Defining High Growth Firms

Sustainable Growth, Volatility, and Survival

Serban Mogos - CMU
Alexander Davis - CMU
Rui Baptista - IST

August 27, 2015
European Central Bank
Frankfurt

Contents

Theory

Motivation - Policy side

Policy shift from creating *more* firms to creating *better* firms

Better defined as firms with high and sustainable growth

(Shane, 2009; Stangler, 2010 [Kauffman]; Bosma & Stam, 2012 [OECD*]; Brown *et al.*, 2014 [Nesta UK])

*OECD = Organization for Economic Co-operation and Development

Increasing number of high growth policies/programs

Countries are experimenting with initiatives to foster high growth firm (HGF) creation

(Autio, 2007; Mason & Brown, 2013; Autio & Rannikko, 2015; Soderblom et al., 2015)

HGF policies are needed, yet research offers “bland” proposals

Research needs to create a solid background for better informed policies

(Shane, 2009; Mason & Brown, 2013)

Motivation - Research side

High variation in defining growth and high growth firms (HGFs)

Choices of indicator, measure, time period, growth type and HGF definition

(Delmar 2006; Shepherd & Wiklund, 2009; Henrekson & Johansson, 2010; Daunfeldt *et al.*, 2013)

Link between HGFs and sustainable growth is implied, not discussed

Some definitions include consecutive period growth, others do not (in selection)

(Henrekson & Johansson, 2010)

Research is limited in helping design policies for sustainable growth

Limited knowledge accumulation between studies; superficial policy recommendations

(Delmar 2006; Shepherd & Wiklund, 2009; Daunfeldt *et al.*, 2013)

RESEARCH QUESTION

Do high growth firms have more sustainable growth
and does this depend on the definition used?

Sustainable growth

A measure of the “quality” of growth, implying that high positive growth rates can be sustained (replicated) in multiple consecutive periods, instead of one-shot growth events

** not related to environmental sustainability*

Sustainable organizations successfully manage rapid expansion

Measures of sustainable growth - persistence, volatility, survival

Growth persistence

The correlation of growth rates over time - a measure of continuity

Usually large firms show higher persistence, small firms show a random process

(Coad, 2007a; Coad and Holzl, 2009; Holzl, 2014)

Growth volatility

The variance, or “unpredictability”, of growth - a measure of uncertainty and risk

Few results - Higher volatility for HGFs selected on relative versus absolute growth

(Delmar, 2003)

Firm survival

Probability of exiting the market - a measure of market fitness

Underperforming firms will be pushed out when industries enter a shakeout period

(Gort & Klepper, 1982; Klepper, 1996)

Huge variation in HGF definitions

Indicator	Revenue, Employees, Profit, Productivity, Assets, Equity, Market Share
x	
Value Measurement	Absolute, Relative (percentage, log difference), Birch Index (absolute * relative)
x	
Growth Type	Organic (hiring), Acquired (M&As), or Total
x	
Time Period	1, 3, 5, 7 years, depending on the available data
x	
HGF Definition	Birch (>20% for 3 periods), OECD (>20% average), Top X% (X% highest performing)

Examples from literature

>20% yearly Sales growth over the interval + base-year revenue $100,000

Birch (all studies)

5% fastest growing firms in Emp Index; 1% / 10% in multiple indicators

Schreyer (2000); Daunfeldt et al. (2013); Delmar (2006)

Surviving firms, growing >100% + >5 employees in the studied period

Bruderl & Prisendorfer (2000)

Double Sales + Emp index >2 over the period (4 years)

Acs, Parsons & Tracy (2008)

All are called HGFs! Are they all the same?

