

Competition and Firm Productivity: Evidence from Portugal

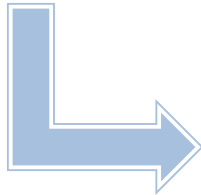
Ciclo de Seminários GEE/GPEARl
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Pedro Carvalho

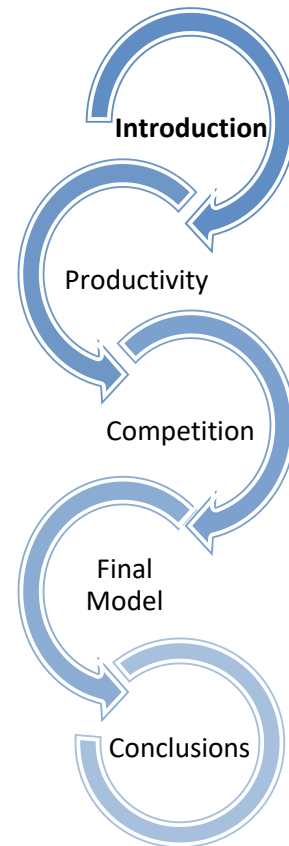
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Research question

Has competition a positive impact on firm-level productivity for the Portuguese economy?



Database: SCIE
(2010-2015).



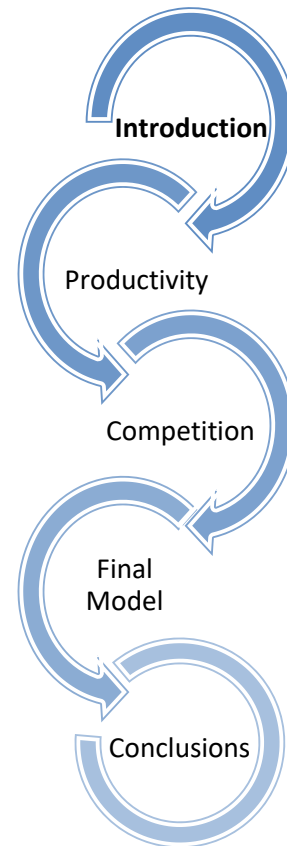
Literature Review

Theoretical vs **Empirical** Analysis

Macro vs **Micro** Analysis

Empirical evidence regarding
the relationship between the
level of competition and
productivity

Empirical evidence regarding
each of the mechanisms by
which competition boosts
productivity



Mechanisms by which competition boosts productivity

Between-firm effect

Competition guarantees that low-productivity firms exit the market to be replaced by more productive firms.

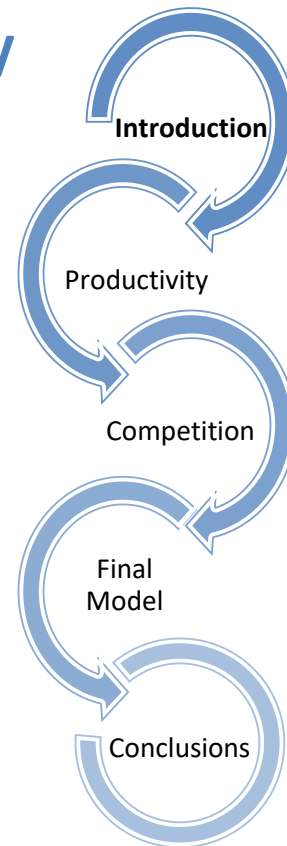
Within-firm effect

Competition can act as a discipline device, placing pressure on managers to reduce X-inefficiency.

Innovation

Competition might also drive firms to innovate and gain a competitive advantage.

Arnold et al. (2011);
Baldwin and Gu (2006);
Disney et al. (2003);
Scarpetta et al. (2002);
Harris and Li (2008);
Cameron (2003); Aghion et al. (2005, 2009).



