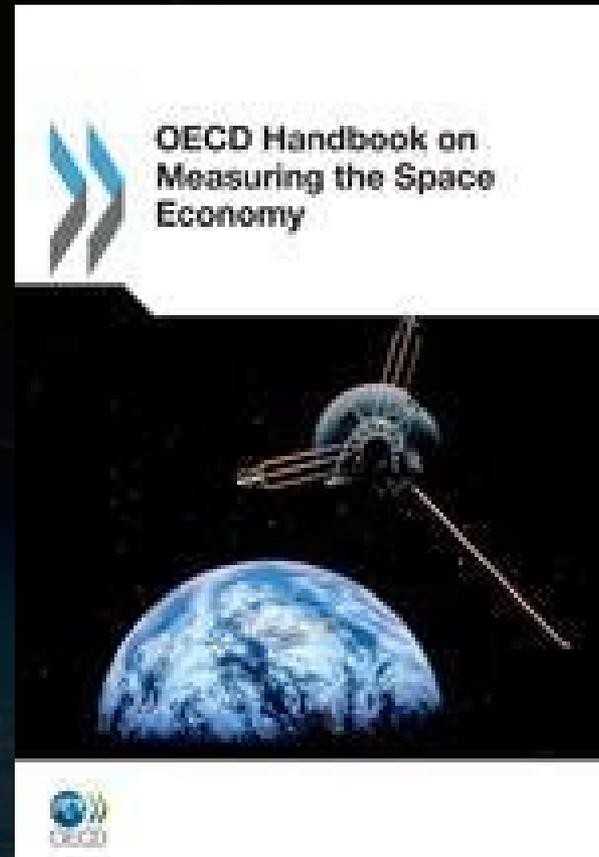
Forthcoming 2013
Socio-economic contributions from
space applications



OECD Forum On The Space Economy: Three Areas of Major Achievements (2006-12)

I. Highlighting the economic significance of space activities *The Space Economy at a Glance (2007, 2011, 2014)*

II. Making progress on key methodological issues in indicators and statistics: *The OECD Handbook on Measuring the Space Economy*





III. Measuring the Impacts of space investments: OECD Space Forum Case Studies

Rationale:

- **In most countries, governments increasingly require that public agencies assess benefits and costs of their operations, while exploring possible monetisation of these benefits.**

Objectives

- **Explore the broad economic and social dimensions of space based applications**
- **Explore different domains of space applications (i.e. agriculture, transport...)**
- **Examine technical capacities of satellite technologies (current & expected in the next 5- 8 years)**
- **Review the scientific contributions from the use of those satellite technologies for particular fields**
- **Provide data on existing economic impacts assessments**
- **Refine findings on socio-economic methodologies used to assess space applications**
- **Give more international perspectives (lessons learned from both OECD and non-OECD countries)**

Canadian Impact: Futron's Competitiveness Index 2012 SWOT Analysis



Source: Futron, 2012 Space Competitiveness Index

	Helpful	Harmful
Internal Origin	<p><u>STRENGTH</u></p> <ul style="list-style-type: none"> Near-term increases in space budget may stimulate local manufacturing Strong international partnerships with the United States and Europe Significant international trade and investment in space products and services, particularly with the United States Successful commercial space industry focused on robotics, EO and satcom products, GPS applications, and subsystems 	<p><u>WEAKNESS</u></p> <ul style="list-style-type: none"> Relatively small-scale industrial base in terms of company size, investment, revenue, and space workforce Despite increases, limited spending on military organization and assets Industry concentration and lack of strategies to encourage small business and entrepreneurial space companies Limited and scattered government attention toward formulating an updated space plan
External Origin	<p><u>OPPORTUNITY</u></p> <ul style="list-style-type: none"> Improve market position for Earth observation assets and applications through innovative new channels Strong university environment could be better leveraged to attract international human resources, perhaps tied to reinvigorating ESA relationship Move up the value chain into integrated satellite manufacturing, perhaps tied to micro-satellite and micro-launch opportunities Successful military programs may lead to deeper relationships with the U.S. DoD Establishing space-based maritime and Arctic awareness create opportunities for export to other polar countries 	<p><u>THREAT</u></p> <ul style="list-style-type: none"> Significant changes in NASA budget and policy could result in misalignment with the country's leading partner Lack of global scale and reach make companies targets for M&A activity Strong global competition in the imagery market space Canadian world-class talent may move abroad in search of the best employment opportunities

