



Scale-ups and Canada's Innovation Policy Suite: Usage and Impacts

STRATEGIC RESEARCH NETWORK MEETING

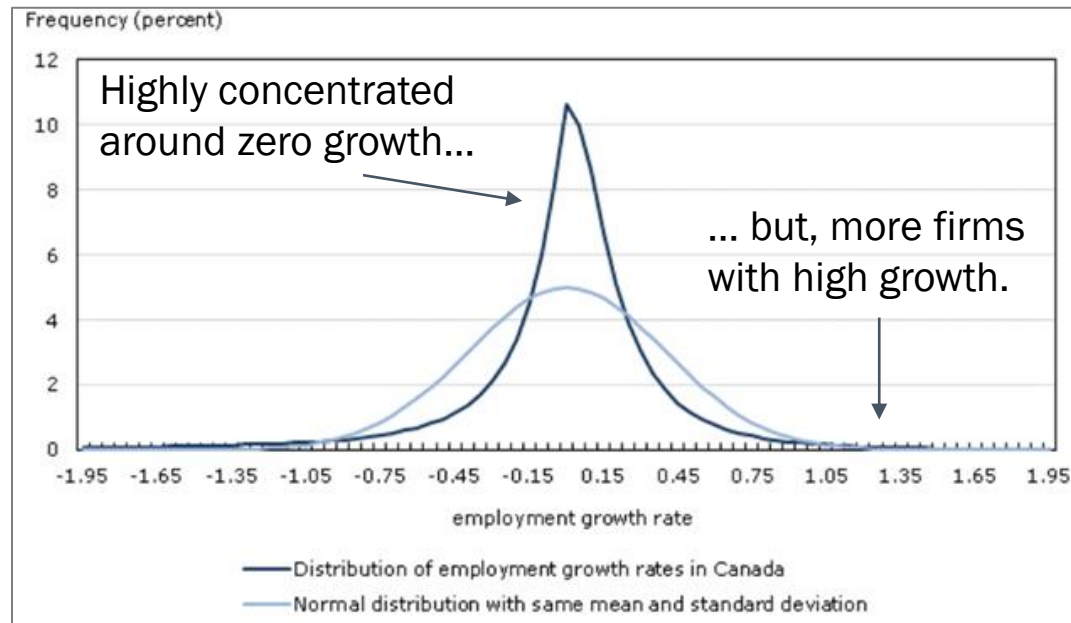
MAY 9, 2024

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The views and opinions expressed in this paper are those of the authors alone and do not represent the views or opinions of the Department of Innovation, Science and Economic Development, the Department of Finance or of the Government of Canada.

Problem: understanding small set of high-performing firms that drive growth

Employment growth distribution (2000-2009),
compared to normal distribution



Scale-ups Rare but impactful

- Between <1% to 8% of firms depending on the definition
- Achieve higher employment levels & pay higher wages
- Higher average productivity growth
- Up to 10X more likely to export.
- Up to 8X more likely to conduct R&D

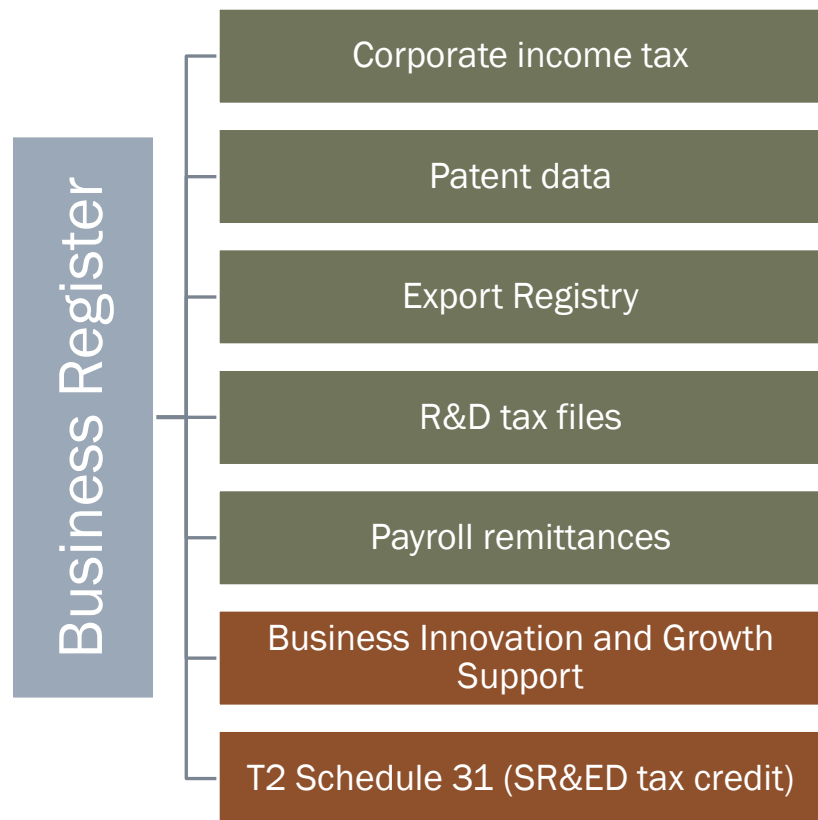
The availability of BIGS data allows for new policy-relevant questions