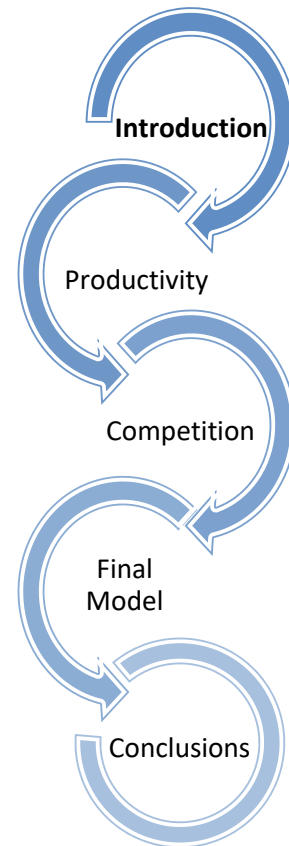
Literature Review

Haskel (1991) found that both higher levels of concentration and market share have a negative impact on TFP.

Nickell (1996) found that a 10% increase in price markups has a negative impact of 1.2 to 1.6 percentage points (on average) on TFP growth.

Ospina and Schiffbauer (2010) found that firms with a 20 percent higher markup have, on average, a 1.2 percent lower TFP level and a 8 percent lower labor productivity.

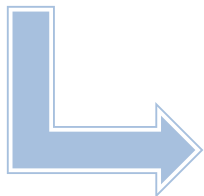
The main conclusion drawn from the literature review indicates a positive impact of competition on firm productivity.



Database: SCIE

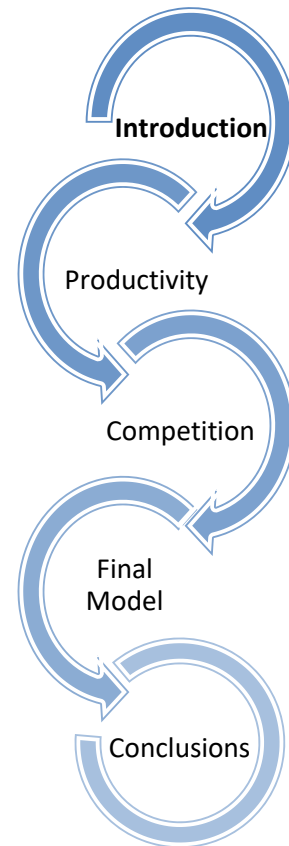
All Portuguese firms between 2010 and 2015 (12M observations).

“Cleaning” the database



Financial industry, public sector,
health, education,... were
excluded.*

Firms with less than 5 workers.**

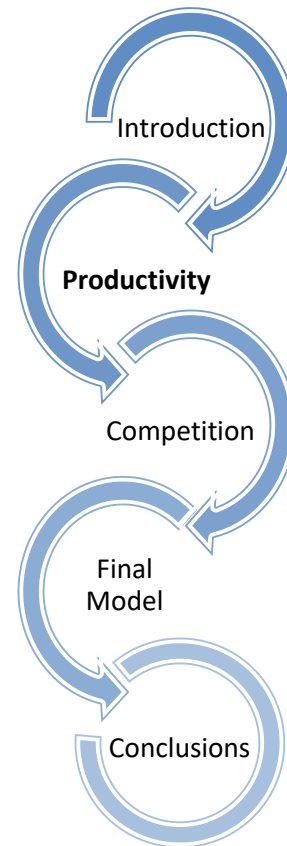


Productivity

Two types of firm productivity are considered: **Total Factor Productivity** (TFP) and **Labor Productivity**.

Labor Productivity is measured as the ratio of gross value added at factor costs to the number of employees.

$$\text{Labor Productivity} = \frac{\text{Gross V.A. (at factor costs)}}{\text{number of employees}}$$

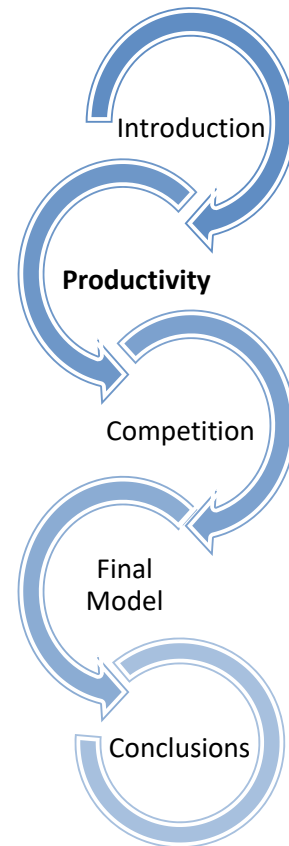


Total Factor Productivity

To calculate total factor productivity, we use **three different approaches**: Levinsohn and Petrin (2003) approach (**TFP LevPet**), the conventional OLS procedure (**TFP OLS**) and an OLS procedure using year and industry fixed effects (**TFP OLS Fixed effects**).