Canada n losing points for lack of progress on LTSP, but rating may improve next year as result of Aerospace review; One of the weaknesses identified last year was a lack of civil engagement in space, this has been removed possibly due to the media activity around Chris Hadfield and ISS; Canadians are paying attention right now to space issues more than ever.

German EO technology is competitive with Canada; also more EO satellites to be launched and data to become cheaper may undercut revenues related to data sales.



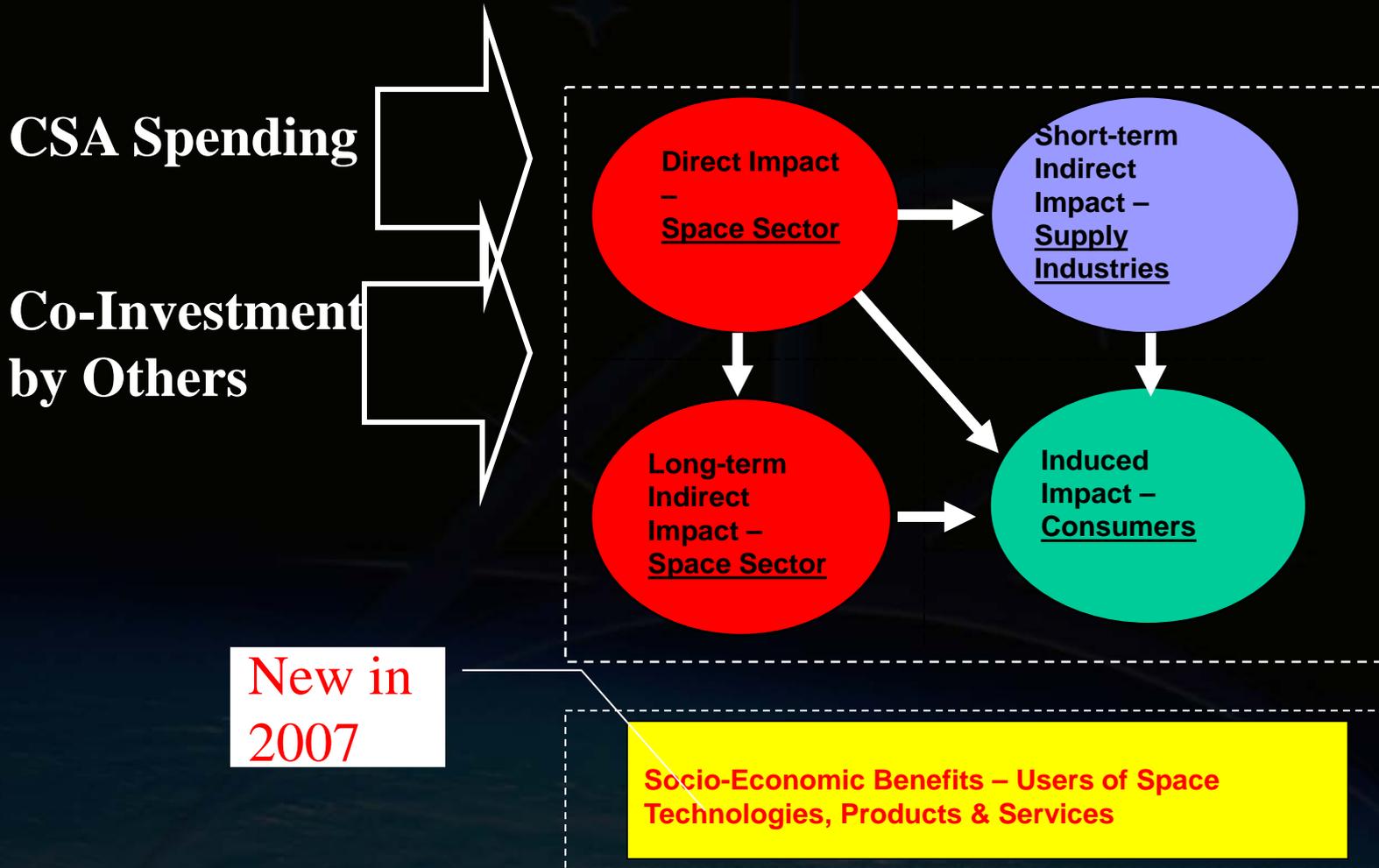
Canadian Impact: International Ranking of Space Competitiveness

