BANK OF GREECE
EUROSYSTEM

Economic Bulletin
ISSN 1105 - 9729 (print)
ISSN 2654 - 1904 (online)

EXPORTING AND PERFORMANCE: EVIDENCE FROM GREEK FIRMS*

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1 INTRODUCTION

Since 2008, Greece has lost over 25% of its GDP as a consequence of a reduction in domestic demand, both consumption and investment. The survival of many companies has thus, to a large extent, been determined by their ability to look to foreign demand to fill the gap. Indeed, macro data point to an increase in exports, especially of goods, from 2010 onwards.[1] Moreover, there are also signs of sectoral reallocation towards tradable goods and services and, more generally, towards the more productive businesses across all economic sectors.[2]

An extensive literature exists exploring differences in performance between firms that export and those that do not. With only a few exceptions, exporters have characteristics which suggest "better" performance than non-exporters, controlling for observed and unobserved heterogeneity. In most empirical studies it is found that exporters are larger, more productive and more capital intensive. Findings also suggest that it is the most productive firms that usually begin exporting and that there is little evidence to support the view that exporting, through learning by doing, brings higher productivity. However, the transition of firms from producing solely for the domestic market to selling abroad involves rapid employment and output and higher productivity growth. Conversely, exiting firms experience sharp declines in output and employment. Other potential benefits of exporting firms may be located in terms of the number of jobs and, through higher plant survival rates, the stability of those jobs.

This paper aims to provide evidence on the differences between exporters and non-exporters in terms of labour productivity and profitability across time, different sectors of economic activity and different size groups, using data from exporting and non-exporting firms incorporated in Greece for the period 2006-2014. We also provide evidence on the effects of transitions in and out of exporting for our sample of firms. The remainder of the paper is organised as follows: Section 2 reviews the relevant literature on the differences between exporters and non-exporters using various measures of firm performance. In Section 3, we move on to the Greek case. Finally, Section 4 concludes presenting some policy implications and avenues for further research.

2 LITERATURE REVIEW: DIFFERENCES BETWEEN EXPORTERS AND NON-EXPORTERS

The literature dealing with the links between productivity and the international activities of firms was pioneered by Bernard and Jensen (1995). They used comprehensive longitudinal data from surveys performed regularly by official statistics in the United States to look at differences between exporters and non-exporters across various dimensions of a firm's performance, including productivity. The results provide evidence in favour of "better" performance of exporters compared to non-exporters: exporters are larger, more productive and more capital intensive. Labour productivity, measured as shipments per worker, was found to be 15% greater for exporters. Exporters are substantially larger than non-exporters even within industries. Employment at exporting plants is about 94% greater than at non-exporters within the same industry and wages are 9% higher on average in exporting

* Warm thanks are extended to our colleagues at the Economic Analysis and Research Department for their very useful comments. The views expressed in this article are those of the authors and do not necessarily reflect those of the Bank of Greece. The authors are responsible for any errors or omissions.

1 Greek exports of goods and services increased by 10.7% between 2010 and 2014, with exports of goods having increased by 18.6% and of services by 3.7%, according to ELSTAT National Accounts.

2 See Bank of Greece (2014), *Annual Report 2013*, Box V.1, and Bank of Greece (2016), *Annual Report 2015*, Box V.3.

establishments than in non-exporters. The total value of shipments is 110% higher at exporters than at non-exporters. It is also found that plants that become exporters grow the most, plants that cease exporting exhibit poor relative performance and movement into exporting is associated with success.

Subsequently, there have been many other studies using firm-level micro data to investigate performance differences between exporting and non-exporting firms and the direction of causality between export activity and firm-level productivity (see Wagner 2007 and 2012a for surveys). More recently, Tavares-Lehmann and Costa (2015) in their paper on performance differences between exporters and non-exporters in Portugal provide an overview of the literature on both the exporter productivity premium and the exporter profitability premium. For the case of Greece, Papadogonas and Voulgaris (2005) investigate the determinants of labour productivity growth at the firm level in the manufacturing sector using a sample of 3,035 firms that were active in the years 1995 and 1999 obtained from the ICAP database. The results show that labour productivity growth is positively related to the growth of net fixed assets per employee (K/L), export orientation and R&D activity. Firm size, employment growth and industry age negatively affect labour productivity growth. To our knowledge, there is no study addressing the issue of export premia for firms' performance in the Greek industry as a whole and for the most recent period.

In the literature the empirical strategies used to investigate the exports/performance relationship (see Wagner 2007) first address the issue of whether there exist exporter premia for plant/firm characteristics, controlling for industry and plant size:

$$\ln X_{it} = \alpha + \beta Export_{it} + \gamma Control_{it} + e_{it} \qquad (1)$$

where i is the firm, t is the year (t=0...T), X_{it} is the plant/firm performance measure, '$Export_{it}$' is a dummy for current export status and '$Control_{it}$' is a set of control variables (usually including industry, region, firm size measured by number of employees, exporter size captured by an interaction term between export status and size and year). The exporter premium, computed from the estimated coefficient β, shows the average percentage difference between exporters and non-exporters controlling for the characteristics included in the vector 'Control'. Export premia are found to be positive and significant for almost every performance characteristic through time and across countries.

With respect to labour productivity, it appears to be a stylised fact that exporters are more productive than non-exporters. Most studies for specific countries find a positive and significant exporter productivity premium: Bernard and Jensen (1995, 1999) for the United States, Bernard and Wagner (1997) and Vogel (2011) for Germany, De Loecker (2007) for Slovenia, Stöllinger et al. (2012) for Austria, Grazzi (2012) for Italy, Fariñas and Martín-Marcos (2007) for Spain, Tavares-Lehmann and Costa (2015) for Portugal and Van Biesebroeck (2005) for nine African countries. By contrast, studies by Girma et al. (2004) for Ireland and Greenaway et al. (2005) for Sweden find no productivity differences between exporters and non-exporters, while Fu and Wu (2013) for China find that exporters are less productive than non-exporters (see Wagner 2012a and Tavares-Lehmann and Costa (2015) for a survey of the relevant literature). The International Study Group on Exports and Productivity (ISGEP 2008) shows that "the average exporter premium in 14 countries, after controlling for individual fixed effects, is 7 per cent". Berthou et al. (2015) provide a cross-country evaluation for a panel of 15 European economies and 23 manufacturing sectors during the 2000s.[3] Exporters are found to be more productive than non-exporters and this productivity premium rises with the export experience of firms, with "always exporters" being much more produc-

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tive than starters. The evidence suggests that beyond entry into the export market, productivity is also an important determinant of firms' survival over a longer time period. It is also shown that both the level and the growth of firm-level exports rise with firm productivity, and that the bulk of aggregate exports in each country are made by a small number of highly productive firms. Finally, Berthou et al. (2015) provide evidence that during the crisis, the growth of exports of high-productivity firms contributed to the current account adjustment of European "stressed" economies.

When measuring firm performance by profitability, the results are less clear-cut, as emphasised in Wagner (2012a) and Tavares-Lehmann and Costa (2015). Yet, the majority of the studies in the literature find a positive exporter profitability premium, allowing them to bear the costs of internationalisation. Melitz (2003) in his theoretical model shows that exporters are more profitable than non-exporters because they are also more productive. Fryges and Wagner (2010) demonstrate that there is an exporter profitability premium, allowing exporters of German manufacturing firms to face all costs of internationalisation and still have profits afterwards. Kneller and Pisu (2010), based on survey data for the UK, find that exporting generates higher profitability and this ex-post effect of exporting is greater for always exporters and to a lesser extent for starters. On the contrary, Girma et al. (2004) find that there is no significant exporter profitability premium in Ireland. Helpman et al. (2004) find that exporters are less profitable than firms serving only their domestic market due to the fixed costs associated with internationalisation and the same line of reasoning is shared by Vogel and Wagner (2009) and Vogel (2009) for German business services sector. Grazzi (2012) finds ambiguous evidence about exporter profitability premium, with exporters being more profitable than non-exporters only for some sectors and years. Vu et al. (2014) use quantile regression to find higher profitability growth of exporters only in the highest percentiles (percentiles 70 and 80), but lower for percentile 10, as for firms with low profit growth profitability advantages are absorbed by the costs of internationalisation.

In the literature, to better understand the transformations that occur in firms when they start and stop exporting, and to better identify any potential benefits from exporting, growth rate regressions in the following spirit are estimated:

$$\Delta X_{it} = \alpha + \beta_1 Start_{it} + \beta_2 Both_{it} + \beta_3 Stop_{it} + \gamma\, Control_{it} + \varepsilon_{it} \qquad (2)$$

where ΔX_{it} is the change in the performance measure; '$Start_{it}$' is a dummy which identifies firms that start exporting during the sample period; '$Both_{it}$' identifies firms that exported throughout; '$Stop_{it}$' identifies firms that stop exporting during the period; and '$Control_{it}$' is a set of control variables (usually including industry, region, firm size measured by number of employees, exporter size captured by an interaction term between export status and size and year). Thus, the coefficients β_1, β_2, β_3 give the differential in growth rates for entrants, exporters throughout the sample and exits, relative to firms that never exported.

The conclusions are clear. Movements in and out of exporting generate more substantial changes. Exiting the export market is associated with bad outcomes for plants/firms, with significantly slower growth rates in the dependent variable being recorded compared to firms that do not exit. The year of entry into the export market is also a time of substantial improvement in firm performance.