Current questions for the **scale-up universe**:

- Who receives direct support?
- How much support do firms receive, and from which programs?
- When are firms getting support – is it before/after scaling?
- What is the impact of direct support on firm behavior?

Data and Definitions

Statistics Canada Administrative Data



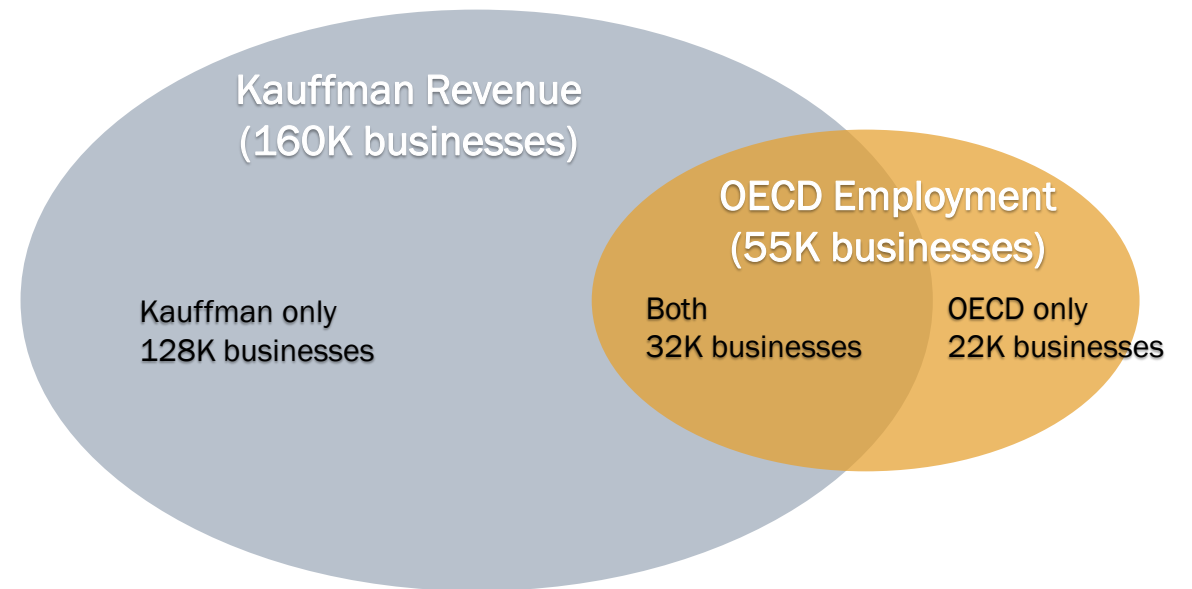
Data links BIGS program data and SR&ED ITC files to key administrative data sources covering growth, patenting, exporting, R&D performance.

Population includes all BIGS program recipients from 2007-19, and all businesses that achieve scale-up status (either employment or revenue).