Source: Futron, 2012 Space Competitiveness Index

2012 Rank	Country	Government (2012) Recentered	Human Capital (2012) Recentered	Industry (2012) Recentered	2012 Overall Score Recentered	2011 Score Recentered (Rank)	2010 Score Recentered (Rank)	2009 Score Recentered (Rank)	2008 Score Recentered (Rank)
1	U.S.	37.38	17.31	36.67	91.36	91.78 (1)	92.49 (1)	94.33 (1)	95.31 (1)
2	Europe	19.84	11.62	18.56	50.01	49.15 (2)	50.39 (2)	48.81 (2)	50.18 (2)
3	Russia	22.28	4.03	13.00	39.31	39.55 (3)	37.99 (3)	34.29 (3)	36.34 (3)
4	China	14.87	2.71	8.07	25.65	23.00 (4)	19.11 (5)	19.35 (5)	18.14 (4)
5	Japan	16.04	1.42	2.63	20.08	21.15 (5)	19.68 (4)	21.57 (4)	14.89 (7)
6	India	15.41	1.49	2.61	19.51	18.69 (6)	18.07 (7)	15.30 (7)	17.59 (5)
7	Canada 	12.29	2.15	0.67	15.11	16.09 (7)	18.33 (6)	18.66 (6)	17.64 (6)
8	South Korea	7.62	0.61	0.80	9.03	9.42 (8)	9.10 (8)	12.73 (8)	9.81 (8)
9	Israel	7.13	0.61	1.28	9.02	8.52 (9)	8.87 (9)	8.81 (9)	8.52 (9)
10	Australia	7.35	0.92	0.15	8.42				
11	Brazil	6.17	0.51	0.58	7.26	7.73 (10)	7.37 (10)	7.14 (10)	5.04 (10)
12	Argentina	5.33	0.60	0.36	6.29				
13	Ukraine	4.92	0.30	0.85	6.07				
14	Iran	2.55	0.40	0.57	3.52				
15	South Africa	3.13	0.11	0.00	3.24				

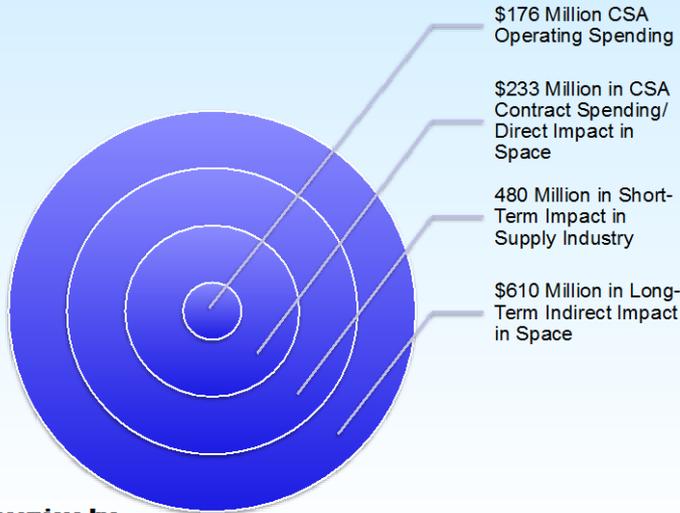
Competitiveness: Measures government policy, human capital and industry for top 10 space countries as these factors are considered internally driven and controllable (i.e. global market forces are not included). The three categories are measured with over 50 different indicators, such as number of university space programs, manufacturing capabilities and international cooperation. Canada is in 7th position in 2012¹² ranking.