In the literature, there are two alternative but not mutually exclusive hypotheses why exporters can be expected to be more productive than non-exporting firms (see Clerides et al. 1998, Bernard and Jensen 1999, Bernard and Wagner 1997, ISGEP 2008, Máñez-Castillejo et al. 2010, Yang and Mallick 2010). They differ in terms of the direction of causality between exporting and productivity. In the

"self-selection hypothesis", the causality runs from productivity to exporting in which only firms with high productivity ex-ante choose to export because exporting involves large sunk costs. The theoretical support for this hypothesis can be found in the seminal paper by Melitz (2003), that allows for within-industry heterogeneous productivity firms, in which only the most productive firms export while less productive firms either supply only the domestic market or exit the market. Furthermore, the behaviour of firms might be forward-looking in the sense that the desire to export tomorrow leads a firm to improve performance today to be competitive on the foreign market too. Cross-section differences between exporters and non-exporters may partly be explained by ex-ante differences between firms: the more productive firms become exporters. By contrast, the "learning-by-exporting hypothesis" proposes that firms gain higher ex-post productivity after exporting. This is due to a number of factors such as new knowledge and expertise from buyers (innovation), scale economies, and exposure to competition (which provides incentives to reduce inefficiency).

A standard approach to examine the direction of causality between exporting and productivity is found in Bernard and Jensen (1999).[4] To test the first hypothesis of self-selection of the more productive firms into export markets, they assume that if good firms become exporters then we should expect to find significant differences in performance measures between exporters and non-exporters several years before the former begin to export. To provide evidence on ex-ante characteristics, a subsample of firms is created including only firms that did not export for at least three years in a row, i.e. plants that did not export in years t-3, t-2 and t-1 but may or may not have exported in year t. Then, they regress the levels of performance measures in year t-3 on the export status of the plant in year t, along with fixed effects and time dummies.

$$\ln X_{it-3} = \alpha + \beta \text{Export}_{it} + \varepsilon_{it-3} \qquad (3)$$

The results from their analysis are quite clear. Good firms do become exporters. Future exporters already have most of the desirable performance characteristics several years before they enter the export market.

To test the hypothesis that exporting fosters productivity, the post-entry differences in productivity growth between export starters and non-exporters are investigated (see ISGEP 2008). This test is based on a comparison of firms that did not export in years t-3 to t-1, but exported in year t and in at least two years between the years t+1 and t+3 —these are the export starters— with firms from a control group that did not export in any year between t-3 and t+3. The empirical model used is:

$$\ln LP_{it+3} - \ln LP_{it+1} = \alpha + \beta \text{ Export}_{it} + \gamma \text{ Control}_{it} + e_{it} \qquad (4)$$

where ln LP is the log of labour productivity, 'Export_{it}' is a dummy variable that equals 1 for export starters and that equals zero for the firms from the control group and 'Control_{it}' is a set of control variables (usually including industry, region, firm size measured by number of employees, exporter size captured by an interaction term between export status and size and year). Evidence regarding the hypothesis of post-entry productivity growth of exporters is more mixed; exporting does not necessarily improve a firm's performance.

A further strand of the literature recognises that labour productivity is persistent (Clerides et al. 1998, Helpman et al. 2004 and Fariñas and Martín-Marcos 2007). Clerides et al. (1998), as a robustness check, used a generalised method of moments (GMM) estimator to deal with endogeneity and serial correlation in the estimation of marginal cost functions. Fariñas and Martín-Marcos (2007) apply instrumental variables to address the endogeneity problem in the estimation of production functions. Unobserved heterogeneity and

4 Many studies, such as Wagner (2002), Máñez-Castillejo et al. (2010), Yang and Mallick (2010), use the matching approach to test the direction of causality between exports and productivity.

potential simultaneity in the estimation of the production function are addressed using the GMM first differenced estimator (Arellano and Bond 1991). Thus, to address the persistence of productivity, equation (1) is re-estimated to include a lagged dependent variable. To deal with the possible bias introduced, especially in panels with a short time series (Galvao 2011), it is necessary to use the Arellano-Bond GMM estimator.

Finally, a number of papers use quantile regressions with fixed effects and instrumental variables (Wagner 2012b, Powell and Wagner 2011, Powell 2016). The rationale stems from the observation that there is considerable firm heterogeneity along the distribution with both low and high productivity firms that export and many that do not. Thus, it is better to estimate the export premium along the productivity distribution and not just at the mean. These studies generally show that the export premium does indeed vary along the distribution.

3 EMPIRICAL INVESTIGATION

3.1 DATA AND DESCRIPTIVE STATISTICS

We use data from ICAP with information on annual balance sheets and profit and loss accounts at firm-level, as well as data on the sector of economic activity to which each firm belongs, the number of employees, the year of establishment and exporting status. We delete the consolidated accounts of company groups, preferring to work with individual firms that make up the group. In this way, it is easier to assign firms to a particular industry. The data are available for 2006-2014 and consist of 60,325 firms across all industries. This amounts to 312,734 observations, after having removed outliers in the calculation of financial indices.[5] Since this paper's focus is on the differences distinguishing exporting from non-exporting firms, we created six different binary variables depending on the exporting status of the firm – exporters, non-exporters, "always exporters" (i.e. firms exporting throughout the period), never having exported, starters (firms not exporting in t-1 and engaging in export activity in t) and stoppers (firms initially exporting in t-1, but stopping their exporting activity in t). Table 1 provides a clear overview of firms according to their exporting status: 81% of firms for the whole sample never exported, while 13% of firms always exported and 6% switched status across years. Interestingly, in the period reviewed the percentage of firms entering in export market ("starters") exceeds the percentage of firms exiting the export market ("stoppers"), suggesting that Greek firms were becoming more open; though the number of companies changing status is small.

Table 2 presents a more detailed decomposition of firms by exporting status and sector of

5 We chose not to remove outliers using automatic methods such as winsorising. The period under examination, by its very nature, is likely to contain "outliers". Their automatic removal, however, would introduce a bias into the sample of companies, for example, by removing failing companies that record large negative profits in their last years of life.

Table 1 Number (and percentage) of firms in each category of firm for the 2006-2014 period

Exporters	9,076 (15.1%)
Non-exporters	51,249 (85.0%)
Always exporters	7,676 (12.7%)
Firms that have never exported	48,898 (81.1%)
Starters	2,659 (4.4%)
Stoppers	1,713 (2.8%)

Source: Authors' own calculations from ICAP database.

Table 2 Share of firms by exporting status and sector of economic activity in the 2006-2014 period

(%)

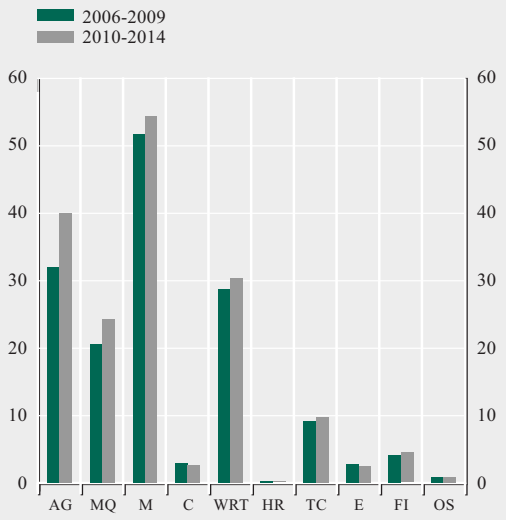
	Exporters	Always exporters	Starters	Stoppers	Never exported
Agriculture, forestry and fishing	35.7	26.5	14.4	10.1	54.7
Mining and quarrying	22.4	20.1	2.3	1.0	76.6
Manufacturing	53.2	44.1	12.8	7.9	38.6
Construction	2.7	1.6	2.0	1.6	95.5
Wholesale and retail trade	29.6	22.0	10.9	7.4	62.6
Accommodation and food service activities	0.3	0.2	0.1	0.1	99.6
Transport and communication	9.5	6.2	5.7	2.4	86.8
Energy	2.6	1.3	2.3	0.9	95.9
Financial intermediation activities	4.3	2.3	3.3	1.7	93.2
Other services	0.9	0.6	0.7	0.4	98.5

Source: Authors' own calculations from ICAP database.
Note: The sectors of economic activity correspond to NACE Rev. 2 classification (see footnote 6).

economic activity.[6] As expected, "manufacturing", "agriculture, forestry and fishing" and "wholesale and retail trade" as well as "mining and quarrying" are the sectors mostly involved in exporting activity and register the highest rates of "starters".

Chart 1 Share (in percent total) of exporting firms by sector of economic activity

(%)



Source: Authors' own calculations from ICAP dataset.
Note: "AG" = Agriculture, forestry and fishing , "MQ" = Mining and quarrying, "M" = Manufacturing, "C" = Construction, "WRT" = Wholesale and retail trade, "HR" = Accommodation and food service activities (Hotels & Restaurants), "TC" = Transport and communication, "E" = Energy, "FI" = Financial intermediation activities and "OS" = Other services (see also footnote 6).