Scale-up Definitions Used

Dimension of Growth	Firm population	Definition
Revenue (output of production)	All firms	Kauffman Revenue Scale-up <= 20% year-on-year growth in revenue over three years <= \$2 million in revenue at the end of the measurement year
Employment (input to production)	Established firms	OECD Employment Scale-up Average of at least 20% year-on-year growth in employment for three consecutive years At least 10 employees at the beginning of the growth period

Scale-ups 2010-19 cohort
by scale-up definition

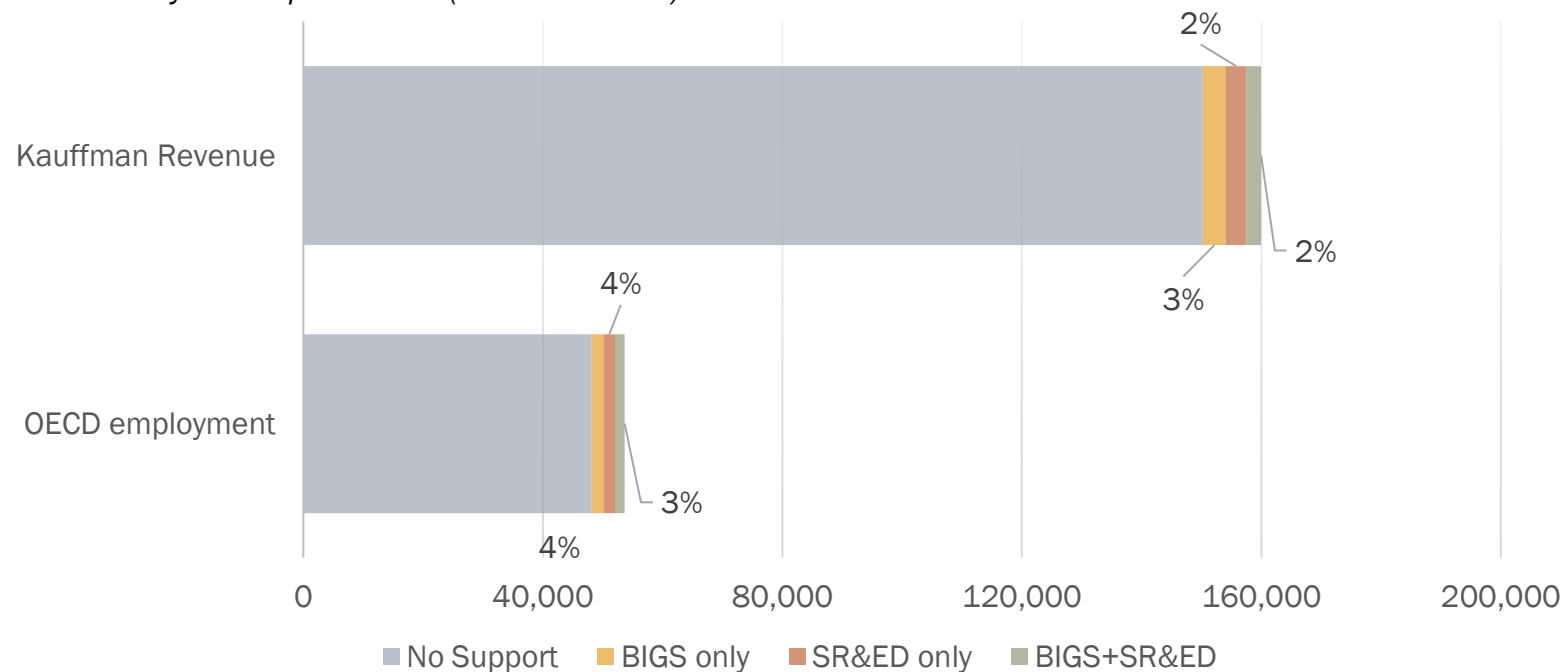


Findings

Majority of scale-ups don't receive BIGS or SR&ED support

Support Status of Scale-ups in 2019

Counts by scale-up definition (2010-19 cohort)



Focus on businesses that achieve scale at some point during 2010-19.