Types of Economic Impacts



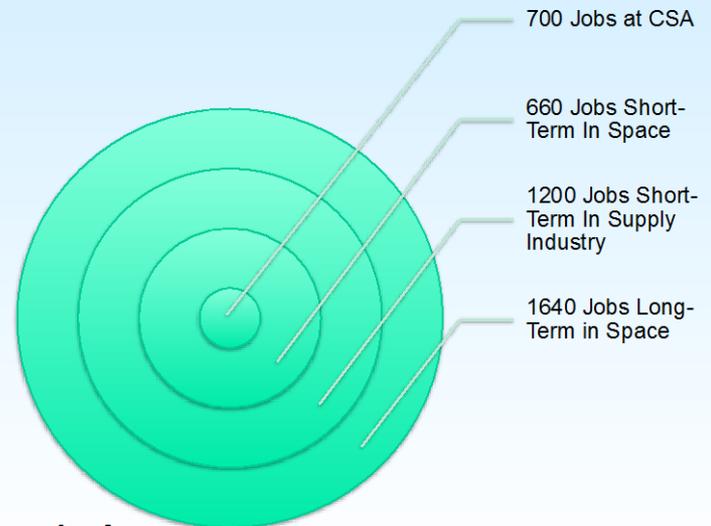
Assessing Economic Impact of CSA Investments in Space

\$1.5 Billion In Total Economic Activity



Total economic activity in space and supply industry totaled 1.5B and maintained 4,200 jobs

In Total 4,200 Jobs Supported



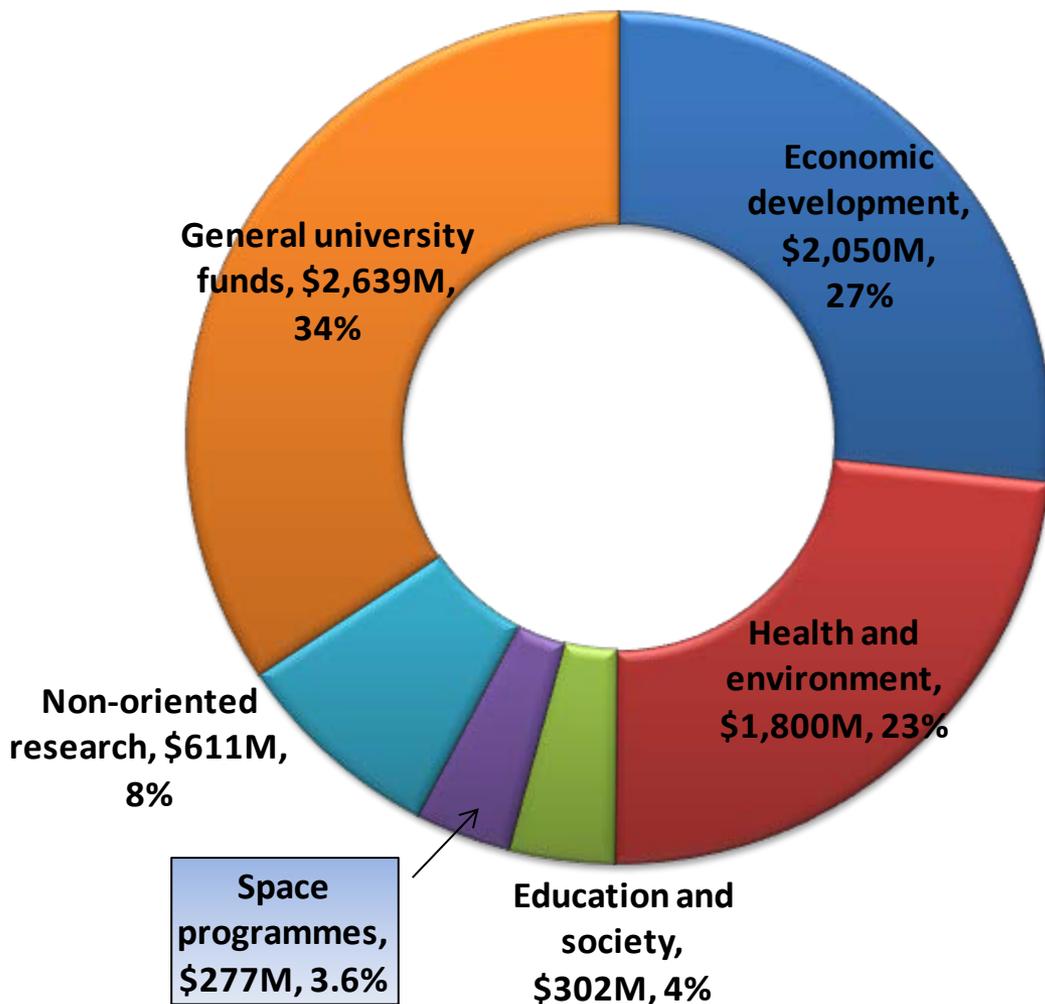
Based on the review of **over 70 economic impact studies (different types) since 2007**, this study concludes that the current CSA framework for measuring economic impact is still at the forefront.