** Adapted from Henrekson & Johansson (2010)

Data & Model

Data Sample

Romania

Democracy from 1989

=> Oldest firm 22 years

NATO from 2004

EU from 2007

Frame

1.1m firms, 6.7m observations, 13 years, 2000-2012

~70% of the population of Romanian firms

Sample Selection

SRL firms (LLCs) - most common (96%)	[1m]
No missing data; consecutive years	[540k]
Active between 2000-2004, no entry	[70k]
> $50k* revenue in 2000; SMEs < 250 emp.	[45.5k]

*all financial values were converted to constant 2013 USD

45,500 firms, 535k observations

Highly-performing selected sample**

HGF Definitions [Selection 2000-2004]

Revenue

Employees

Profit
(gross profit)

Productivity
(profit / employees)

x

Birch (>20% yearly growth for 3+ years)

OECD (>20% growth average p.a. over 3 years)

Top 5% - Absolute

Top 5% - Percentage

Top 5% - Logarithmic ($Log(X_t) - Log(X_{t-1})$)

Top 5% - Index (Absolute * Percentage)

over 5 years (2000-2004)

** Note: Our Productivity measure is different than the traditional one based on Value Added

** Note: Log and % select the same firms, so we have Absolute, Relative and Index for each

Sustainability Indicators [Observation 2005-2012]

Persistence = the autoregressive coefficient (β_1)

Volatility = standard deviation of GrowthRate ($\sigma * \sqrt{T}$)

Survival (exit) = year of last observation in the sample

Autoregressive model AR(1), First Differenced

$$GrowthRate_t = \alpha * GrowthRate_{t-1} + \delta_t + \eta_i + v_{it}$$

$$GrowthRate(Revenue) = Log(Revenue_t) - Log(Revenue_{t-1}) \text{ and}$$
$$GrowthRate(Employees) = Log(Employees_t) - Log(Employees_{t-1})$$

$$\Delta GrowthRate_t = \alpha * (\Delta GrowthRate_{t-1}) + \delta_t + \Delta v_{it}$$

α - autoregressive coefficient

δ_t - time dummy

η_i - firm fixed effect

v_{it} - idiosyncratic error term

Estimated using Anderson-Hsiao (IV) and Arellano-Bond (GMM)

Summary

Selection

2000 — 2004

5 years

Y1 — **Y5**

OECD (4)

Birch (4)

Top 5% (12)

Observation

Y5 — **Y13**

8 years

2005 — 2012

Persistence (autoregressive coefficient)

Volatility (standard deviation of growth rate)

Survival (percentage of firms closed)

Results

Different definitions select different firms

Percentage of firms found at the intersection of two definitions

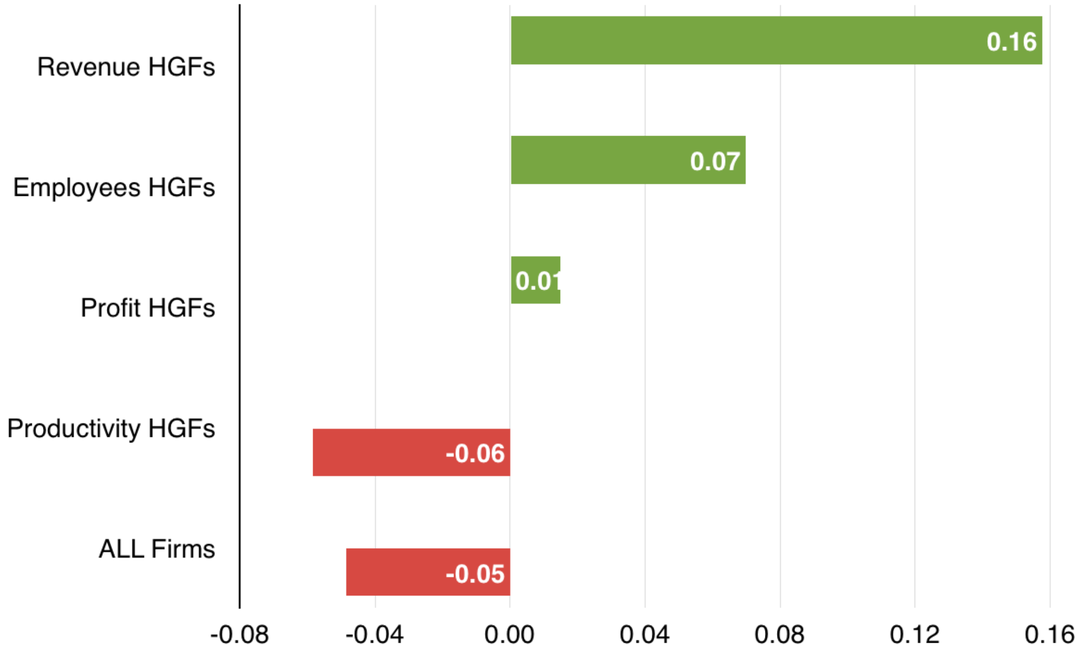
	OECD	Revenue	Employees	Profits	Productivity
TOP5		5,659	3,793	4,786	3,549
Revenue Abs	2,137	**69%**	49%	25%	12%
Revenue Perc / Log	2,185	**67%**	42%	23%	11%
Revenue Index	2,160	**78%**	51%	25%	11%
Employees Abs	2,141	54%	**62%**	**17%**	12%
Employees Perc / Log	2,170	44%	48%	**17%**	**4%**
Employees Index	2,145	58%	**69%**	**19%**	**6%**
Profits Abs	2,139	53%	37%	29%	16%
Profits Perc	2,197	**25%**	**15%**	28%	22%
Productivity Abs	2,256	**23%**	**9%**	24%	20%
Productivity Perc	2,254	**12%**	**4%**	23%	22%