TFP LevPet will be considered for the main model.

LevPet method follows a semi-parametric approach and addresses simultaneity and selection bias. It also assumes that productivity is the only unobservable variable.



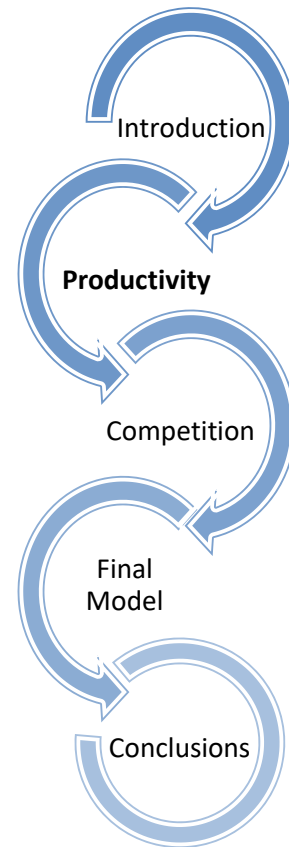
Total Factor Productivity: LevPet

Turnover was used as the **output measure**.

Basu and Fernald (1997) prove the existence of biased returns to scale under value added production functions.

Fixed tangible assets were used as physical capital, **labor costs** as labor and **external supplies and services** as materials.

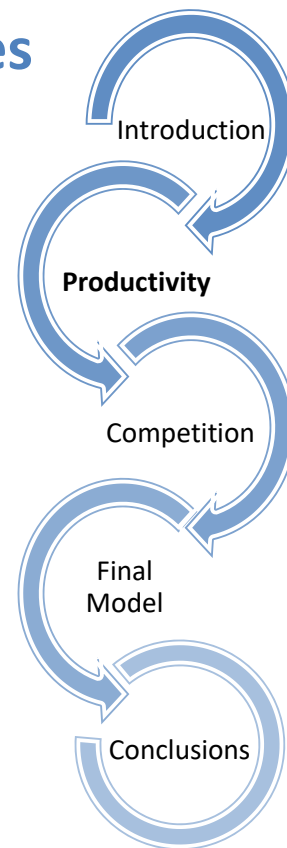
The estimation assumes **homogeneity** of the **labor force**.



Comparison of alternative production function estimates

Variables	LevPet	OLS	Fixed effects
Capital (k)	0.07***	0.038259***	0.032265***
Labor (l)	0.394091***	0.391949***	0.361015***
Material (m)	0.44***	0.575819***	0.612551***
Sum of elasticities	0.904091	1.006027	1.005831

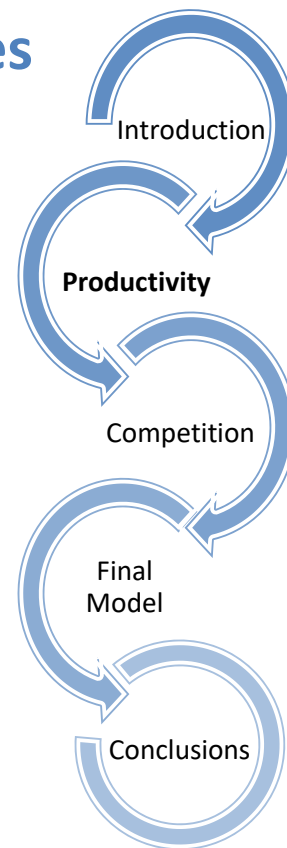
The results are consistent with Muendler (2004) and Levinsohn and Petrin (2003).