Most sectors of economic activity show increased —albeit slightly higher— exporting activity, measured by the number of exporting firms in our sample, in the crisis period (see Chart 1), with traditionally tradable sectors, such as "agriculture, forestry and fishing", "manufacturing", "mining and quarrying", "wholesale and retail trade" and "transport and communication" sectors, exhibiting higher openness. As the crisis has proceeded there has been a tendency for mainly micro SMEs ("1-9" and "10-19") to become more export-oriented. By contrast, the share of bigger exporting firms in the total number of exporters has declined. This reflects a structural characteristic of Greek industry where SMEs —and in particular micro SMEs— predominate (see Chart 2). Exporting

6 The sectors of economic activity correspond to NACE Rev. 2 classification: "Agriculture, forestry and fishing" ("AG") comprises codes 01-03, "Mining and quarrying" ("MQ") codes 05-09, "Manufacturing" ("M") codes 10-33, "Construction" ("C") codes 41-43, "Wholesale and retail trade" ("WRT") codes 45- 47, "Accommodation and food service activities" ("HR") codes 55-56, "Transport and communication" ("TC") codes 49-53 and 58-63, "Energy" ("E") codes 35-39, "Financial intermediation activities" ("FI") codes 64-66 and 69-82, "Real estate" ("RE") code 68 and "Other services" ("OS") codes 84-96.

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In the literature, there are two alternative but not mutually exclusive hypotheses why exporters can be expected to be more productive than non-exporting firms (see Clerides et al. 1998, Bernard and Jensen 1999, Bernard and Wagner 1997, ISGEP 2008, Máñez-Castillejo et al. 2010, Yang and Mallick 2010). They differ in terms of the direction of causality between exporting and productivity. In the

"self-selection hypothesis", the causality runs from productivity to exporting in which only firms with high productivity ex-ante choose to export because exporting involves large sunk costs. The theoretical support for this hypothesis can be found in the seminal paper by Melitz (2003), that allows for within-industry heterogeneous productivity firms, in which only the most productive firms export while less productive firms either supply only the domestic market or exit the market. Furthermore, the behaviour of firms might be forward-looking in the sense that the desire to export tomorrow leads a firm to improve performance today to be competitive on the foreign market too. Cross-section differences between exporters and non-exporters may partly be explained by ex-ante differences between firms: the more productive firms become exporters. By contrast, the "learning-by-exporting hypothesis" proposes that firms gain higher ex-post productivity after exporting. This is due to a number of factors such as new knowledge and expertise from buyers (innovation), scale economies, and exposure to competition (which provides incentives to reduce inefficiency).

A standard approach to examine the direction of causality between exporting and productivity is found in Bernard and Jensen (1999).[4] To test the first hypothesis of self-selection of the more productive firms into export markets, they assume that if good firms become exporters then we should expect to find significant differences in performance measures between exporters and non-exporters several years before the former begin to export. To provide evidence on ex-ante characteristics, a subsample of firms is created including only firms that did not export for at least three years in a row, i.e. plants that did not export in years t-3, t-2 and t-1 but may or may not have exported in year t. Then, they regress the levels of performance measures in year t-3 on the export status of the plant in year t, along with fixed effects and time dummies.

$$\ln X_{it-3} = \alpha + \beta \text{Export}_{it} + \varepsilon_{it-3} \qquad (3)$$

The results from their analysis are quite clear. Good firms do become exporters. Future exporters already have most of the desirable performance characteristics several years before they enter the export market.

To test the hypothesis that exporting fosters productivity, the post-entry differences in productivity growth between export starters and non-exporters are investigated (see ISGEP 2008). This test is based on a comparison of firms that did not export in years t-3 to t-1, but exported in year t and in at least two years between the years t+1 and t+3 —these are the export starters— with firms from a control group that did not export in any year between t-3 and t+3. The empirical model used is:

$$\ln LP_{it+3} - \ln LP_{it+1} = \alpha + \beta \text{ Export}_{it} + \gamma \text{ Control}_{it} + e_{it} \qquad (4)$$

where ln LP is the log of labour productivity, 'Export_{it}' is a dummy variable that equals 1 for export starters and that equals zero for the firms from the control group and 'Control_{it}' is a set of control variables (usually including industry, region, firm size measured by number of employees, exporter size captured by an interaction term between export status and size and year). Evidence regarding the hypothesis of post-entry productivity growth of exporters is more mixed; exporting does not necessarily improve a firm's performance.

A further strand of the literature recognises that labour productivity is persistent (Clerides et al. 1998, Helpman et al. 2004 and Fariñas and Martín-Marcos 2007). Clerides et al. (1998), as a robustness check, used a generalised method of moments (GMM) estimator to deal with endogeneity and serial correlation in the estimation of marginal cost functions. Fariñas and Martín-Marcos (2007) apply instrumental variables to address the endogeneity problem in the estimation of production functions. Unobserved heterogeneity and

4 Many studies, such as Wagner (2002), Máñez-Castillejo et al. (2010), Yang and Mallick (2010), use the matching approach to test the direction of causality between exports and productivity.

potential simultaneity in the estimation of the production function are addressed using the GMM first differenced estimator (Arellano and Bond 1991). Thus, to address the persistence of productivity, equation (1) is re-estimated to include a lagged dependent variable. To deal with the possible bias introduced, especially in panels with a short time series (Galvao 2011), it is necessary to use the Arellano-Bond GMM estimator.

Finally, a number of papers use quantile regressions with fixed effects and instrumental variables (Wagner 2012b, Powell and Wagner 2011, Powell 2016). The rationale stems from the observation that there is considerable firm heterogeneity along the distribution with both low and high productivity firms that export and many that do not. Thus, it is better to estimate the export premium along the productivity distribution and not just at the mean. These studies generally show that the export premium does indeed vary along the distribution.

3 EMPIRICAL INVESTIGATION

3.1 DATA AND DESCRIPTIVE STATISTICS

We use data from ICAP with information on annual balance sheets and profit and loss accounts at firm-level, as well as data on the sector of economic activity to which each firm belongs, the number of employees, the year of establishment and exporting status. We delete the consolidated accounts of company groups, preferring to work with individual firms that make up the group. In this way, it is easier to assign firms to a particular industry. The data are available for 2006-2014 and consist of 60,325 firms across all industries. This amounts to 312,734 observations, after having removed outliers in the calculation of financial indices.[5] Since this paper's focus is on the differences distinguishing exporting from non-exporting firms, we created six different binary variables depending on the exporting status of the firm – exporters, non-exporters, "always exporters" (i.e. firms exporting throughout the period), never having exported, starters (firms not exporting in t-1 and engaging in export activity in t) and stoppers (firms initially exporting in t-1, but stopping their exporting activity in t). Table 1 provides a clear overview of firms according to their exporting status: 81% of firms for the whole sample never exported, while 13% of firms always exported and 6% switched status across years. Interestingly, in the period reviewed the percentage of firms entering in export market ("starters") exceeds the percentage of firms exiting the export market ("stoppers"), suggesting that Greek firms were becoming more open; though the number of companies changing status is small.

Table 2 presents a more detailed decomposition of firms by exporting status and sector of

5 We chose not to remove outliers using automatic methods such as winsorising. The period under examination, by its very nature, is likely to contain "outliers". Their automatic removal, however, would introduce a bias into the sample of companies, for example, by removing failing companies that record large negative profits in their last years of life.

Table 1 Number (and percentage) of firms in each category of firm for the 2006-2014 period

Exporters	9,076 (15.1%)
Non-exporters	51,249 (85.0%)
Always exporters	7,676 (12.7%)
Firms that have never exported	48,898 (81.1%)
Starters	2,659 (4.4%)
Stoppers	1,713 (2.8%)

Source: Authors' own calculations from ICAP database.

Table 2 Share of firms by exporting status and sector of economic activity in the 2006-2014 period

(%)

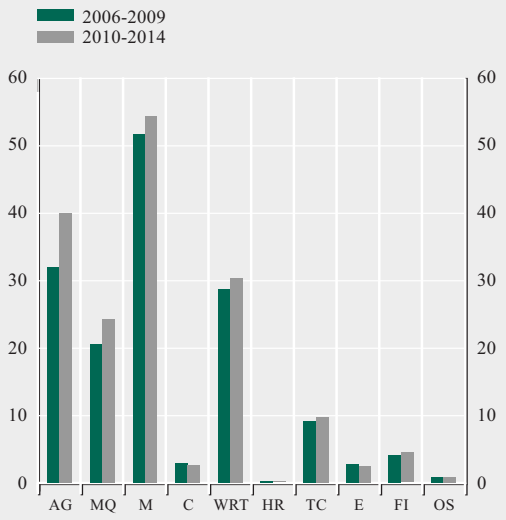
	Exporters	Always exporters	Starters	Stoppers	Never exported
Agriculture, forestry and fishing	35.7	26.5	14.4	10.1	54.7
Mining and quarrying	22.4	20.1	2.3	1.0	76.6
Manufacturing	53.2	44.1	12.8	7.9	38.6
Construction	2.7	1.6	2.0	1.6	95.5
Wholesale and retail trade	29.6	22.0	10.9	7.4	62.6
Accommodation and food service activities	0.3	0.2	0.1	0.1	99.6
Transport and communication	9.5	6.2	5.7	2.4	86.8
Energy	2.6	1.3	2.3	0.9	95.9
Financial intermediation activities	4.3	2.3	3.3	1.7	93.2
Other services	0.9	0.6	0.7	0.4	98.5

Source: Authors' own calculations from ICAP database.
Note: The sectors of economic activity correspond to NACE Rev. 2 classification (see footnote 6).

economic activity.[6] As expected, "manufacturing", "agriculture, forestry and fishing" and "wholesale and retail trade" as well as "mining and quarrying" are the sectors mostly involved in exporting activity and register the highest rates of "starters".