Canadian Federal Government Outlays for Civil R&D Investment (GBOARD), by Socio-Economic Objective

(in millions, Purchasing Power Parity)

Source: OECD, Main Science and Technology Indicators, 2012/1



*Total = \$7,679M (some data are estimates)

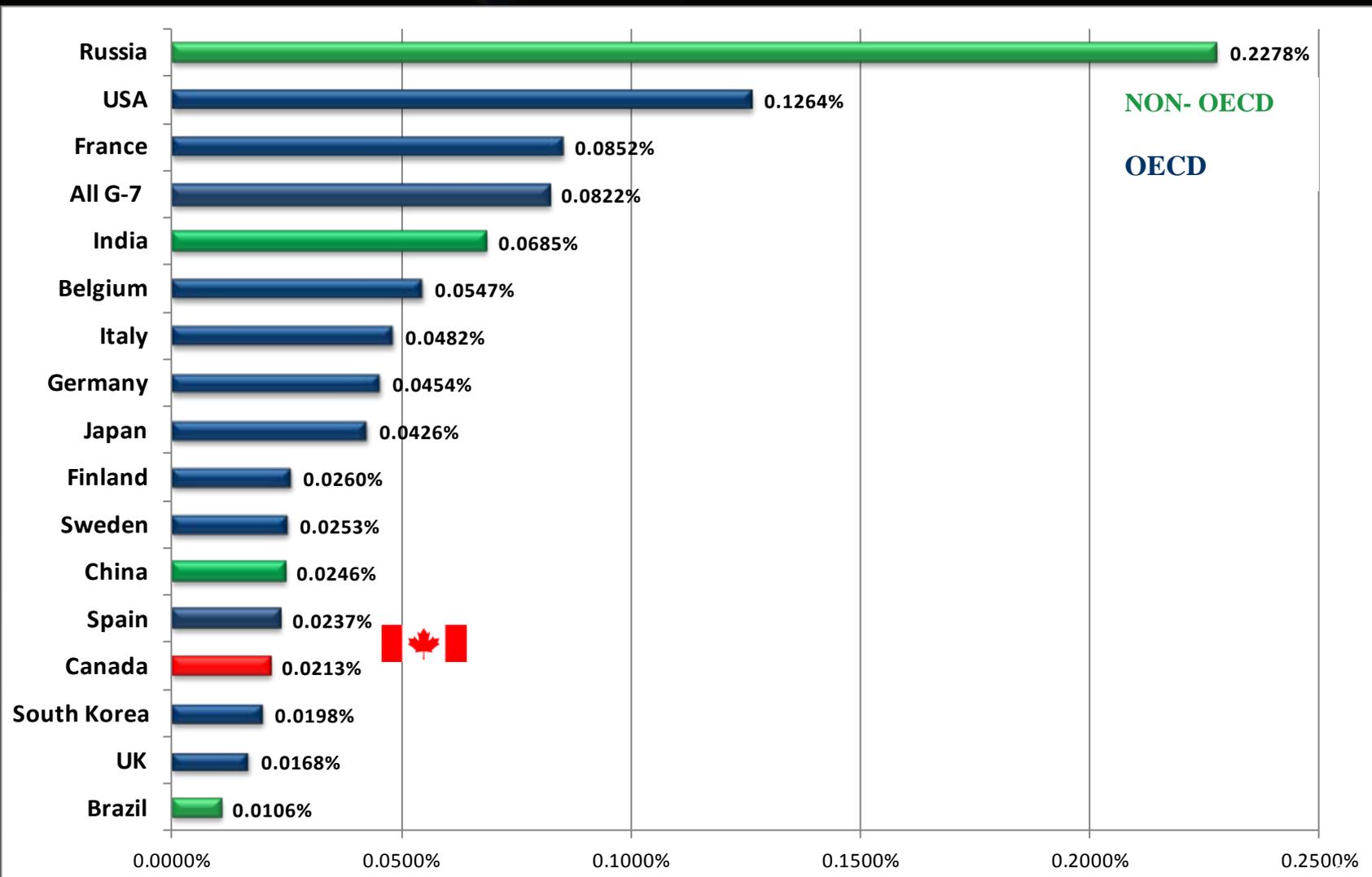
*Civil GBOARD in Canada for space programmes dropped since 2009 (from 4.3% in 2009 to 3.6% in 2012)