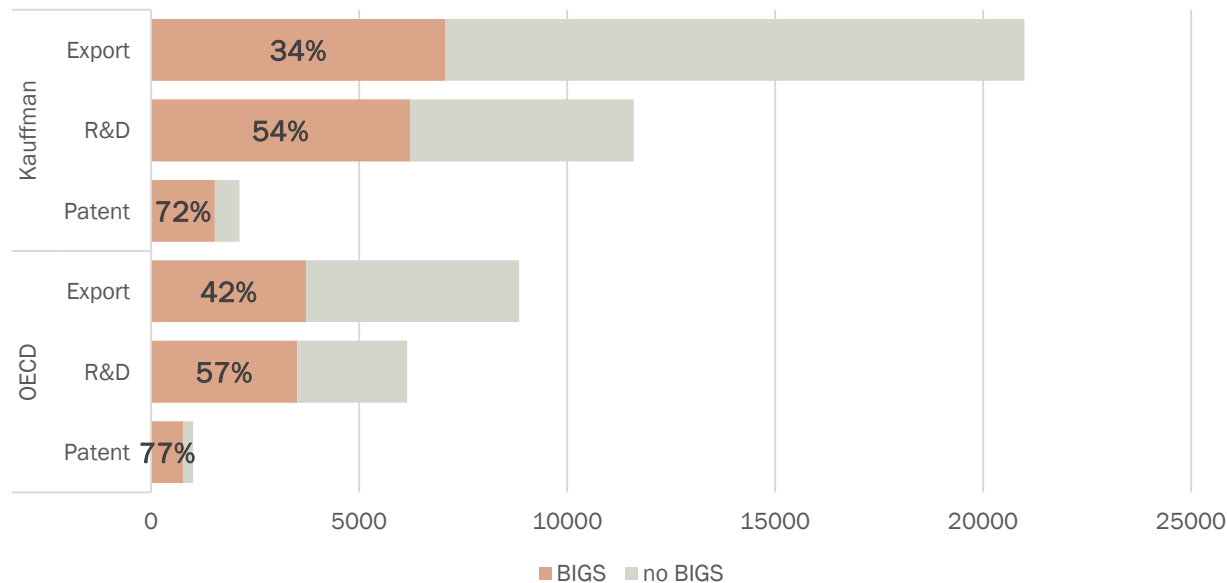
Depending on the definition Between 7-11% received support in 2019.

- Note: following a cohort of 2012-15 scale-ups and evaluating over full BIGS sample (i.e., 2007-2019) % of supported scale-ups goes up to 15-23%.

However, high percentage of exporting, R&D performing or patenting scalers get BIGS support...

Export, R&D and Patenting Scale-ups by BIGS support status*

Counts by scale-up definition (2010-15 cohort)



BIGS coverage higher in the manufacturing sector.

- 52-56% of exporting scale-ups
- 61-63% of R&D performing scale-ups
- 82-85% of patenting scale-ups

And, higher among larger scale-ups (i.e., those with 100+ employees)

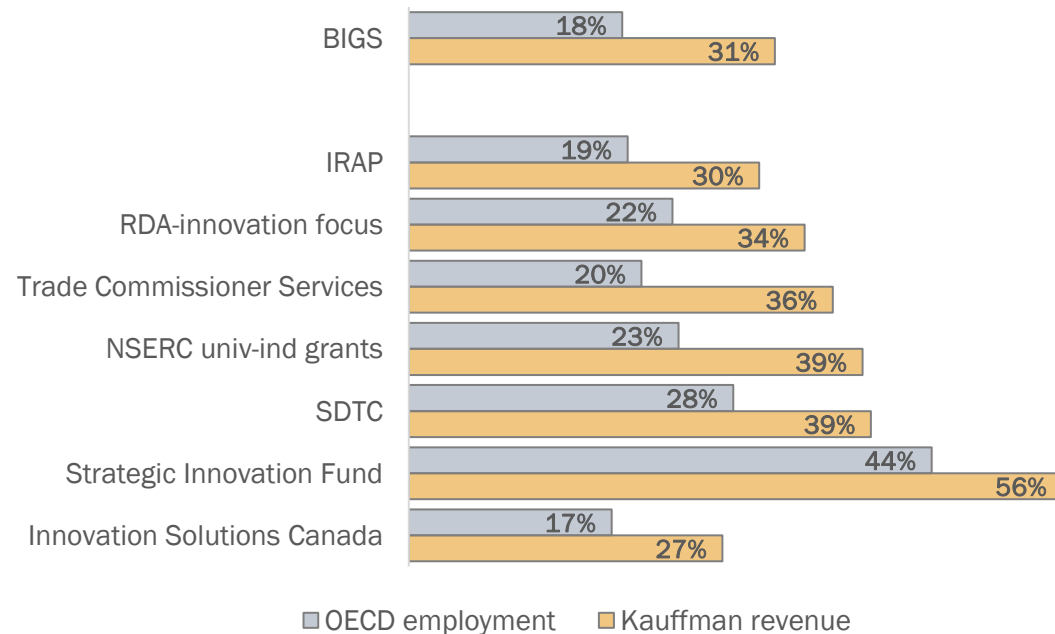
- 54-57% of exporting scale-ups
- 69-70% of R&D performing scale-ups
- 85-86% of patenting scale-ups

*BIGS support received at any point during 2007-19; Exporter or R&D performer if the business had R&D expenditures or exports at any point 2007-19; Patenting if business applied for a patent 2007-2015.

