

INNOVATION AND EXPORT PERFORMANCE: DO YOUNG AND OLD INNOVATIVE FIRMS DIFFER?

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AGENDA

Motivation

Theoretical Considerations

Hypotheses

Data & Method

Results & Discussion

Conclusions

TOTAL: \$35.6B

Refined Petroleum

What does Greece export? (2013)

36%

Cement

0.87%

Petroleum Coke

0.58%

Petroleum Gas

0.40%

Marble...

0.39%

Dolomite

Lead Ore

Aluminium Plating

1.9%

Copper Pipes

1.2%

Raw Aluminium

0.88%

Raw Steel

0.81%

Raw Iron Bars

0.64%

Scrap Copper

0.39%

Hot-Rolled Iron...

Iron Structures

0.32%

Other Large Iron Pipes

Other Small Iron...

Aluminium Foil

0.63%

Ferroalloys

0.57%

0.50%

Insulated Wire

0.85%

Broasting Equipment

0.62%

Gas Turbines

0.34%

Electric Heaters

Essential Machinery

Other...

Grapes

0.68%

Citrus

0.67%

Pitted...

0.66%

Other...

0.54%

Other Vegetables

0.32%

Melons

Rice

Apples and...

Raw Cotton

1.5%

Knit T-Shirts

0.41%

0.32%

0.25%

Other Processed Fruits and Nuts

1.3%

Other Processed Vegetables

1.2%

Raw Tobacco

0.28%

0.79%

Rolled Tobacco

0.72%

Hard Liquor

Mail...

0.31%

Jams

Processed Tomatoes

Pasta

Non-Fillet Fresh Fish

1.7%

Cheese

1.2%

Fermented...

0.31%

Pure Olive Oil

2.0%

Olive...

Furskin Apparel

0.66%

Raw...

0.24%

Packaged Medicaments

3.2%

Aluminium Oxide

0.44%

Cleaning...

Beauty Products

Mixed Mineral or Chemical...

Propylene Polymers

0.68%

Rain Plastic Sheeting

0.54%

Styrene Polymers

Plastic Lids

0.30%

Rubber Belting

Ethylene Polymers

Bel...