Result

Different definitions select different firms

HGFs selected on Revenue have highest persistence

Estimations of autoregressive coefficients averaged per indicator



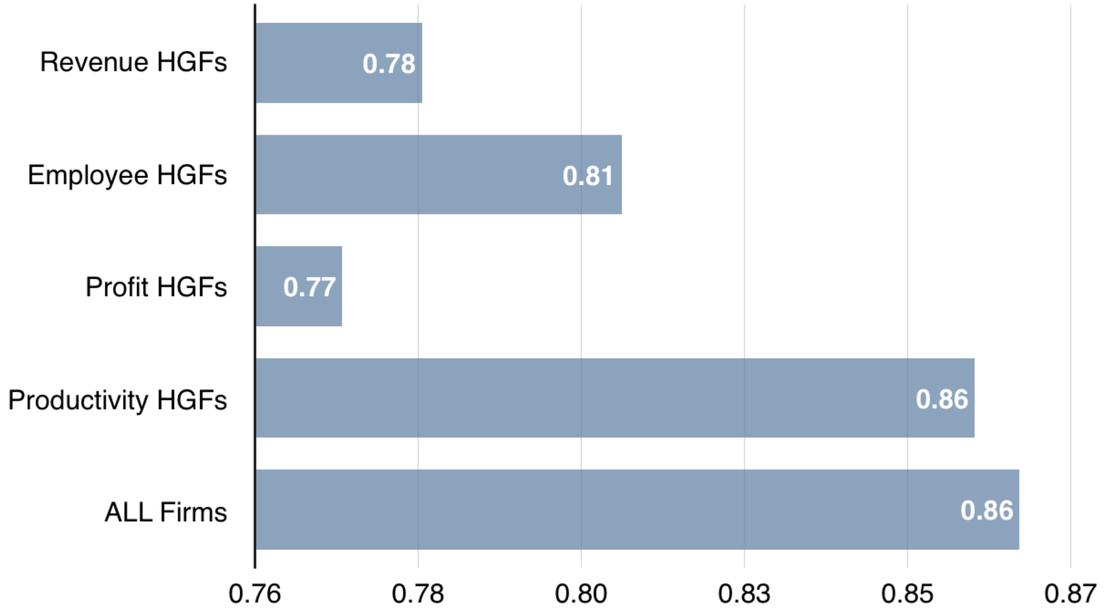
Result

Variation in persistence results based on the indicator

Highest persistence for Birch Revenue (24%)

HGFs have lower volatility

Median of standard deviations for GrowthRate(Revenue)