...And, a high percentage of BIGS recipients have scaled

Percentage of 2019 BIGS recipients that achieved scale-up status prior to support

by scale-up definition (2010-19)



Between ~20-30% of BIGS recipients had at least one instance of scaling depending on the definition

A higher percentage of recipients are scalers in more targeted programs, e.g., SDTC, SIF.

Coverage and intensity of BIGS support to scale-ups varies by program

IRAP and TCS are the most commonly leveraged programs by scale-ups, but involve less financial support than other more targeted programs (e.g., SIF)

Value of Support going to Scale-ups in 2019

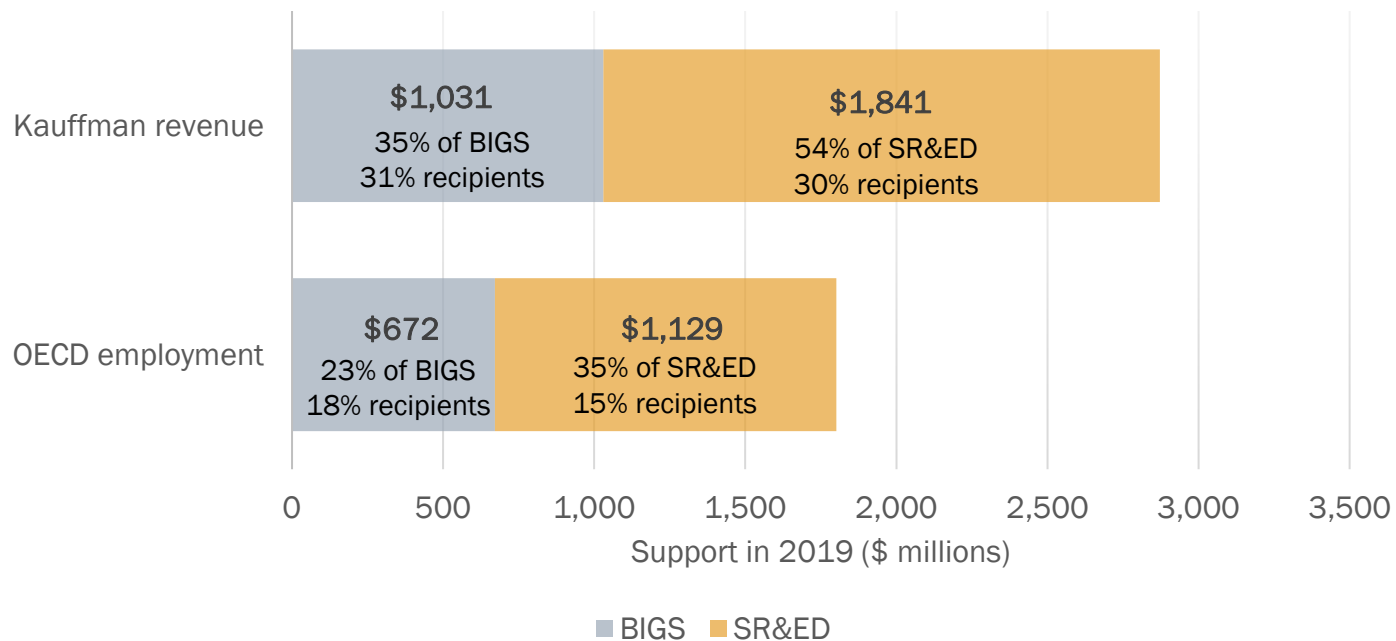
By scale-up definition (2010-19 cohort)

	OECD Employment Scale-ups			Kauffman Revenue Scale-ups		
	Recipients	Value (\$)	Avg Value (\$)	Recipients	Value (\$)	Avg Value (\$)
IRAP	1,340	106,000,000	79,000	2,145	150,000,000	70,000
RDA-innovation focus	500	223,000,000	446,000	750	302,000,000	403,000
Trade Commissioner Services	1,740	N/A	N/A	3,170	N/A	N/A
Other programs	1,785	343,000,000	192,000	2,870	579,000,000	202,000
SDTC	40	40,000,000	1,000,000	55	61,000,000	1,109,000
Strategic Innovation Fund	20	65,000,000	3,250,000	25	111,000,000	4,440,000
Innovation Solutions Canada	25	8,000,000	320,000	40	11,000,000	275,000
BIGS	3,675	672,000,000	183,000	6,300	1,031,000,000	164,000
SR&ED	3,465	1,129,000,000	326,000	5,925	1,841,000,000	311,000

Supported scale-ups punch above their weight in BIGS/SR&ED \$\$

Value of Support going to Scale-ups in 2019

By scale-up definition (2010-19 cohort)



Businesses scaling at some point in the last ten years received a significant percentage of overall 2019 support.