*Canada with 1.5% of total OECD civil GBOARD spent on Space programmes



Civil Space Spending as % of National GDP (for OECD and non-OECD countries, 2012) *

Source: IMF, World Economic Outlook Database 2013; Euroconsult, Government Space Markets 2013



* European budgets include ESA Contributions; National GDP figures for 2012 are IMF estimates



Methods: Lessons Learned from recent socio-economic studies

Multi-method approach ➤ indicators of direct and indirect benefits, avoidance costs, willingness to pay and sensitivity analysis for commercial and strategic components

- ✓ **Willingness to Pay – Social C/B Analysis – (contingent valuation)**
- ✓ **Value of Information (VOI) (1 - 4%?)**
- ✓ **Cost Avoidance (direct benefits)**
- ✓ **Relative Importance of Effects - Multi criteria Analysis**
- ≠ **Evaluation of Alternatives/Sensitivity Analysis \$ 🕒**
- ≠ **Cost-benefit Analysis – later stage 🕒**
- ≠ **Discount rate – Financial Analysis – for wider CBA study**





Way forward for S/E studies of this nature....

TIMING of Ex ante studies: Conduct in two phases: Phase A - early on for Benefit Assessment validating of Concept/Business case followed by Phase B after technical design and service design completed & have costs for full C/B analysis – will allow use of fuller range of methods to calibrate results

Undertake an in depth business case analysis (Phase B) of Mission with the objective to obtain detailed assessment on business case including services to be implemented, operation models, competitiveness, future revenues, cost scenarios, risks, financing schemes etc.

Undertake a full cost benefit assessment (Phase B) of Mission, with the to obtain an end-to-end assessment of the return of investment to be expected from the mission.

Summary Comments on Measuring Innovation and Competitiveness

- *SatCom and Navigation sectors seem to be the most competitive/commercial and EO, Human spaceflight etc. although less commercial are serving more public good needs (govt. institutional, public domain) also considered <essential>*
- *If we view the role of innovation policies as critical for restoring growth and competitiveness in S & T domains then perhaps ...*
- *A broader view of innovation **towards** service activities beyond science & technology (e.g. ICT infrastructure) would be helpful and is progressively pervading policies including those concerned with public services*
- *As science becomes more commercialized and as ICT's make access to knowledge easier many governments want science to diffuse broadly & flow to society and the economy ➤ That's our job as a community!*