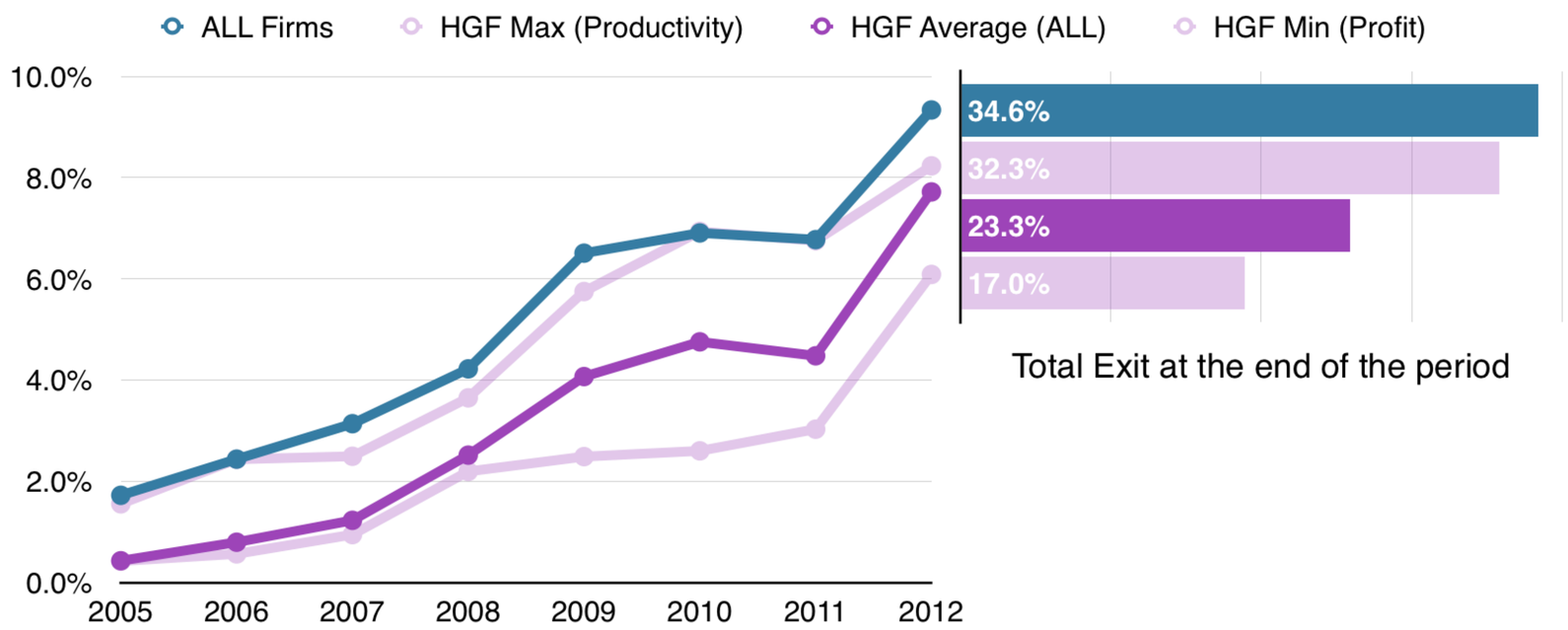
Result

HGFs have lower volatility

Profit and Revenue give lowest volatility

OECD and Birch give lowest volatility

Exit rates per year and total, all firms vs averages for HGFs