Scale-ups received nearly twice as much support from SR&ED compared to BIGS.

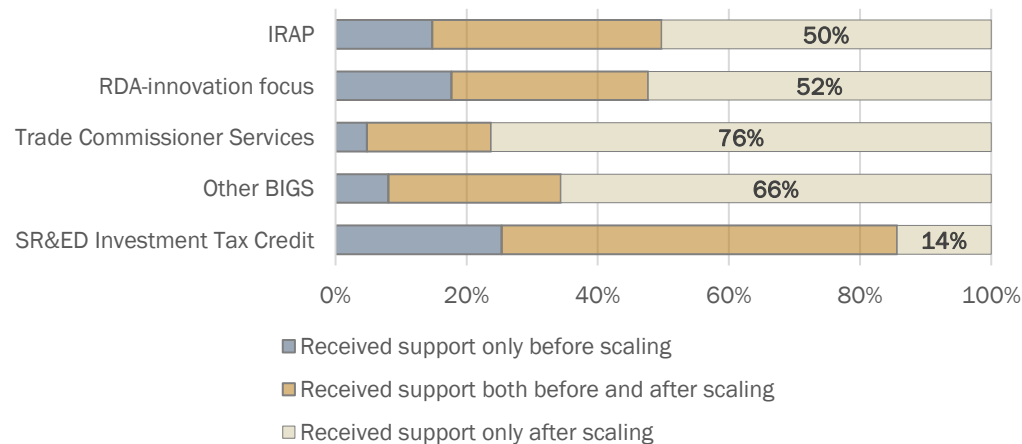
For most supported scale-ups, BIGS came only after initial scaling

More than half of scale-up recipients received support from BIGS only after scaling

In contrast, the majority (86%) of SR&ED supported scale-ups received support prior to scaling.

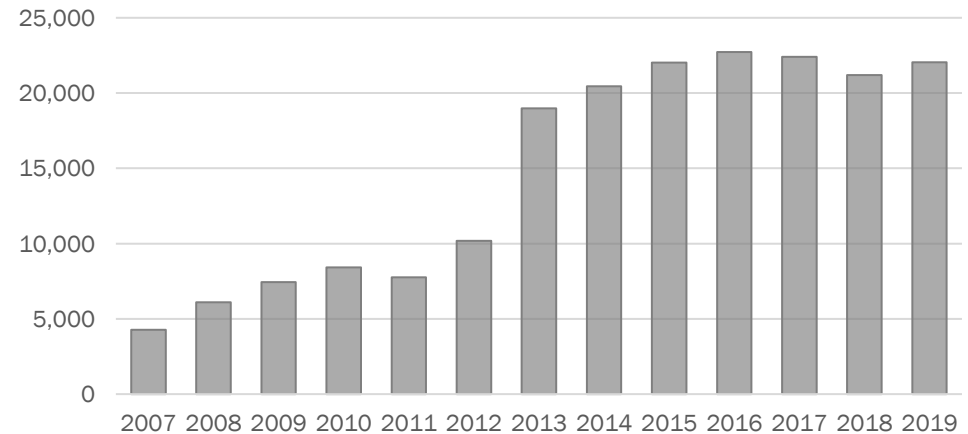
Distribution of scale-ups by timing of support

OECD employment scale-up (2012-15 cohort)



This stark difference is at least partially an artifact of the expansion of BIGS, which touched more businesses from 2013 onwards.