Comparison of alternative production function estimates

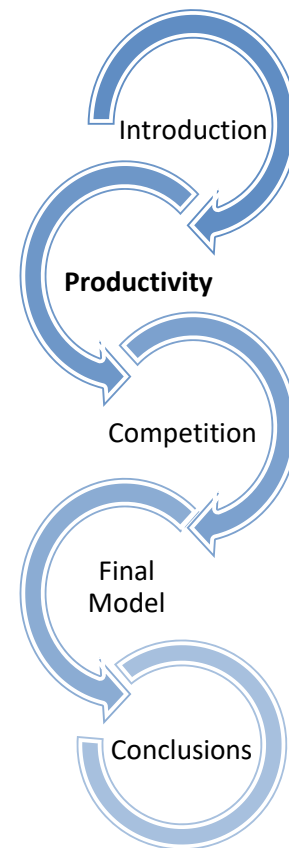
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Correlation coefficients for productivity measures

	TFP LevPet	TFP OLS	TFP fixed effects	Labor productivity
TFP LevPet	1.0000			
TFP OLS	0.9699	1.0000		
TFP fixed effects	0.9694	0.9995	1.0000	
Labor productivity	0.3264	0.2154	0.2139	1.0000



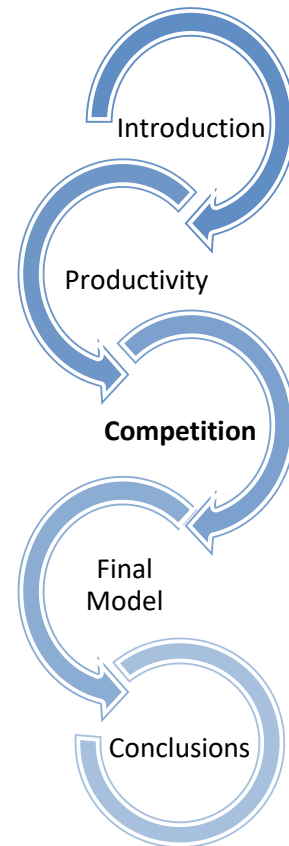
Competition

The Herfindahl-Hirschman Index, HHI, is one of the most widely used empirical indicators of a market's level of concentration.

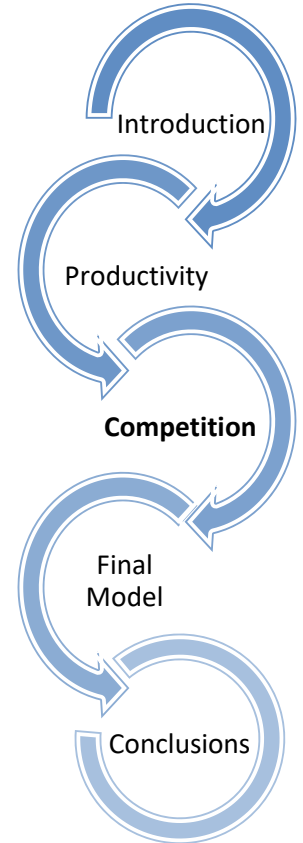
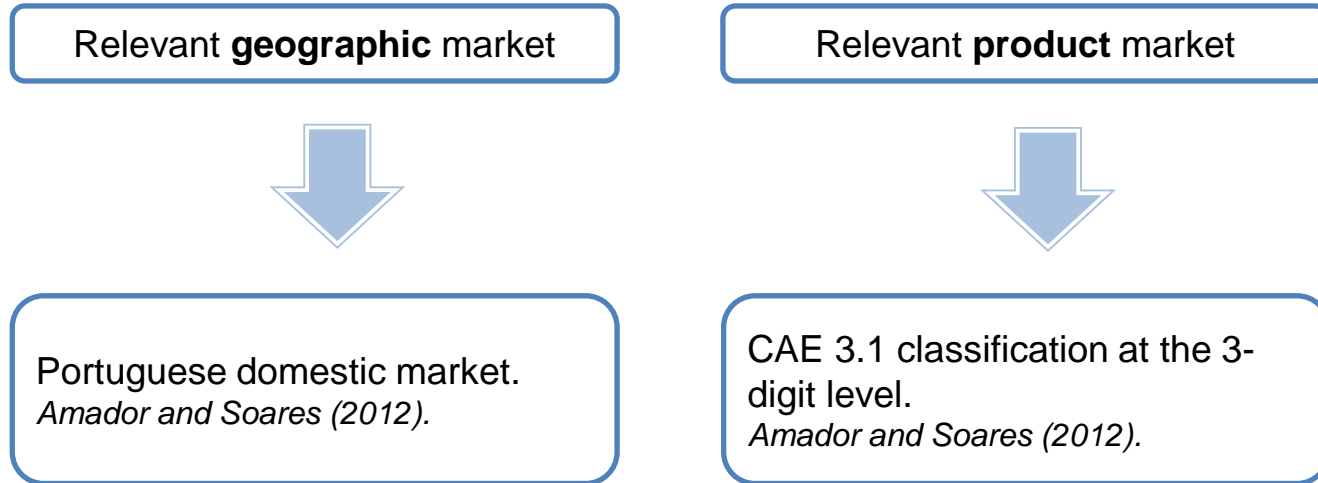
This index assesses market concentration as a function of the number of competitors and the distribution of market shares among them.