Chart 1 Share (in percent total) of exporting firms by sector of economic activity

(%)

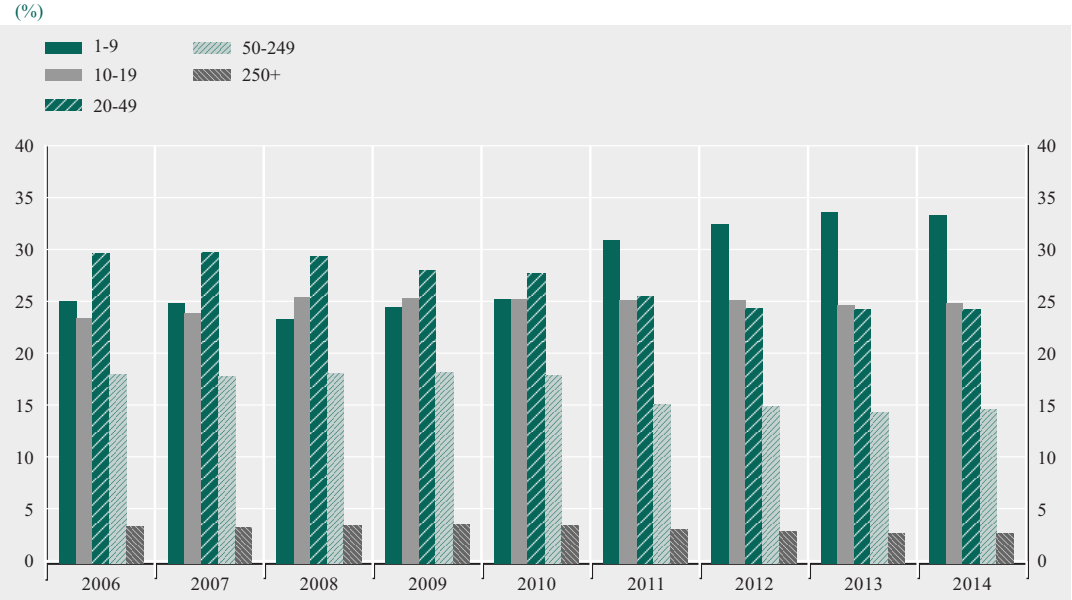


Source: Authors' own calculations from ICAP dataset.
Note: "AG" = Agriculture, forestry and fishing , "MQ" = Mining and quarrying, "M" = Manufacturing, "C" = Construction, "WRT" = Wholesale and retail trade, "HR" = Accommodation and food service activities (Hotels & Restaurants), "TC" = Transport and communication, "E" = Energy, "FI" = Financial intermediation activities and "OS" = Other services (see also footnote 6).

Most sectors of economic activity show increased —albeit slightly higher— exporting activity, measured by the number of exporting firms in our sample, in the crisis period (see Chart 1), with traditionally tradable sectors, such as "agriculture, forestry and fishing", "manufacturing", "mining and quarrying", "wholesale and retail trade" and "transport and communication" sectors, exhibiting higher openness. As the crisis has proceeded there has been a tendency for mainly micro SMEs ("1-9" and "10-19") to become more export-oriented. By contrast, the share of bigger exporting firms in the total number of exporters has declined. This reflects a structural characteristic of Greek industry where SMEs —and in particular micro SMEs— predominate (see Chart 2). Exporting

6 The sectors of economic activity correspond to NACE Rev. 2 classification: "Agriculture, forestry and fishing" ("AG") comprises codes 01-03, "Mining and quarrying" ("MQ") codes 05-09, "Manufacturing" ("M") codes 10-33, "Construction" ("C") codes 41-43, "Wholesale and retail trade" ("WRT") codes 45- 47, "Accommodation and food service activities" ("HR") codes 55-56, "Transport and communication" ("TC") codes 49-53 and 58-63, "Energy" ("E") codes 35-39, "Financial intermediation activities" ("FI") codes 64-66 and 69-82, "Real estate" ("RE") code 68 and "Other services" ("OS") codes 84-96.

Chart 2 Share (in percent total) of exporting firms by size class in the 2006-2014 period



Source: Authors' own calculations from ICAP dataset.

firms with "1-9" employees increased as a share of total exporters from 25.1% in 2006 to 33.3% in 2014 and "10-19" size firms also increased from 23.5% in 2006 to 24.9% in 2014. This finding is in line with Nassr et al. (2016), who also find that Greece has one of the highest shares of micro SMEs in its business demography among OECD countries.

Before proceeding with the estimation of whether exporting firms are more productive and more profitable than non-exporting ones, we provide a descriptive analysis of the two main variables related to firms' performance – namely, labour productivity and profitability.[7] Once the ratios are computed using the firm-level data, they are aggregated along five dimensions: time, 2-digit sectoral level (NACE Rev. 2), 1-digit sectoral level, size class and exporting status.[8] To better assess firms' characteristics before the crisis and during the crisis, the indicators are reviewed for two sub-periods, 2006-2009 and 2010-2014.

Labour productivity is defined as real turnover (sales and other operating income deflated using the output deflator at a 64-sector level from ELSTAT national accounts) over number of employees. This is one of the most important measures of a firm's performance and an index of competitiveness. Charts 3-6 provide some descriptives for our sample of companies. Median labour productivity fell in the crisis period in all sectors with the exception of "agriculture, forestry and fishing" (see Chart 3); nevertheless, exporting firms exhibit a steadily significantly higher labour productivity across time and sectors of economic activity (see Charts 4-5). Labour productivity of exporting firms has followed a downward path since 2008, before registering an upturn in 2012. Sectoral data on labour productivity at the 2-digit level point to higher productivity of exporting firms in the crisis period in "crop and animal production", "fishing and aquaculture", "coke and refined petroleum products", "electricity, gas, steam and air conditioning supply",

7 The description of the data largely follows Ferrando et al. (2015).
8 Gibson and Pavlou (2017) review other additional indicators relating to firm performance. The results are in line with expectations, providing reassurance about the quality of the data.

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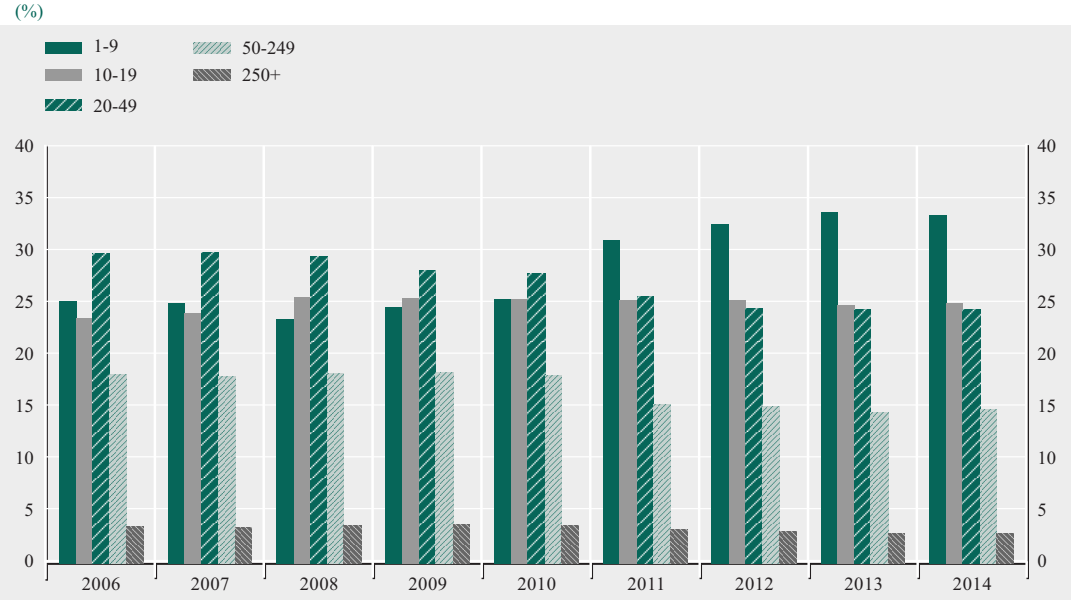

Source: Authors' own calculations from ICAP dataset.