Toilet Paper

0.38%

Brochures

Utility Meters

Building Stone

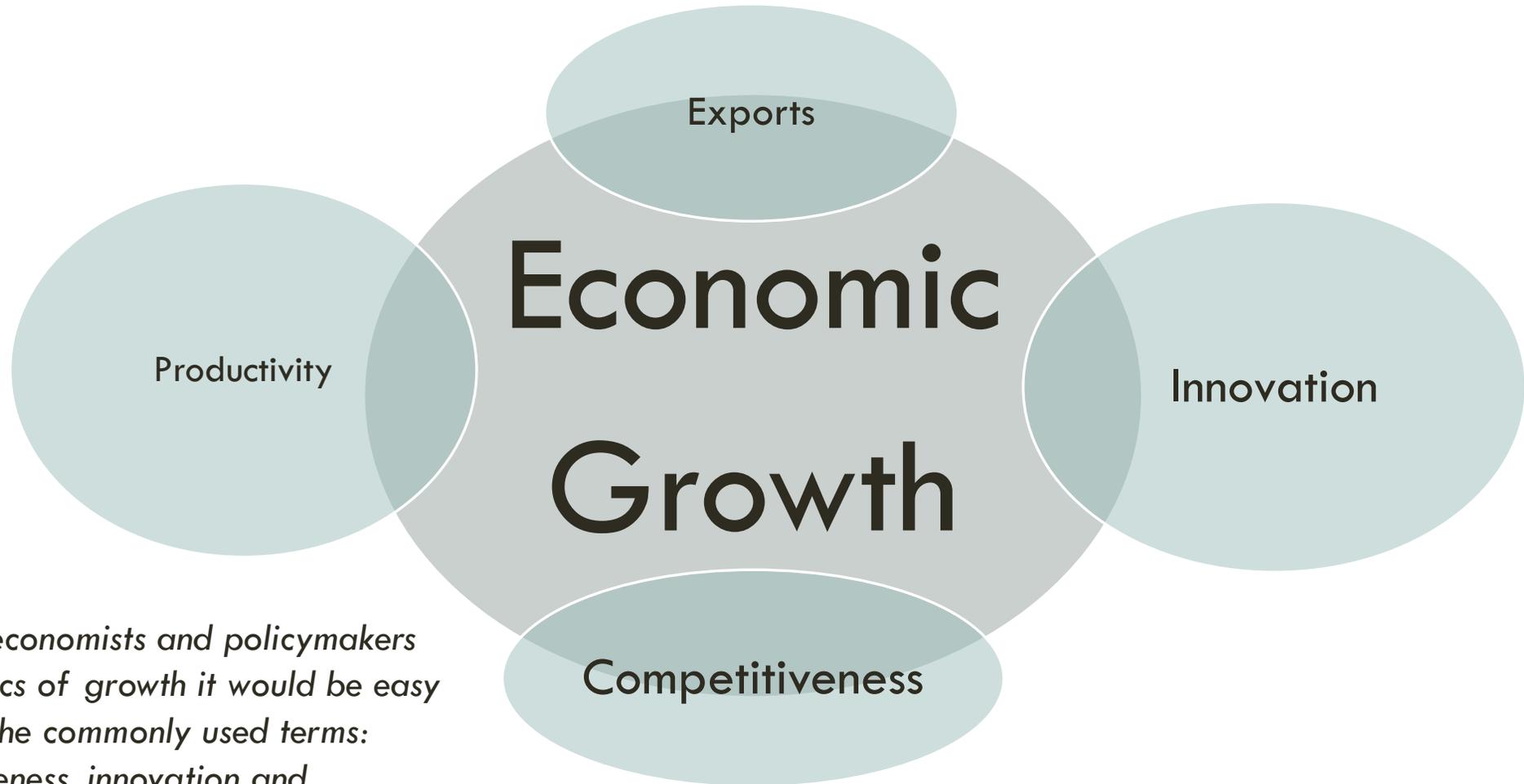
0.38%

Gold

Models...

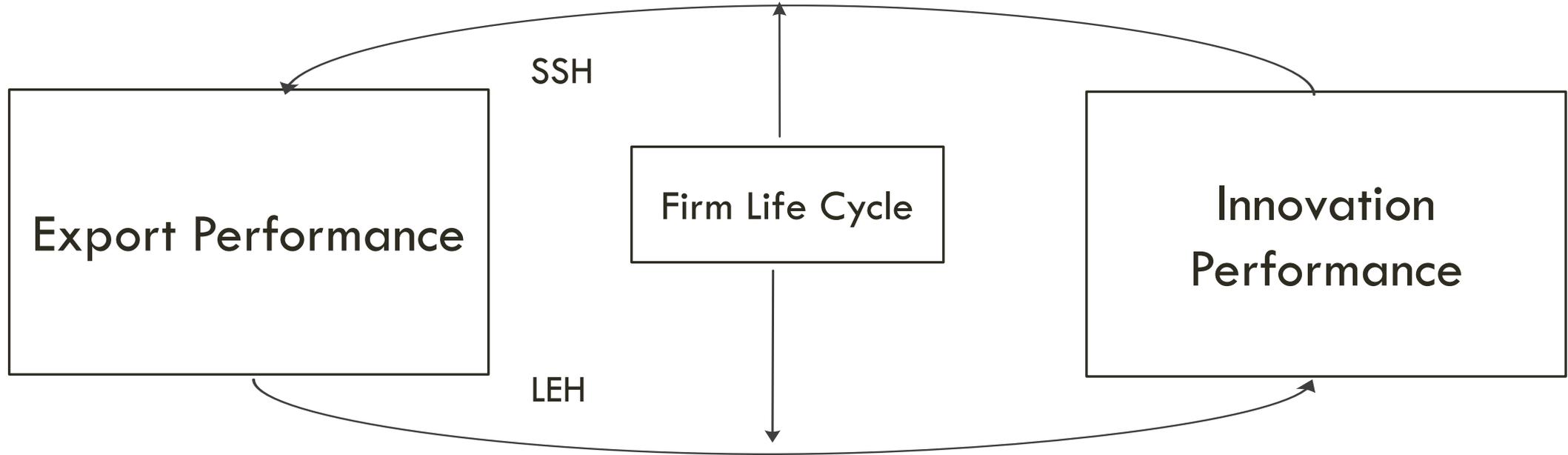


INTERESTING? WHY?



“To listen to many economists and policymakers discuss the economics of growth it would be easy to be confused by the commonly used terms: exports, competitiveness, innovation and productivity.” R. Atkinson

MOTIVATION



THEORETICAL CONSIDERATIONS

The Self Selection Hypothesis (Wagner, 2007; SSH) and the Learning by Exporting Hypothesis (Clerides et al., 1998; LEH) claim different causality direction for the export-innovation nexus.

Constantini and Melitz (2008) devised a theoretical framework where they accounted for the existence of **endogeneity** between this relationship. However, it is implicitly assumed that (i) the differential gains of innovation activities are symmetrically distributed among innovators and (ii) export orientation is solely dependent on the productive performance gains induced by R&D activities.