$$HHI_j = \sum_{i=1}^N s_i^2$$

N stands for the total number of firms in market j , and s_i denotes the market share of firm i .



Defining the relevant market

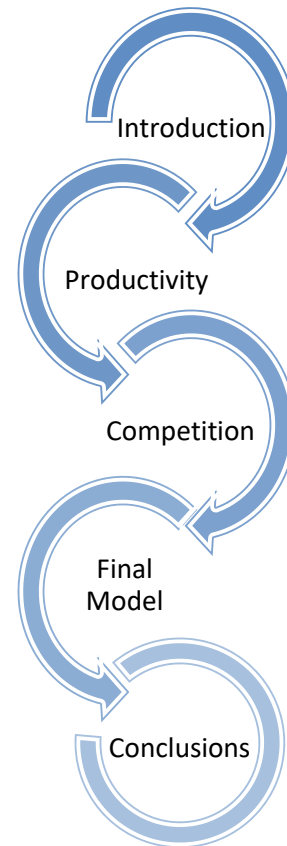


Further treatments of the database

Any firm with Labor productivity above 1.7 M€ per employee per year was excluded from our final model.*

Exclude all the relevant markets where there was a set of firms whose market changed over the years and they did not belong to a competitive fringe.

A firm belongs to the competitive fringe if it has a market share at most twenty times smaller than the largest firm operating in its market.



*Included to calculate the HHI.

Empirical relation between competition and firm productivity

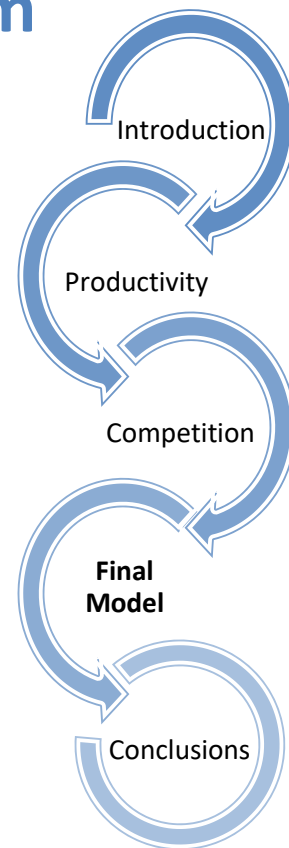
The empirical model is described by

$$y_{itj} = \beta_0 + \beta_c C_{itj} + \beta_x X_{itj} + \mu_t + \eta_j + \omega_i + \varepsilon_{itj}.$$

Industry (η_j), year (μ_t), and firm (ω_i) fixed effects.

The model includes a set of firm-specific control variables (X_{it}).

The ultimate goal of this work is to estimate the sign of β_c .

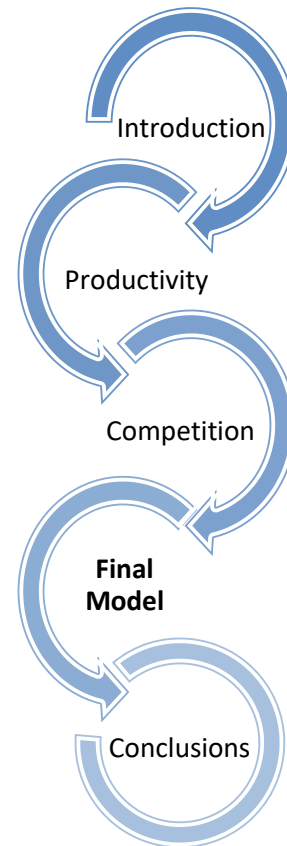


Determinants of TFP (Portuguese case):

The determinants were identified by Gonçalves and Martins (2016).