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7 The description of the data largely follows Ferrando et al. (2015).
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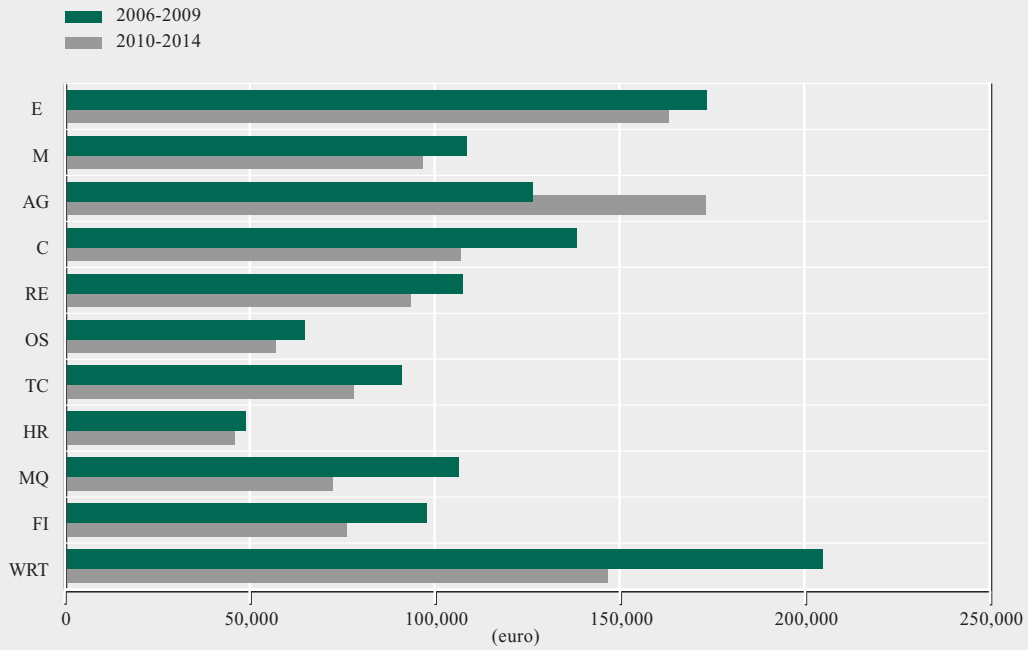
Chart 3 Median labour productivity by sector of economic activity

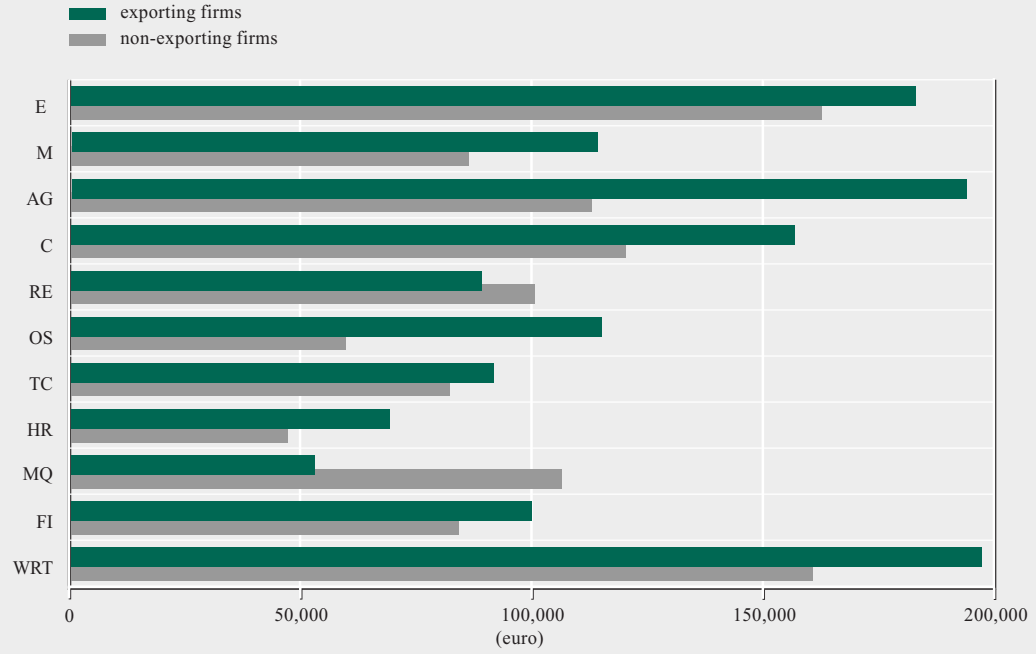


Source: Authors' own calculations from ICAP dataset.
Note: "E" = Energy, "M" = Manufacturing, "AG" = Agriculture, forestry and fishing , "C" = Construction, "RE" = Real estate, "OS" = Other services, "TC" = Transport and communication, "HR" = Accommodation and food service activities (Hotels & Restaurants), "MQ" = Mining and quarrying, "FI" = Financial intermediation activities, and "WRT" = Wholesale and retail trade (see also footnote 6).

"manufacture of food and beverage products", "land transport, "transport via pipelines", "warehousing and support activities for transportation", "programming and broadcasting activities" and "telecommunications". The performance of firms across different size categories indicates that median labour productivity is mostly higher in upper size classes. The smallest companies which exhibited dynamic productivity in the pre-crisis years appear to have been particularly badly hit by the crisis, though this could also reflect that as firms fail and their turnover declines, they lay off workers and move into the smallest size category, that is, it is a compositional effect (see Chart 6).

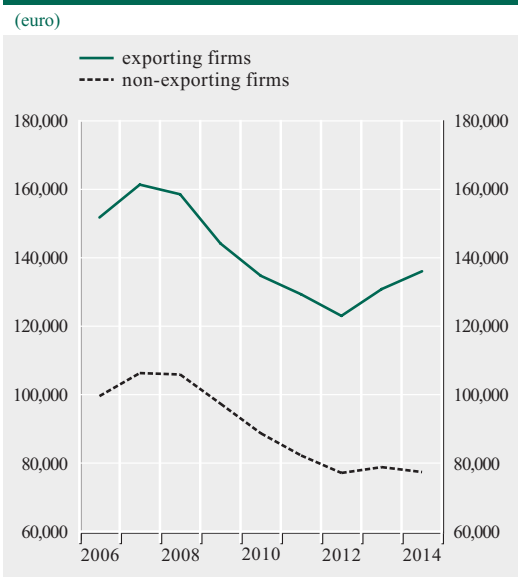
The rate of return on assets (RoA), defined as earnings before interest, taxes and depreciation over total assets, is used to estimate the quality of a company's earnings, as it shows how efficiently the company is using its assets to collect cash from sales and customers. The performance of exporting firms across different size categories shows that medium-sized firms do tend to have higher profitability than very large or very small firms (see Chart 7). Exporters are more profitable than non-exporters throughout time and across all sectors (see Chart 8). Higher profitability was recorded, in terms of median RoA, during the crisis, mainly due to the performance of exporting firms in certain industries; median RoA was higher in the 2010-2014 period in "agriculture, forestry and fishing" (crop and animal production, fishing and aquaculture), in "mining and quarrying", in "manufacture of food products", in "coke and refined petroleum products", in "energy" (sewerage, waste collection and waste management services), in the "tourism" sector, in "financial services" (mainly insurance, reinsurance and pension

Chart 4 Median labour productivity by exporting status and sector of economic activity



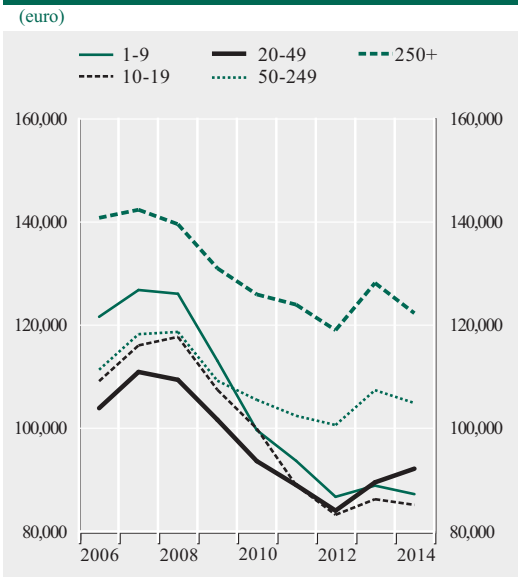
Source: Authors' own calculations from ICAP dataset.
Note: "E" = Energy, "M" = Manufacturing, "AG" = Agriculture, forestry and fishing , "C" = Construction, "RE" = Real estate, "OS" = Other services, "TC" = Transport and communication, "HR" = Accommodation and food service activities (Hotels & Restaurants), "MQ" = Mining and quarrying, "FI" = Financial intermediation activities, and "WRT" = Wholesale and retail trade (see also footnote 6).

Chart 5 Median labour productivity by exporting status



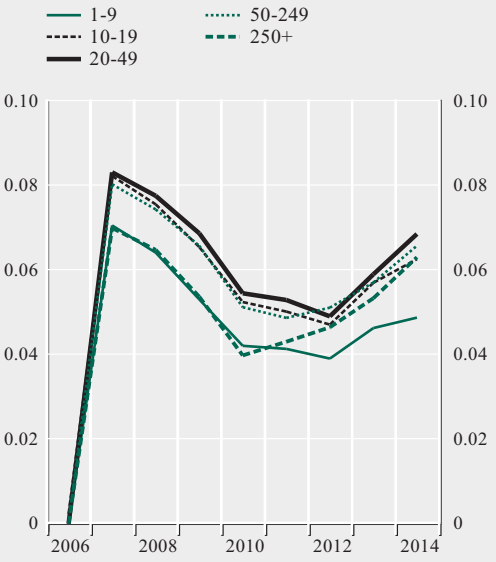
Source: Authors' own calculations from ICAP dataset.