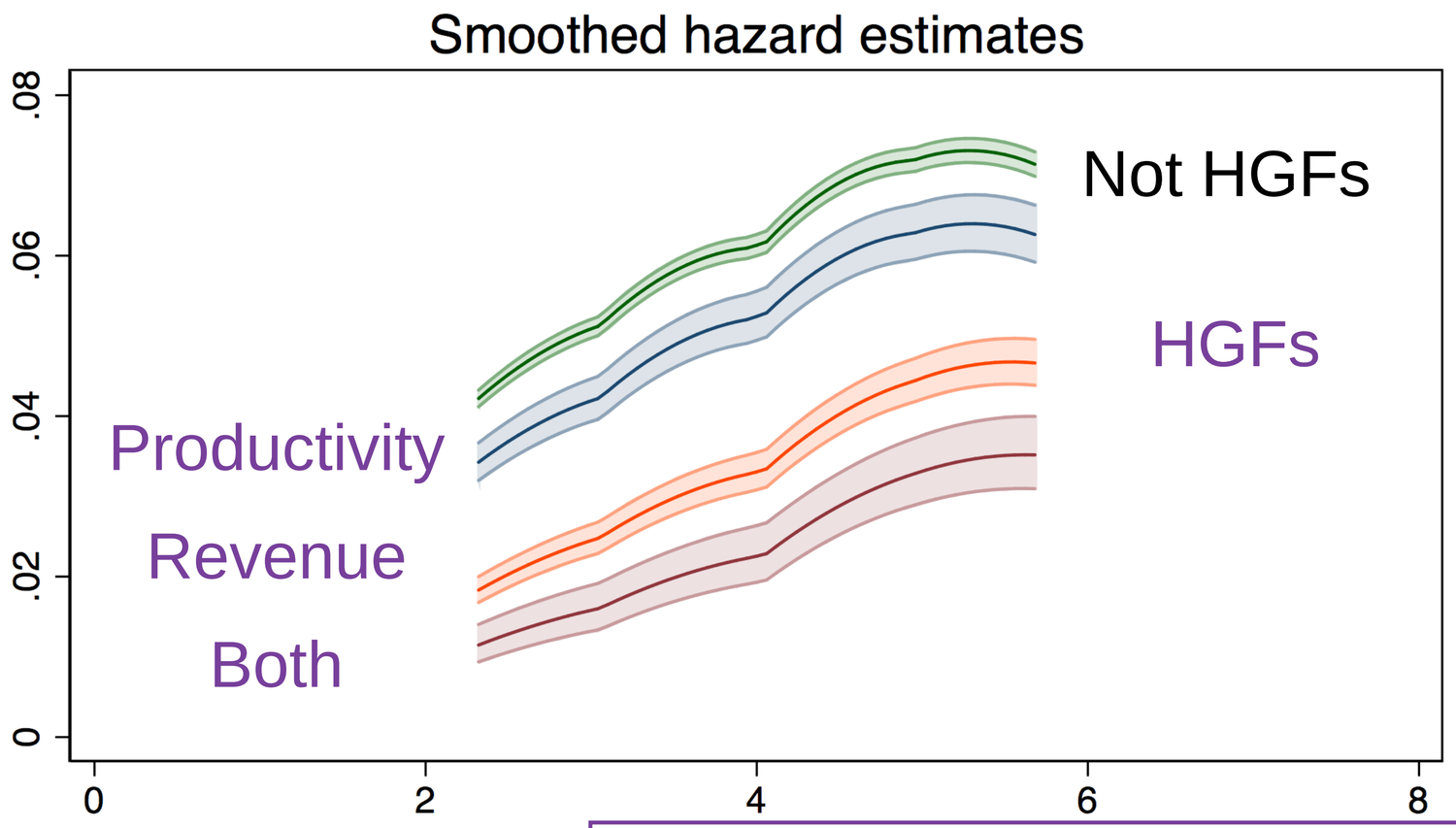
Result

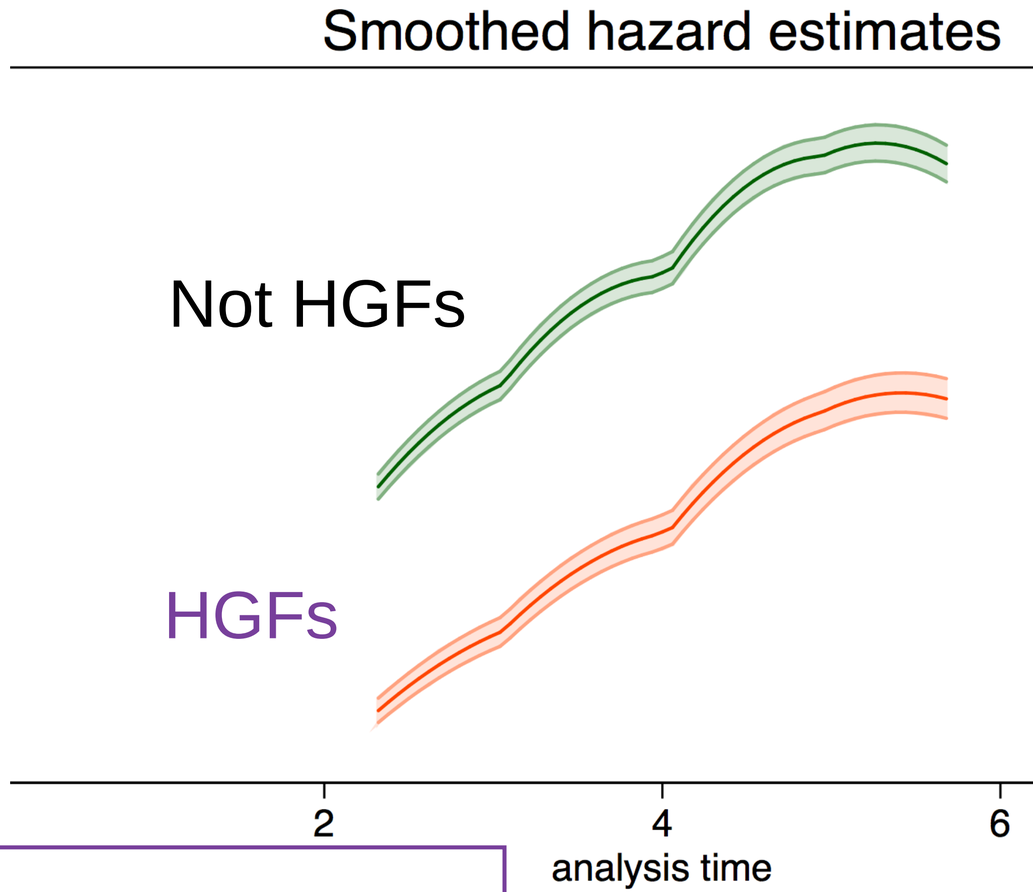
HGFs have lower exit rates

Exit rates for Profit and Revenue are lowest (18%)

Exit rates for Productivity are highest (32%)