We are able to isolate the impact of competition on firm-level productivity.

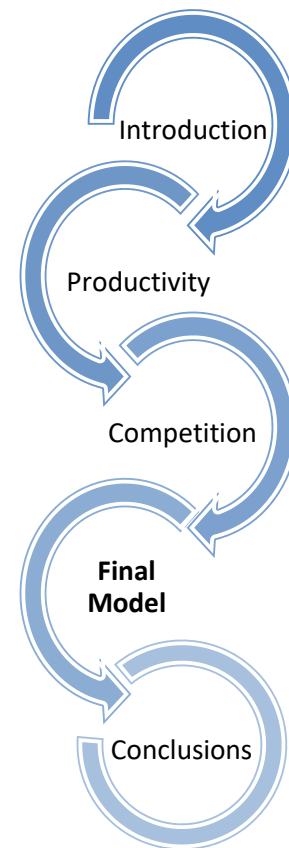


Fixed effect estimator: competition and productivity

VARIABLES	lnTFP LevPet	lnTFP OLS Fixed effects	lnLabor Productivity
lnHHI	-0.0130**	-0.0112*	-0.0170***
small	0.0576***	0.0248***	-0.0521***
medium	0.155***	0.0817***	-0.0512***
large	0.257***	0.137***	-0.0207
dumexportbdp	0.103***	0.0872***	0.0734***
Indebttoequity	-0.0270***	-0.0244***	-0.0823***
dumimports	0.0302***	0.0235***	0.0163***
lnwages	0.0432***	-0.00197	0.673***
dummysubsidies	-0.00925***	-0.0160***	0.0129***
Observations	226,287	226,287	230,438
Number of firms	58,906	58,906	60,041
R-squared	0.940	0.937	0.844

Heteroscedasticity robust standard errors.

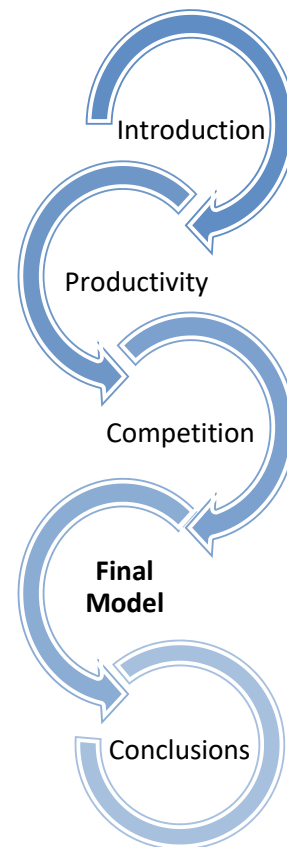
*** p<0.01, ** p<0.05, * p<0.1



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The coefficients show that the Herfindahl-Hirschman Index is **negatively correlated** with all the measures of productivity used.

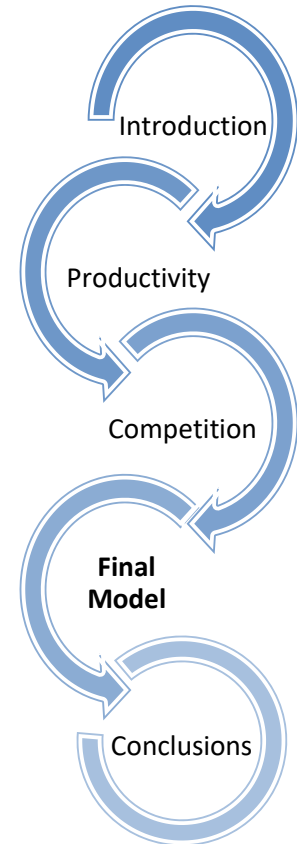


Fixed effect estimator: competition and productivity (robustness test)