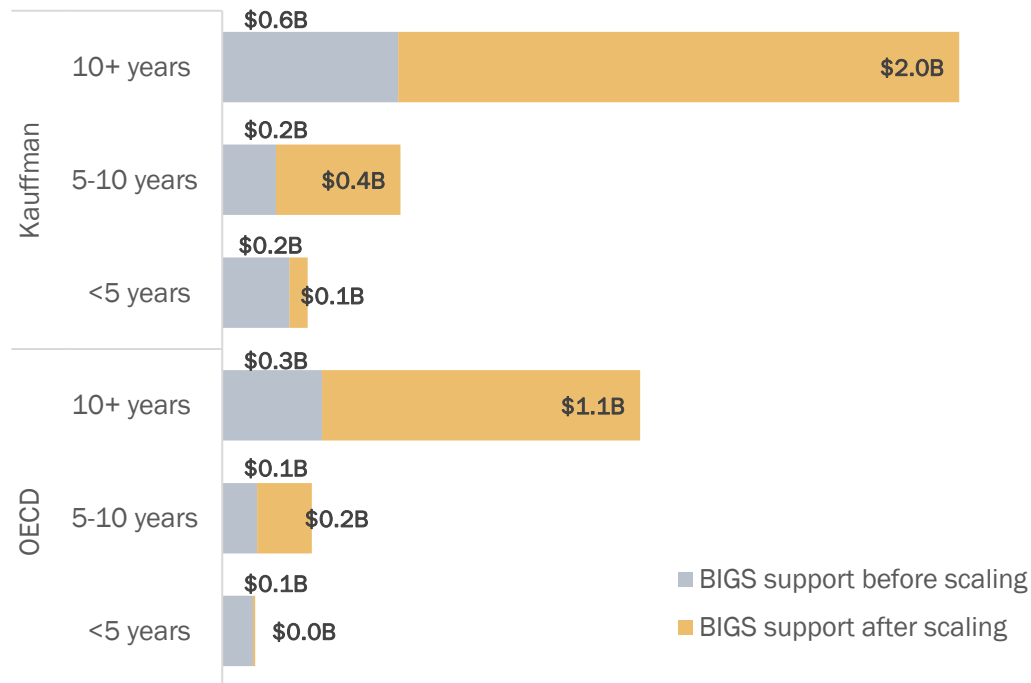
Count of BIGS Recipients



Most scalers are mature when they scale-up, and receive most of the BIGS support after scaling

Total Value of BIGS support over 2007-19 by timing relative to initial scaling

By age at initial scaling (2012-15 scale-up cohort)



Roughly 60% of scale-ups first achieved scale at 10+ years.

Half of mature scale-ups (scaling at 10+ years) getting BIGS received support only after scaling.

Between 55-60% of the value of BIGS support going to scale-ups went to mature scale-ups after scaling.

Econometric results

Estimating impacts of BIGS on businesses post-scaling performance

Treatment group: Businesses receiving first round of BIGS in 2012-14 that achieved scale-up status prior to support.

Use propensity score matching to select controls among non-supported scale-up population:

- Nearest neighbour matching with replacement; include caliper to drop poor matches.
- Exact match on years since scaling, in addition to matching on previous employment/revenue growth

By limiting both treatment and control to scale-ups (i.e., high-performing, market validated businesses), we help mitigate unobserved differences in firm quality.

Estimate Propensity Score from Logistic Model
 $\Pr(\text{Support}_{i,t} = 1) = \alpha_c + \alpha_t + \beta X_{it-1} + \varepsilon_{it}$

Controls ($X_{i,t}$) include:

- Previous growth 3yrs (employment/revenue);
- R&D performer (dummy)
- R&D expenditures
- Exporter (dummy)
- Exports
- Size (employment/revenue);
- Average wages
- Age;
- NAICS 3-digit industry
- Years since scaling (exact match)

Control groups balanced across several key covariates

	OECD employment scale-ups					Kauffman Revenue scale-ups				
	Any BIGS	IRAP	RDA Innovation	TCS	NSERC	Any BIGS	IRAP	RDA Innovation	TCS	NSERC
Before matching	Employment	***	***	**	***	***	***	***	***	***
	Revenue	***	***	***	***	***	***	**	***	***
	Average wages	***	***	***	***	***	***	***	***	***
	Age	***	**		***		***	***	***	
	R&D performer (dummy)	***	***	***	***	***	***	***	***	***
	R&D expenditures	***	***	***	***	***	***	***	***	***
	Exports	***	***	***	***	***	***	***	***	***
	Employment growth (past 3 years)	***	***	*	***	*	***	***	***	***
	Revenue growth (past 3 years)	***	***	*	***	*	***	***	***	
	Years since scaling				***		***		***	
Propensity score	***	***	***	***	***	***	***	***	***	***
After matching	Employment				**					
	Revenue				**					
	Average wages	**		**	*				**	
	Age									
	R&D performer (dummy)									
	R&D expenditures				**	***			***	
	Exports				*					
	Employment growth (past 3 years)		*		**					
	Revenue growth (past 3 years)								*	*
	Years since scaling (exact match)									
Propensity score										

Kolmogorov-Smirnov equality of distribution tests; *** P<0.01; ** P<0.05; * P<0.1

BIGS associated with positive impacts on growth

Results show BIGS support is associated with faster growth, and higher rates of subsequent scaling periods.