Gkypali and Tsekouras (2015) employed a sample of Greek Manufacturing R&D active firms and provided empirical evidence that firms endogenously self select into exporting after discounted the net benefits from their decision.

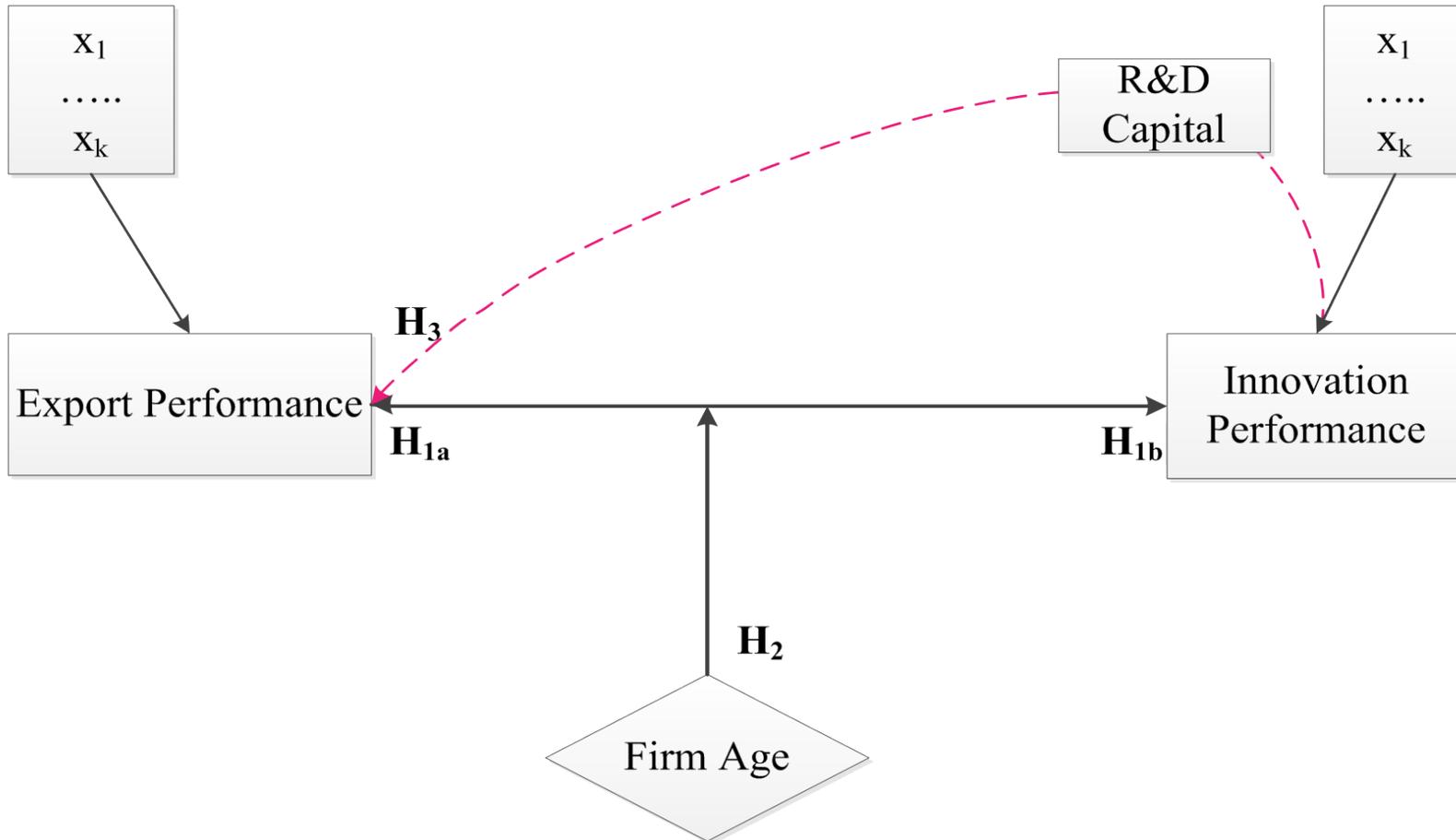
However, firms face different production possibilities sets, strategic priorities and constraints **depending on the stage of their life cycle.**

R&D capital is considered an input in the innovation process (Crepon et al., 1998) but it may also affect export performance (Harris and Moffat, 2011).

RESEARCH QUESTIONS

- ❖ RQ₁: Is there a **feedback loop** relationship between innovation and exporting performance?
- ❖ RQ₂: Does firm age **moderates** the innovation-exports nexus, and if so how?
- ❖ RQ₃: What is the **mechanism** through which innovation and exporting are linked?