Chart 6 Median labour productivity by size class



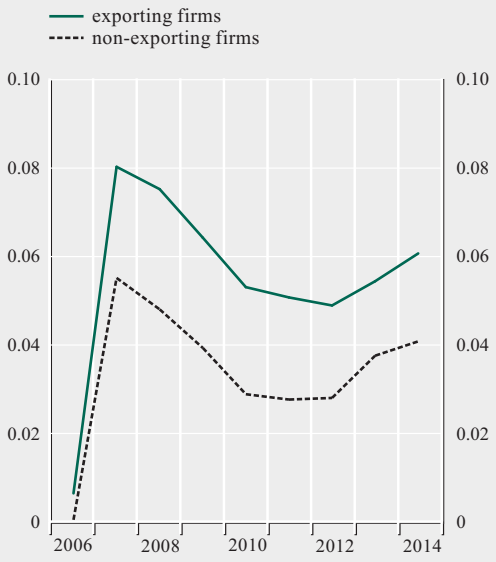
Source: Authors' own calculations from ICAP dataset.

Chart 7 Median RoA by size class



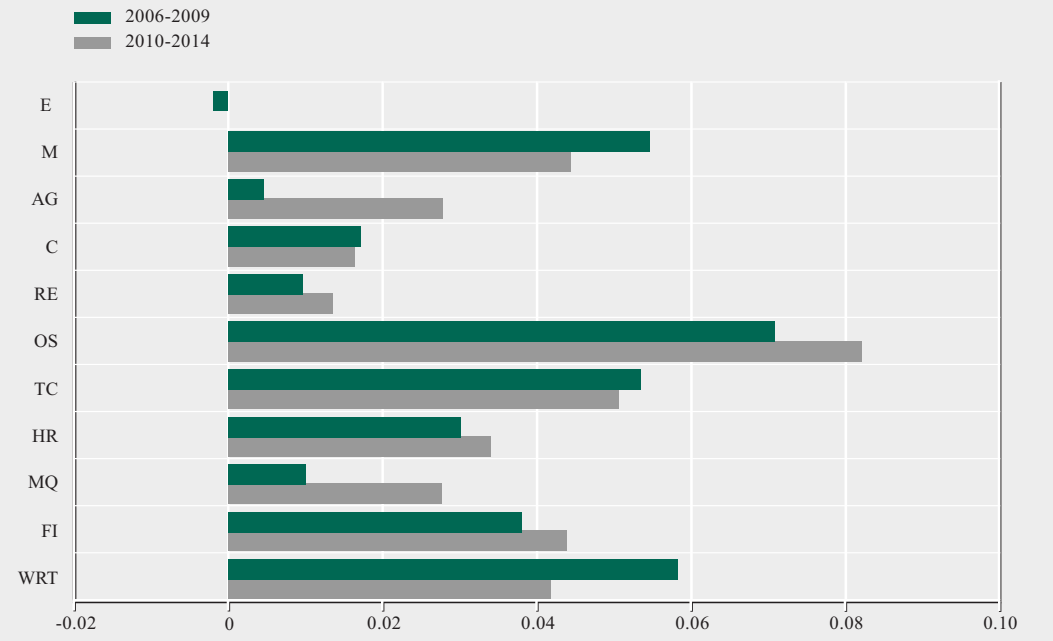
Source: Authors' own calculations from ICAP dataset.

Chart 8 Median RoA by exporting status



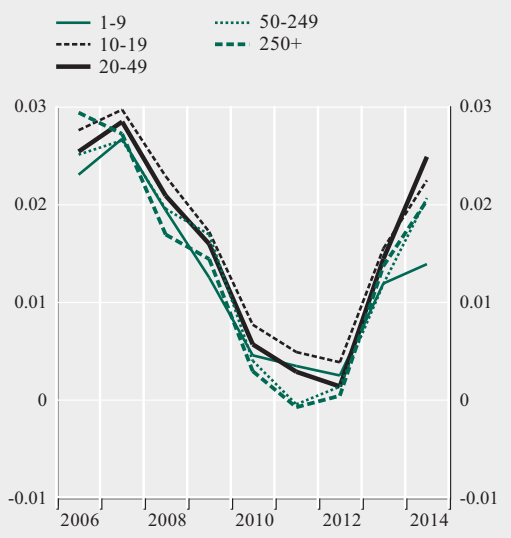
Source: Authors' own calculations from ICAP dataset.

Chart 9 Median RoA by sector of economic activity



Source: Authors' own calculations from ICAP dataset.
Note: "E" = Energy, "M" = Manufacturing, "AG" = Agriculture, forestry and fishing , "C" = Construction, "RE" = Real estate, "OS" = Other services, "TC" = Transport and communication, "HR" = Accommodation and food service activities (Hotels & Restaurants), "MQ" = Mining and quarrying, "FI" = Financial intermediation activities, and "WRT" = Wholesale and retail trade (see also footnote 6).

Chart 10 Operating profits to total assets, median, by size class



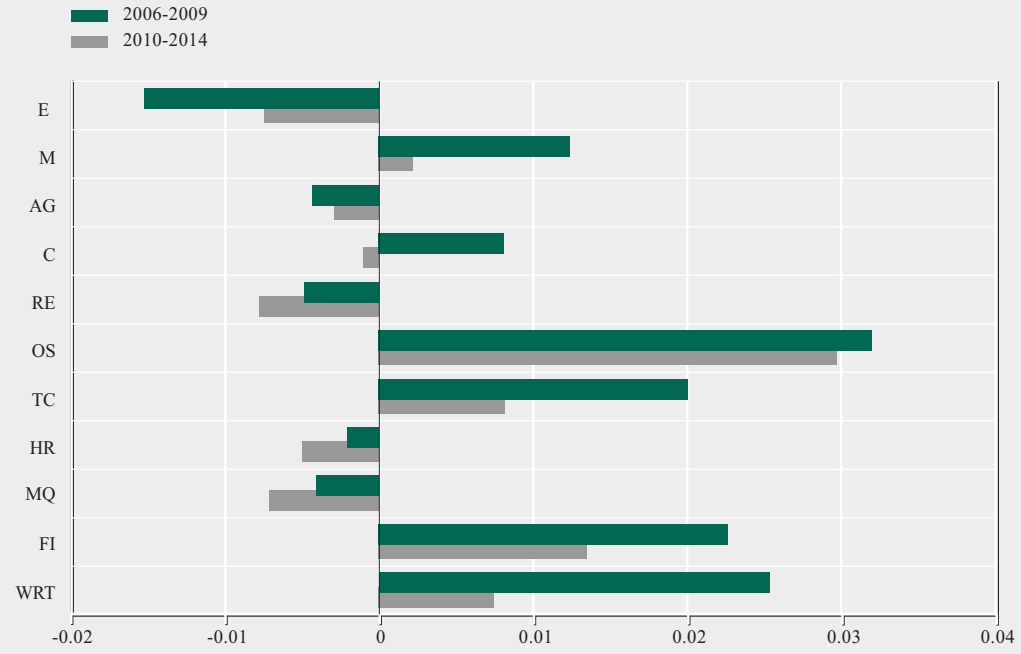
Source: Authors' own calculations from ICAP dataset.

funding) as well as in "other services" sector (see Chart 9).[9]

Our second measure of profitability is median **operating profits to total assets**. It is an important measure of a firm's profitability as it explains how much earnings were generated from operations per se and it is often thought less amenable to accounting manipulation. It followed the same path through time as median RoA, falling and bottoming out in 2012 before rising again. Medium-sized firms had higher profitability compared to small and large firms (see Chart 10). Operating profits fell in all broad sectors in the crisis period (see Chart 11), but when examining the perform-

9 Although median RoA slightly fell in 2010-2014 in the broad sector Transport and communication "TC" (see Chart 9), the analysis at 2-digit level shows higher performance in the sectors of "land transport", "transport via pipelines", "air transport", "warehousing and support activities for transportation" and "telecommunications".

Chart 11 Operating profits to total assets, median, by sector of economic activity



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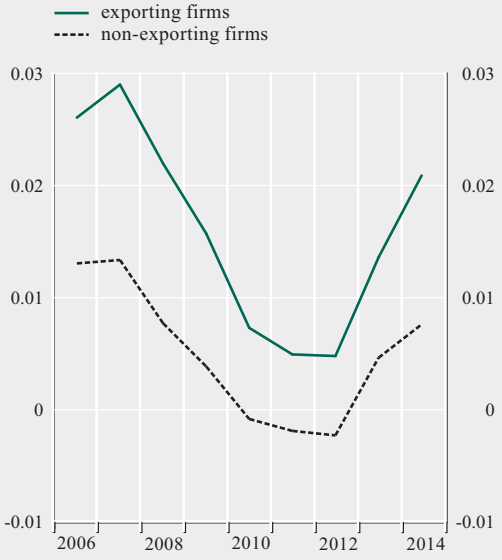
Note: "E" = Energy, "M" = Manufacturing, "AG" = Agriculture, forestry and fishing , "C" = Construction, "RE" = Real estate, "OS" = Other services, "TC" = Transport and communication, "HR" = Accommodation and food service activities (Hotels & Restaurants), "MQ" = Mining and quarrying, "FI" = Financial intermediation activities, and "WRT" = Wholesale and retail trade (see also footnote 6).