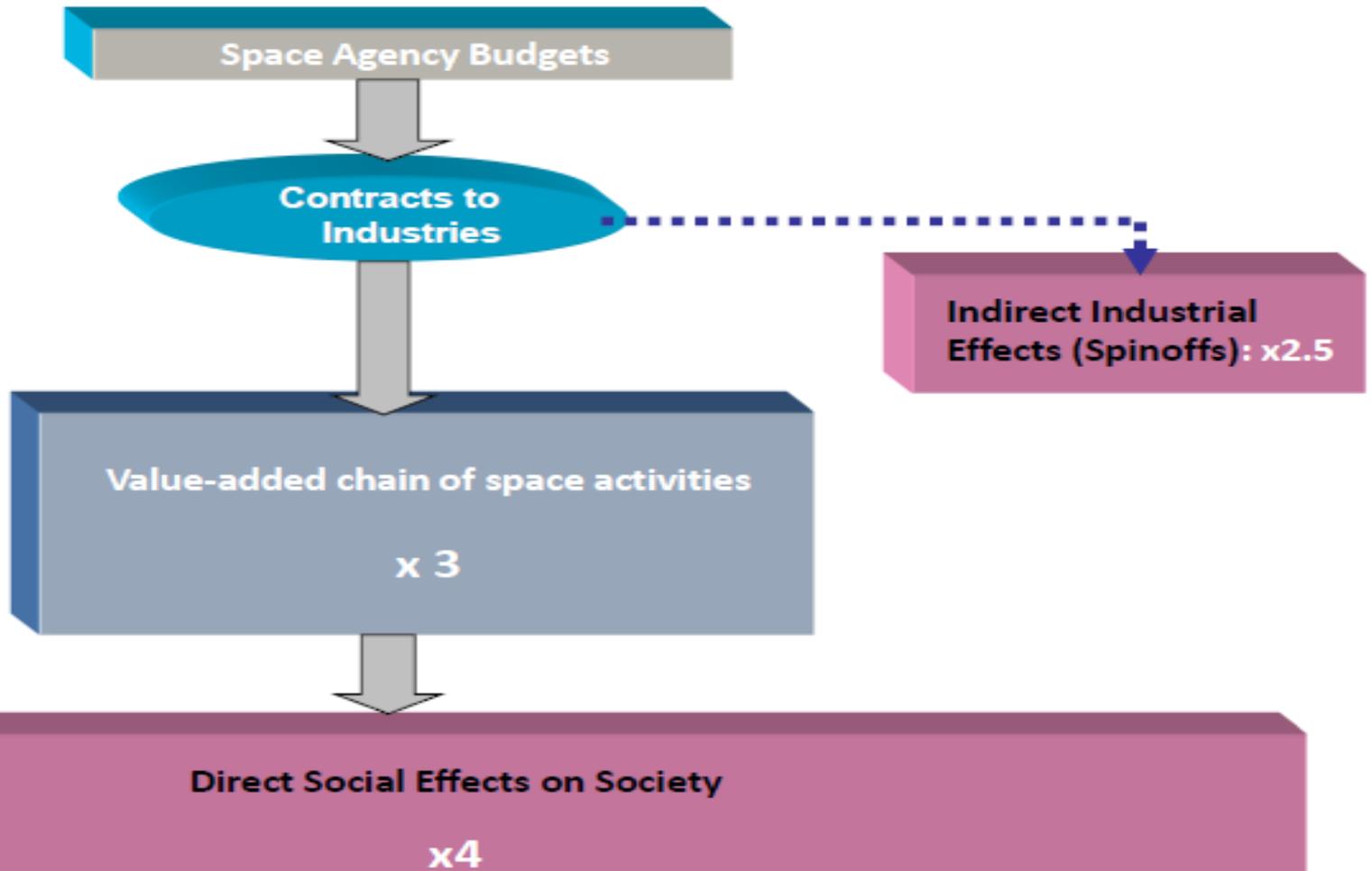
Thank you for your attention

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ANS • YEARS

VISION • PASSION • INNOVATION

Generation of Direct and Indirect Economic Benefits from Space





Generation of Direct and Indirect Economic Benefits from Space

source: BETA, Euroconsult, Herzfeld, etc.