HYPOTHESES



H₁: Firms' export and innovation performance present an endogenous two-way relationship

H₂: The endogenous relationship between innovation and export performance is moderated by firm's age

H₃: Firm's R&D capital indirectly and distinctively determines export performance in young and old firms

COPING WITH ENDOGENEITY AND HETEROGENEITY: MULTI-GROUP ANALYSIS

The structural relationships are quite **complex** and an appropriate methodology needs to be employed. **Multi-group analysis** is adopted in order to address simultaneous relationships and non-recursive models as well as control for firm level heterogeneity.

WHY MUTLI-GROUP MODELLING?

A threefold advantage of the adopted approach is that it allowed us to investigate

- i. the existence of **feedback loop** in the relationship between innovation and export performance,
- ii. the **moderating effect** of firm age not only with respect to a key variable but with respect to the overall model specification and which enables the examination of whether different groups behave similarly (Hayduk, 1987),
- iii. the **indirect effect of** firms' R&D capital on export performance through its direct influence on innovation performance.

THE MODEL PUT DIFFERENTLY...

$$\text{experf}^g = a_{ep} + \mathbf{B}_{ip}^g \text{innperf}_{ip}^g + \mathbf{\Gamma}^g \mathbf{x}_{ep}^g + \varepsilon_{ep}^g$$

$$\text{innperf}^g = a_{ip} + \mathbf{B}^g \text{experf}^g + \mathbf{\Gamma}^g \mathbf{x}_{ip}^g + \varepsilon_{ip}^g$$

The non-recursive system of equations is fitted by the robust full information maximum likelihood (MLR) estimator for continuous variables, accounting for missing data, heteroskedasticity and non-normality.

Standard errors are computed using the Huber-White sandwich estimator.

DATA (1)

This research concerns Greek Manufacturing firms which all share a common attribute; that of presenting R&D activities either continuously or occasionally during the period 2001-2010.

The information employed in the present paper is the output of matching three different information sources:

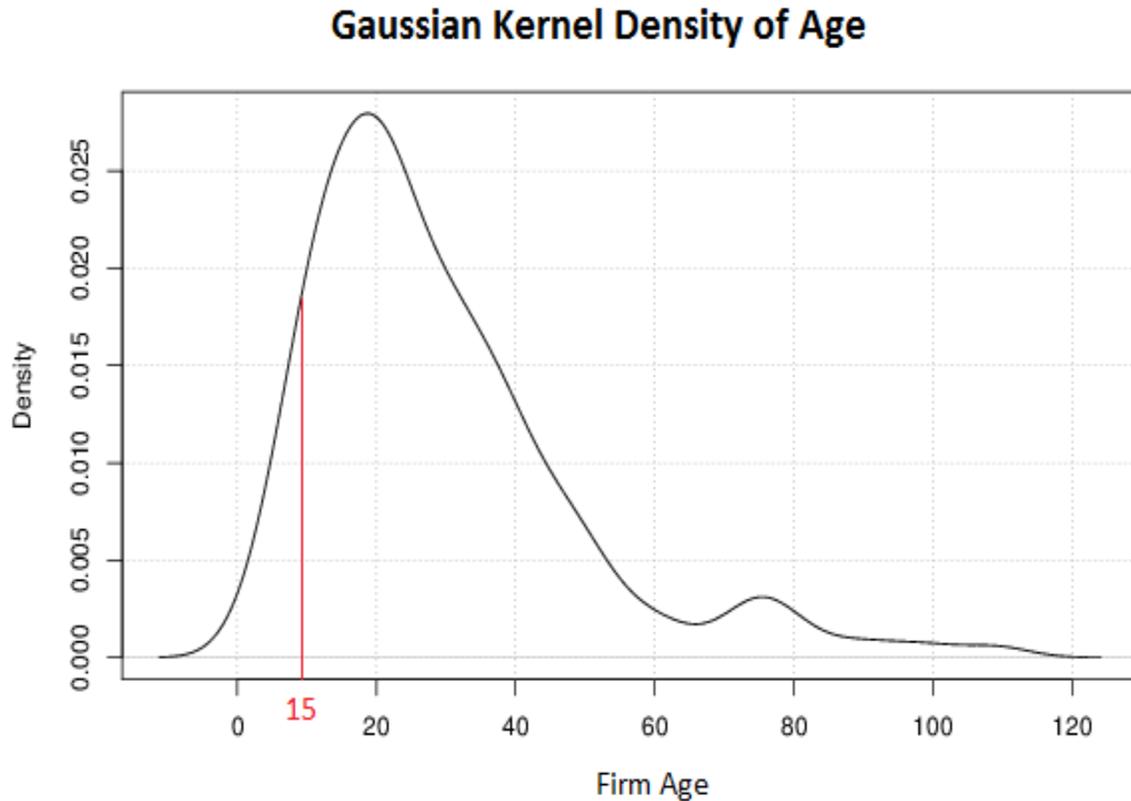
GRD firms general and financial information through published financial accounts

GRD firms survey with unique information on R&D and exports

GRD firms knowledge stock construction via perpetual inventory method

DATA (2)

A central issue is the distinction between young and old firms.