Chart 12 Operating profits to total assets, median, by exporting status



Source: Authors' own calculations from ICAP dataset.

ance of firms by their exporting status (see Chart 12), exporting firms are more profitable than non-exporting throughout time. At the 2-digit level, firms exhibited higher profitability in "coke and refined petroleum products" mainly as a result of their exporting activity, in "insurance, reinsurance and pension funding", in "telecommunications" and "warehousing and support activities for transportation".

In conclusion, the descriptive statistics are consistent with the hypothesis that exporting firms exhibit superior performance to their purely domestically focused counterparts. However, to understand whether it is exporting per se or some characteristics correlated with being an exporter requires a more formal multivariate analysis.

3.2 ECONOMETRIC MODEL AND ESTIMATIONS

3.2.1 Investigating the exports/productivity relationship[10]

To investigate differences in productivity between exporters and non-exporters, we follow the methodology introduced by Bernard and Jensen (1995 and 1999) and compute the so-called exporter productivity premia, defined as the ceteris paribus percentage difference of labour productivity between exporters and non-exporters. These premia are computed from the regression given in equation (1). To control for unobserved firm heterogeneity due to time-invariant firm characteristics which might be correlated with the variables included in the empirical model, thus leading to a biased estimate of exporter premia, equation (1) is estimated with fixed effects. Time dummies are also included. The current export status dummy takes a value of 1 in time t if the firm exports in time t, and zero otherwise. The set of control variables includes firm size, exporter size and the age of the company. The size of the firm is proxied by the number of employees. To test for the existence of a quadratic relationship between productivity and size, we also add as an independent variable the squared number of employees (a similar test was applied by Fryges and Wagner (2010) and Tavares-Lehmann and Costa (2015)). Following Tavares-Lehmann and Costa (2015), an interaction term for exporter and size is also included, computed as the multiplication between the dummy for export status and total employment. The age of the company from its establishment (company age) is also included. To test for the existence of a quadratic relationship we also add the squared age of the company (company age^2).

The export premium, computed from the estimated coefficient β ($100(\exp(\beta)-1)$), shows the average percentage difference between exporters and non-exporters, controlling for the other characteristics included. Table 3 summarises the results of estimating equation (1), excluding other control variables across sectors. As expected, exporting has a positive effect on labour productivity in full sample and in the sectors of "agriculture, forestry and fishing", "manufacturing", "wholesale and retail

10 We test the sensitivity of our results to dropping banks and insurance companies from the sample. The results are qualitatively similar.

Table 3 Impact of exporting on labour productivity in the 2006-2014 period (total economy and by sector of economic activity)

	Fixed effects equation β (p-value)	Exporter productivity premium 100*(expβ-1)
All sectors	0.05 (0.000)	5.1
Agriculture, forestry and fishing	0.46 (0.000)	58.4
Mining and quarrying	-0.85 (0.063)	-
Manufacturing	0.09 (0.000)	9.4
Construction	-0.17 (0.094)	-
Wholesale and retail trade	0.03 (0.015)	3.0
Accommodation and food service activities	0.58 (0.000)	78.6
Transport and communication	0.005 (0.899)	-
Energy	0.006 (0.967)	-
Financial intermediation activities	0.15 (0.002)	16.2
Other services	-0.002 (0.987)	-

Notes: β is the estimated regression coefficient from a fixed effects regression of the logarithm of labour productivity on a dummy variable for exporting firms and year dummies. The numbers in brackets are p-values. The sectors of economic activity correspond to NACE Rev. 2 classification (see footnote 6).

trade", "accommodation and food service activities" and "financial intermediation activities". The impact of exporting strengthens when we control for firm size, exporter companies' size and company age (see Tables 4a and 4b). As regards the size effect, there exists a U-shaped relationship between labour productivity and size. The minimum is at the logarithm of employment equal to 9.8; the logarithm of employment has a range of 0 to 10 in our data. Thus, for the sample, the effect of size on labour productivity is largely negative. This finding is not consistent with most of the literature, which finds that labour productivity rises with size. The negative relationship between firm size and productivity could reflect a structural characteristic of Greek industry where SMEs prevail. Company age and exporter size are not significant (exporter size appears positive and significant only in the sector of "accommodation and food service activities").

To provide a better understanding of the productivity trajectory of firms as a function of their exporting status, differences in productivity growth between exporters and non-exporters are investigated based on the empirical model given in equation (2) where non-exporting in all years is the reference category. The regression coefficients β1, β2 and β3 are estimates of the impact on labour productivity growth of starting exporting, being an exporter throughout and stopping exporting, respectively, controlling for firm characteristics included in the vector 'Control' (employment, employment^2, company age, company age^2, size interacted with export dummy). Tables 5a and 5b present the results. Firms that exported throughout the period have higher labour pro-

Table 4a Impact of exporting on labour productivity with control variables in the 2006-2014 period

Fixed-effects (within) regression — Number of observations = 212,052

Number of firms = 40,491

R^2: within = 0.1234
between = 0.0050
overall = 0.0062

Observations per firm: min = 1
avg = 5.2
max = 9

corr(u_i, Xb) = -0.3803 — F(14.171547) = 1725.37

Prob > F = 0.0000

lnLabour productivity	Coefficient	Standard error	t	P>|t|	[95% confidence interval]	
Export dummy	0.135	0.010	13.34	0.000	0.115	0.155
lnEmployment	-0.633	0.010	-61.23	0.000	-0.653	-0.613
lnEmployment^2	0.032	0.002	16.62	0.000	0.028	0.036
Company age	0.000	0.000	0.85	0.395	0.000	0.001
Company age^2	0.000	0.000	-0.67	0.501	0.000	0.000
Exporter size	0.000	0.000	-1.42	0.156	0.000	0.000
dum06	0.490	0.008	59.33	0.000	0.473	0.506
dum07	0.534	0.008	66.9	0.000	0.518	0.550
dum08	0.503	0.008	64.62	0.000	0.488	0.518
dum09	0.376	0.008	49.3	0.000	0.361	0.391
dum10	0.241	0.008	32.27	0.000	0.227	0.256
dum11	0.094	0.007	13.57	0.000	0.080	0.107
dum12	-0.030	0.007	-4.37	0.000	-0.044	-0.017
dum13	-0.043	0.007	-6.26	0.000	-0.056	-0.030
dum14	0.000	(omitted)				
Constant	12.519	0.017	740.99	0.000	12.486	12.552
sigma_u	1.5111					
sigma_e	0.669					
rho	0.836					

Note: F test significance of fixed effects: F(40490, 171547) = 16.67 Prob > F = 0.0000
Hausman Test: $X^2(13) = 6807.72$ (prob>X^2 = 0.000)

ductivity growth. Starters, however, experience an even bigger effect on labour productivity growth, while stopping has a negative but not significant effect on labour productivity growth. Firm size has a positive effect on the growth of labour productivity; there exists a U-shaped relationship between labour productivity growth and employment. The minimum is at the logarithm of employment equal to 3.86: the logarithm of employment has a range of 0 to 10 in our data. Thus for the sample, firm size has a positive effect on the growth of labour productivity for firms with more than 48 employees. Looking at the results by sector (see Table 5b), starters make the difference in "agriculture, forestry and fishing". In "manufacturing", "wholesale and retail trade" and "transport and communication" sectors, both always exporters and starters have higher productivity growth, while starters have higher productivity growth in the "financial intermediation activities'" sector. Firm size has a positive impact on labour productivity growth in "manufacturing", "wholesale and retail trade" and "transport and communication". Again, there exists a U-shaped relationship between labour productivity growth and employment in these sectors and, for the sample, firm size has a positive effect on

Table 4b Impact of exporting on labour productivity with control variables in the 2006-2014 period (total economy and by sector of economic activity)

	Fixed effects β	Exporter premium 100*(expβ-1)	lnEmploy-ment	lnEmploy-ment^2	Company age	Company age^2	Exporter size
	(p-value)		(p-value)	(p-value)	(p-value)	(p-value)	(p-value)
All sectors	0.135 (0.000)	14.5	-0.632 (0.000)	0.032 (0.000)	0.000 (0.395)	0.000 (0.501)	0.000 (0.156)
Agriculture, forestry and fishing	0.299 (0.021)	34.9	-1.059 (0.000)	0.088 (0.124)	-0.014 (0.566)	0.001 (0.148)	-0.001 (0.683)
Mining and quarrying	-0.110 (0.805)	-	-1.109 (0.000)	0.123 (0.004)	-0.029 (0.287)	0.001 (0.091)	-0.011 (0.029)
Manufacturing	0.168 (0.000)	18.3	-0.575 (0.000)	0.039 (0.000)	0.000 (0.538)	0.000 (0.937)	0.000 (0.004)
Construction	0.049 (0.630)	-	-0.849 (0.000)	0.027 (0.003)	0.005 (0.228)	0.000 (0.206)	0.000 (0.594)
Wholesale and retail trade	0.089 (0.000)	9.3	-0.589 (0.000)	0.044 (0.000)	0.000 (0.647)	0.000 (0.348)	0.000 (0.992)
Accommodation and food service activities	0.441 (0.003)	55.4	-0.885 (0.000)	0.056 (0.000)	-0.011 (0.000)	0.000 (0.000)	0.002 (0.008)
Transport and communication	0.085 (0.040)	8.9	-0.517 (0.000)	0.011 (0.062)	0.003 (0.231)	0.000 (0.539)	0.000 (0.909)
Energy	0.216 (0.127)	-	-0.956 (0.000)	0.084 (0.001)	-0.006 (0.795)	0.000 (0.402)	0.000 (0.018)
Financial intermediation activities	0.302 (0.000)	35.3	-0.719 (0.000)	0.038 (0.000)	0.004 (0.176)	0.000 (0.242)	0.000 (0.565)
Other services	0.206 (0.323)	-	-0.596 (0.000)	0.008 (0.489)	0.004 (0.488)	0.000 (0.271)	0.000 (0.986)

Notes: β is the estimated regression coefficient from a fixed effects regression of the logarithm of labour productivity on a dummy variable for exporting firms controlling for the number of employees and its squared value, exporter size captured by an interaction term between export status and size, and company's age and company's age squared. We also add year dummies. The numbers in brackets are p-values. The sectors of economic activity correspond to NACE Rev. 2 classification (see footnote 6).

the growth of labour productivity for firms with more than 33, 14 and 81 employees, in "manufacturing", "wholesale and retail trade" and "transport and communication", respectively.