- Estimates show average growth premium over 5 years post treatment.

Given some covariates we were unable to balance fully, we use a Fixed Effects model to estimate the impacts.

$$Y_{it} = \alpha_i + \delta_t + \beta X_{it} + \theta Treat_{it} + \epsilon_{it}$$

Controls ($X_{i,t}$) include:

- R&D performer; Exporter; Patent holder
- Industry year cross-products
- SR&ED support

Treatment Effects

By program aggregate and scale-up definition (2012-14) scale-up cohorts

	Employment	Revenue	Scaling incidence
	<i>OECD employment</i>		
Any BIGS	10% ***	17% ***	5% ***
IRAP	9% ***	15% ***	3%
RDA innovation	21% ***	26% ***	8% *
TCS	14% ***	24% ***	6% ***
NSERC	22% ***	34% ***	8% **
	<i>Kauffman revenue</i>		
Any BIGS	14% ***	20% ***	4% ***
IRAP	14% ***	18% ***	4% ***
RDA innovation	16% ***	20% ***	10% **
TCS	14% ***	23% ***	5% ***
NSERC	20% ***	27% ***	5% **

Each cell represents a Fixed Effects model estimate of the corresponding program aggregate treatment effect for either OECD employment scale-ups or Kauffman Revenue Scale-ups. Each model includes controls for R&D performers, exporters, patent holders, industry-year cross products and SR&ED support. Treatment control pair observations are included from t -5 to t+5. Standard errors clustered at the firm level.

*** P<0.01; ** P<0.05; * P<0.1

BIGS support leads to higher wages, R&D and exports

Despite impacts on other performance variables, impact on labour productivity not statistically significant.

- Lack of impact could be related to growing pains.

Individual program impacts show similar results across the board.

- While supports and target populations may differ across programs, the overall impacts of \$1 support could be similar.
- Could also be related to high overlap among the programs (particularly large among the scale-up population).

Treatment Effects

By program aggregate and scale-up definition (2012-14) scale-up cohorts

	Average wages	R&D expenditures	R&D incidence	Exports	Export incidence	Sales per employee
<i>OECD employment</i>						
Any BIGS	2% *	15% ***	5% ***	17% **	4% ***	2%
IRAP	4% ***	15% ***	7% ***	6%	5% ***	0%
RDA innovation	4%	13%	0%	46%	6% **	-6%
TCS	3% ***	12% ***	6% ***	12% *	7% ***	4%
NSERC	-2%	13% **	3%	24%	6% ***	-9%
<i>Kauffman revenue</i>						
Any BIGS	3% ***	14% ***	5% ***	12% **	5% ***	1%
IRAP	3% **	13% ***	5% ***	4%	5% ***	0%
RDA innovation	5% **	16% *	1%	41% **	4% *	-11% *
TCS	3% ***	14% ***	5% ***	14% ***	5% ***	3%
NSERC	2%	20% ***	7% ***	21% *	7% ***	3%

Each cell represents a Fixed Effects model estimate of the corresponding program aggregate treatment effect for either OECD employment scale-ups or Kauffman Revenue Scale-ups. Each model includes controls for exporters, patent holders, and industry-year cross products; non-R&D models also include controls for R&D performers and SR&ED support; R&D models limit matches to cases where R&D performer status in match year is aligned. Treatment control pair observations are included from t -5 to t+5. Standard errors clustered at the firm level.

*** P<0.01; ** P<0.05; * P<0.1

Conclusions

Many scale-ups do not receive support, but more innovative scale-ups do (i.e., exporters, R&D spenders or patenting firms).

Much of the government support comes after initial scaling:

- Selection by programs (i.e., selecting businesses with proven track records)
- Selection by businesses (i.e., better-managed businesses more effective)

Results show positive impacts (growth, R&D, exporting) on supported scalers and continuous scaling. However, support was not associated with increased labour productivity in the near-term.