Hazard ratios are lower for HGFs





Result

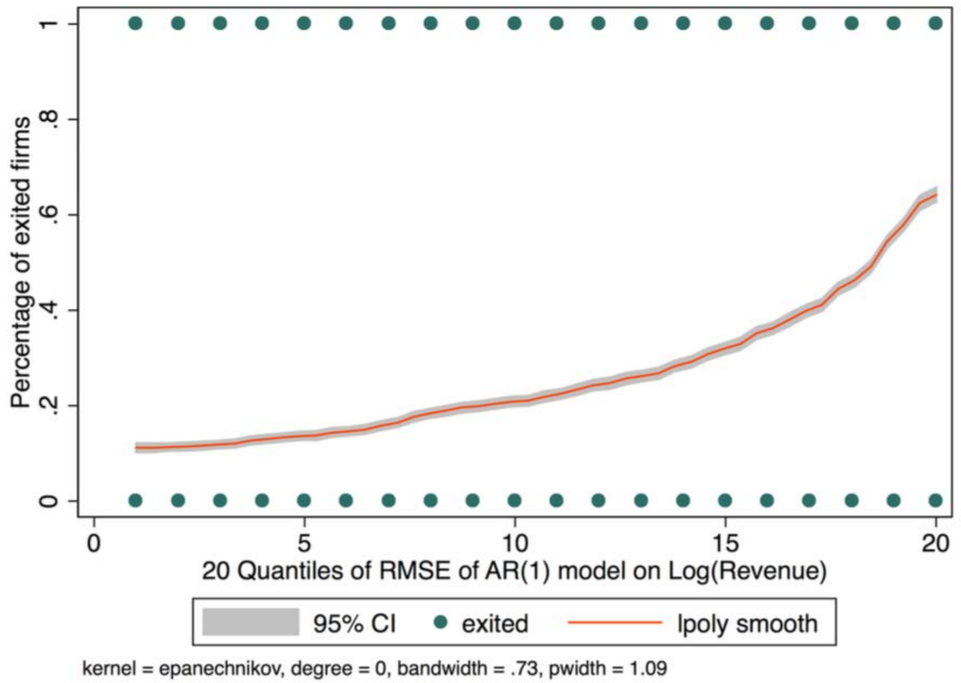
HGFs have lower exit rates

Exit rates for Profit and Revenue are lowest (18%)

Exit rates for Productivity are highest (32%)