- Firms in the sample ($N=300$) are exhibiting a **right skewed** distribution. Hence, we opted to define the age threshold at 15 years, in order to obtain a good degree of representativeness in the subsample of young firms ($N_y=74$), albeit without increasing the age threshold too far.

RESULTS: HYPOTHESIS 1

Ful sample			
<i>Export Performance</i>		<i>Innovation Performance</i>	
	2.955*** (1.136)	EXPPERF	0.041 (0.031)
INNPERF			
	0.211*** (0.060)	RDSTOCK	0.196*** (0.061)
SIZE			
	1.097*** (0.205)	SIZE	-0.029** (0.014)
MSPREURO			
	0.951*** (0.224)	ABSCAP	-0.038 (0.058)
MSPROE			
	2.728*** (0.716)	PATAPP	0.079** (0.038)
MSPRNAM			
	0.456*** (0.155)	TECINTENS	-0.056 (0.037)
TECHINTENS			
	-1.528*** (0.591)		0.477*** (0.063)
Cons			
			-
			0.302*** (0.113)
		Cov(e_{exp}, e_{inn})	

- Based on the estimation results the existence of a feedback loop between innovation and exporting performance is not confirmed.
- Self Selection Hypothesis (SSH) seems to be supported by empirical results

RESULTS: HYPOTHESIS 2 (1)

	Ch.Sq., df	p-value	CFI	TLI	RMSEA
Young firms	1.051, 4	0.902	1.000	1.252	0.000
Old firms'	4.796, 4	0.309	0.985	0.935	0.030
No moderation	2.226, 4	0.694	1.000	1.046	0.000
Moderation model	4.699, 8	0.790	1.000	1.138	0.000
Wald test for equality restrictions	10.148, 5 (0.071)				

In order to investigate whether firm age moderates the export-innovation nexus the multi-group analysis allows for testing for cross-group invariance by comparing two nested models: (1) a baseline model wherein no constraints were specified thus, across groups *all* structural parameters differ, and (2) a second model where critical structural parameters were constrained to be invariant between the two groups. Comparison of the two models is performed with a **Wald test** imposing equality restrictions in structural parameters.

RESULTS: HYPOTHESIS 2 (2)

	Full Sample	Young Firms Group	Old Firms Group
<i>Export Performance</i>			
INNPERF	2.955*** (1.136)	2.173 (1.453)	3.457** (1.849)
<i>Innovation Performance</i>			
EXPPERF	0.041 (0.031)	0.107** (0.047)	-0.007 (0.067)
Cov (e_{exp} , e_{inn})	-0.302*** (0.113)	-0.279** (0.145)	0.296- (0.190)

For young Greek Manufacturing R&D active firms empirical evidence supports the Learning by Exporting Hypothesis (LEH) while for old firms, the Self Selection Hypothesis (SSH) is confirmed.

RESULTS: HYPOTHESIS 3

			Young firms Group	Old Firms Group
Source	Mediator	Outcome		
RDSTOCK	INNPERF	EXPERF	0.724* (0.406)	0.660** (0.281)

In both groups, there is a statistically significant indirect influence of R&D capital on export performance, suggesting that the existence of an augmented knowledge base, reinforces the firms' competencies and capabilities required to succeed in foreign market penetration.

OVERALL

- Empirical results do not corroborate a two way causality in the export-innovation nexus for the full sample of Greek R&D active Manufacturing firms.
- Firms' life cycle stage is hypothesized to convey the underlying heterogeneity due to different production possibility sets, strategic orientation etc. Hence we investigated the moderating role of firm age in order to reveal potentially differential patterns with respect to export-innovation performance relationship.
- The direction of causality implied by the Learning by Exporting Hypothesis (LEH) is driving the Young Firms' group while the Self Selection Hypothesis is supported by estimation results for the Old firms' group.
- R&D capital is a strong link for the relationship between innovation and export performance for both group of firms.



THANK YOU FOR YOUR
ATTENTION!!!!!!