VARIABLES	lnTFP LevPet	lnTFP LevPet	lnTFP OLS Fixed effects	lnTFP OLS Fixed effects	lnLabor Productivity	lnLabor Productivity
lnC4	-0.0223**		-0.0193**		-0.0173*	
lnC10		-0.0358***		-0.0287**		-0.0704***
small	0.0722***	0.0721***	0.0185***	0.0185***	-0.0376***	-0.0377***
medium	0.201***	0.201***	0.0572***	0.0570***	-0.0149*	-0.0150*
large	0.363***	0.363***	0.0974***	0.0975***	0.0684***	0.0683***
dumexportbdp	0.113***	0.113***	0.0844***	0.0843***	0.111***	0.111***
dumimports	0.0470***	0.0469***	0.0361***	0.0360***	0.0453***	0.0453***
lndebttoequity	-0.0243***	-0.0243***	-0.022***	-0.022***	-0.0660***	-0.0660***
lnwages	0.0520***	0.0520***	-0.00921*	-0.00924*	0.690***	0.690***
dumsubsidies	-0.0160***	-0.0161***	-0.023***	-0.023***	0.0148***	0.0148***
Observations	226,261	226,181	226,261	226,181	230,412	230,334
Number of id	58,092	58,885	58,902	58,885	60,037	60,020
R-squared	0.939	0.939	0.937	0.937	0.844	0.844

Heteroscedasticity robust standard errors.

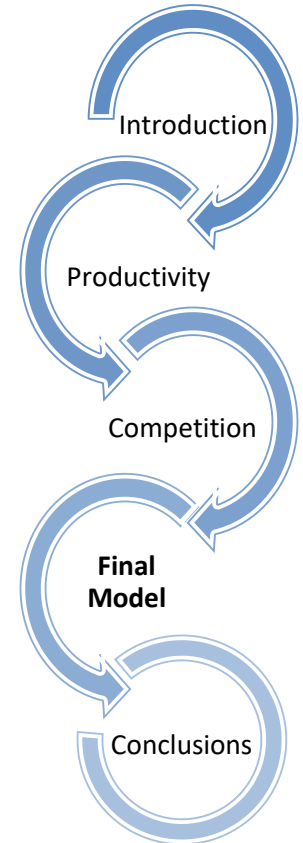
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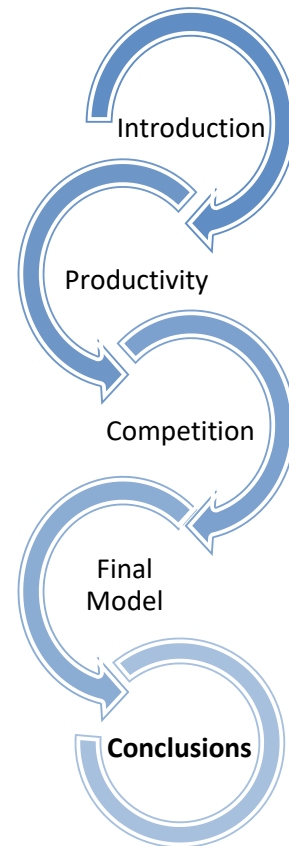
The results were found to be robust in all the cases.



Conclusions

The results show a positive association between competition and productivity for the Portuguese economy and were found to be robust to several specifications.

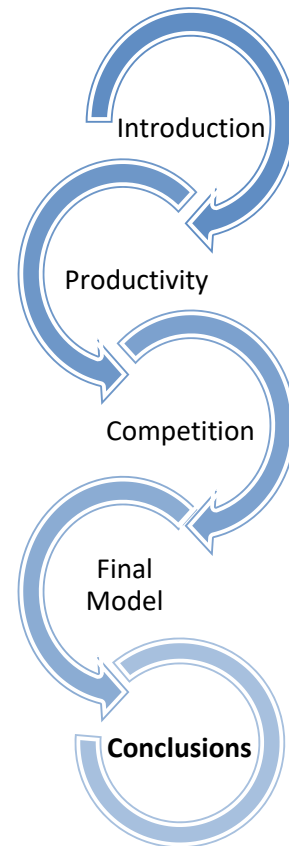
The results for the Portuguese economy are in line with international literature.



Further Research

Decompose each of the mechanisms by which competition boosts productivity for the Portuguese economy.

Analysis of a specific industry.



Q&A

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