Probability of exit increases with volatility

Exit percentage and average growth for quantiles of volatility



Result

Probability of exit increases with volatility

Conclusion

Implications of our study

HGFs have more sustainable growth (after selection), but result vary

Different definitions select different firms with different characteristics

Birch & OECD / Rev & Emp give better results in terms of sustainable growth

(Labor) Productivity and Employment have an opposite relation

Productivity HGFs have negative persistence, higher volatility and higher exit

Indicates a potential mismatch between public and private incentives

Why it matters? HGF policies should target high *quality* growth

Autio & Rannikko (May, 2015) evaluate a 6-year HG policy program in Finland

“The initiative had more than doubled the growth rates of treated firms”

Limitations & Future Work

Contributions

- Benchmarking HGF definitions on future performance
- Methodology to evaluate sustainable growth of HGFs
- Unique context - dataset on Romania (developing country)

Limitations

- Limited generalizability - selected sample, specific context
- Data quality - significant amounts of missing data
- Small timeframe - only 8 years for observation

Future work

- Reduce the sample selection and missing data issues
- Explore in more detail - size, age and industry
- Multiple datasets - Portugal and United States

References

Acs, Z. J., Parsons, W., & Tracy, S. (2008). High-Impact Firms: Gazelles revisited. SBA Office of Advocacy, Corporate research Board, LLC Washington, DC 20037.34, pp. 253-277

Autio, E., & Rannikko, H. (2015). Retaining Winners: Can Policy Boost High-Growth Entrepreneurship?. Imperial College Business School Innovation and Entrepreneurship Working Papers.

Birch, D. L. (1981). Who creates jobs? The Public Interest, 65(Fall), 3-14.

Bosma, N., & Stam, E. (2012). Local Policies for High-Employment Growth Enterprises.

Brown, R., Mason, C., & Mawson, S. (2014). Increasing 'The Vital 6 Percent': Designing Effective Public Policy to Support High Growth Firms.

Coad, A. (2007). A closer look at serial growth rate correlation. Review of Industrial Organization, 31(1), 69-82.

Coad, A., & Holzl, W. (2009). On the autocorrelation of growth rates. Journal of Industry, Competition and Trade, 9(2), 139-166.

Daunfeldt, S. O., Elert, N., & Johansson, D. (2013). The economic contribution of high-growth firms: Do policy implications depend on the choice of growth indicator?. Journal of Industry, Competition and Trade

Delmar, F., Davidsson, P., & Gartner, W. B. (2003). Arriving at the high-growth firm. Journal of business venturing, 18(2), 189-216.

Delmar, F. (2006). Measuring growth: methodological considerations and empirical results. Entrepreneurship and the Growth of Firms, 1, 62-84.

Henrekson, M. and Johansson, D. (2010). Gazelles as job creators: A survey and interpretation of the evidence, Small Business Economics, Vol. 35, pp. 227-244.

Gort, M., & Klepper, S. (1982). Time paths in the diffusion of product innovations. The economic journal, 630-653.

Holzl, W. (2014). Persistence, survival, and growth: a closer look at 20 years of fast-growing firms in Austria. Industrial and Corporate Change, 23(1), 199-231.

Klepper, S. (1996). Entry, exit, growth, and innovation over the product life cycle. The American economic review, 562-583.

Mason, C., & Brown, R. (2013). Creating good public policy to support high-growth firms. Small Business Economics, 40(2), 211-225.

Shane, F. (2009) Why encouraging more people to become entrepreneurs is bad public policy. Small Bus Econ 33:141-149

Soderblom, A., Samuelsson, M., Wiklund, J., & Sandberg, R. (2015). Inside the black box of outcome additionality: Effects of early-stage government subsidies on resource accumulation and new venture performance. Research Policy, 44(8), 1501-1512.

Stangler D (2010) High-growth firms and the future of the American economy. Kauffman Foundation Research Series: Firm Formation and Economic Growth, March 2010.

Shepherd, D., & Wiklund, J. (2009). Are we comparing apples with apples or apples with oranges? Appropriateness of knowledge accumulation across growth studies. Entrepreneurship Theory and Practice, 33(1), 105-123.

Thank You!

Questions?

mogos@cmu.edu

FCT

Fundação para a Ciência e a Tecnologia

MINISTÉRIO DA CIÊNCIA, INOVAÇÃO E DO ENSINO SUPERIOR

Carnegie Mellon

Engineering & Public Policy

TÉCNICO LISBOA