We then examine whether the relationship between exporting and productivity growth differs across firms of different sizes. The regression on labour productivity growth is estimated by size band (see Table 6).[11] For firm sizes "1-9", "10-19" and "20-49" there is a positive and significant effect of exporting activity on labour productivity growth; when examining the impact of exporting by sector, there is a positive and significant effect in "manufacturing" and "wholesale and retail trade". It should be noted though that the positive effect of exporting on labour productivity growth becomes less strong as we move up size bands. Turning to "50-249" firm size, the findings point to a positive and significant effect of exporting on labour productivity growth for starters in all sectors and in "transport and communication". Finally, for firms "250+" there is no effect of exporting on labour productivity growth. This provides evidence of the importance of exporting for small Greek companies and/or the fact that smaller companies can be very productive and thus not excluded from exporting. This is consistent with Máñez-Castillejo et al. (2010) who find evidence in favour of the existence of a process of self-selection into exporting for small firms, but do not find this result for large firms.

Next, following Bernard and Jensen (1995), we also examine whether exporters also increase

11 Gibson and Pavlou (2015) present the estimated impact of exporting on labour productivity by firm size and sector of economic activity.

Table 5a Impact of exporting on labour productivity growth in the 2006-2014 period

Number of observations =	170,453
F(94, 170358) =	26.87
Prob > F =	0.000
R^2=	0.015
Adj R^2 =	0.014
Root MSE =	0.719

ΔlnLabour productivity	Coefficient	Standard error	t	P>¦t¦	[95% confidence interval]	
Always exporters	0.036	0.005	6.66	0.000	0.025	0.046
Export starters	0.063	0.007	9.38	0.000	0.050	0.076
Export stoppers	-0.004	0.008	-0.53	0.597	-0.020	0.011
lnEmployment	-0.043	0.004	-10.38	0.000	-0.051	-0.035
$lnEmployment^2$	0.006	0.001	7.94	0.000	0.004	0.007
Company age	0.000	0.000	0.73	0.466	0.000	0.000
Company age^2	0.000	0.000	-0.48	0.634	0.000	0.000
Exporter size*	0.000	0.000	-1.21	0.227	0.000	0.000
dum06	0.000	(omitted)				
dum07	0.049	0.007	6.81	0.000	0.035	0.063
dum08	-0.029	0.007	-4.04	0.000	-0.043	-0.015
dum09	-0.128	0.007	-17.87	0.000	-0.142	-0.114
dum10	-0.133	0.007	-18.39	0.000	-0.147	-0.119
dum11	-0.151	0.007	-20.64	0.000	-0.165	-0.136
dum12	-0.141	0.007	-19.27	0.000	-0.156	-0.127
dum13	-0.033	0.007	-4.46	0.000	-0.047	-0.018
dum14	0.000	(omitted)				
Constant	0.098	0.041	2.42	0.016	0.019	0.178

Note: These results are from an OLS regression.

employment faster than non-exporters, considering the relationship between export status and job growth. The dependent variable is employment growth captured by the growth in the number of employees at firm level. Table 7 indicates a positive impact of exporting on employment growth for starters in most sectors and for always exporters in "wholesale and retail trade", in line with the evidence from the literature. We now test the two hypotheses articulated in the literature regarding the direction of causality between labour productivity and exporters, namely the self-selection hypothesis and the learning-by-exporting hypothesis. To shed light on the empirical validity of the hypothesis that firms succeed before they begin exporting —the self-selection hypothesis— we test the differences in labour productivity before firms begin exporting on the basis of equation (3). The estimation is based on a sample of firms with business activity throughout the period 2006-2014. One group of firms never exports. The other was non-exporters in t-1, t-2 and t-3 and started to export in period t (defined as either 2010 or 2011) and continued exporting up to 2014. We end up with a sample of 6,256 observations, of which 146 firms are starters. The estimated coefficient β on the export dummy is negative and insignificant, thus providing no evidence in favour of the self-selection of the most productive firms in the export market. We then provide another check of the relationship between exporting and ex-ante performance in terms of labour productivity growth (see Bernard and Wagner 1997). We consider the

Table 5b Impact of exporting on labour productivity growth in the 2006-2014 period (total economy and by sector of economic activity)

	Always exporters	Starters	Stoppers	Employment	Employment^2	Company age	Company age^2	Exporter size
	(p-value)	(p-value)	(p-value)	(p-value)	(p-value)	(p-value)	(p-value)	(p-value)
All sectors	0.036 (0.000)	0.063 (0.000)	-0.004 (0.597)	-0.043 (0.000)	0.006 (0.000)	0.000 (0.466)	0.000 (0.634)	0.000 (0.227)
Agriculture, forestry and fishing	0.012 (0.897)	0.205 (0.026)	-0.083 (0.475)	-0.058 (0.675)	0.012 (0.700)	-0.005 (0.573)	0.000 (0.675)	0.000 (0.825)
Mining and quarrying	-0.043 (0.751)	-0.116 (0.624)	0.620 (0.112)	0.068 (0.611)	-0.016 (0.536)	-0.003 (0.882)	0.000 (0.966)	0.001 (0.417)
Manufacturing	0.059 (0.000)	0.084 (0.000)	0.001 (0.908)	-0.114 (0.000)	0.016 (0.000)	0.000 (0.989)	0.000 (0.689)	0.000 (0.008)
Construction	0.069 (0.357)	0.041 (0.572)	0.069 (0.360)	-0.078 (0.005)	0.008 (0.128)	0.002 (0.122)	0.000 (0.149)	0.000 (0.448)
Wholesale and retail trade	0.023 (0.000)	0.051 (0.000)	0.000 (0.984)	-0.022 (0.001)	0.004 (0.000)	-0.001 (0.030)	0.000 (0.019)	0.000 (0.224)
Accommodation and food service activities	-0.113 (0.178)	0.172 (0.108)	-0.114 (0.203)	-0.027 (0.012)	0.002 (0.258)	-0.001 (0.165)	0.000 (0.120)	0.000 (0.321)
Transport and communication	0.059 (0.016)	0.051 (0.042)	-0.002 (0.965)	-0.036 (0.010)	0.004 (0.051)	0.000 (0.910)	0.000 (0.891)	0.000 (0.631)
Energy	-0.023 (0.842)	0.012 (0.905)	-0.081 (0.537)	-0.083 (0.097)	0.011 (0.170)	-0.027 (0.001)	0.000 (0.005)	0.000 (0.442)
Financial intermediation activities	0.033 (0.358)	0.059 (0.053)	-0.062 (0.136)	-0.027 (0.034)	0.003 (0.103)	0.000 (0.638)	0.000 (0.413)	0.000 (0.745)
Other services	0.140 (0.905)	0.014 (0.884)	0.065 (0.591)	-0.003 (0.898)	-0.001 (0.777)	-0.005 (0.011)	0.000 (0.019)	0.001 (0.840)

Notes: These results are from an OLS regression. The numbers in brackets are p-values. The sectors of economic activity correspond to NACE Rev. 2 classification (see footnote 6).

Table 6 Impact of exporting on labour productivity growth in the 2006-2014 period across different firm sizes

	Always exporters	Starters	Stoppers	Employment	Employment^2	Company age	Company age^2	Exporter size
	(p-value)	(p-value)	(p-value)	(p-value)	(p-value)	(p-value)	(p-value)	(p-value)
"1-9"	0.063 (0.000)	0.097 (0.000)	0.014 (0.379)	-0.123 (0.005)	0.037 (0.014)	0.000 (0.668)	0.000 (0.998)	-0.006 (0.031)
"10-19"	0.059 (0.000)	0.070 (0.000)	0.005 (0.730)	0.128 (0.776)	-0.018 (0.836)	0.000 (0.598)	0.000 (0.421)	-0.003 (0.016)
"20-49"	0.049 (0.001)	0.040 (0.001)	-0.022 (0.072)	-0.014 (0.963)	0.003 (0.939)	0.000 (0.034)	0.000 (0.120)	0.000 (0.319)
"50-249"	0.020 (0.219)	0.026 (0.098)	-0.010 (0.575)	0.033 (0.857)	-0.003 (0.873)	0.000 (0.572)	0.000 (0.199)	0.000 (0.780)
"250+"	0.024 (0.586)	0.022 (0.623)	-0.018 (0.733)	-0.014 (0.938)	0.001 (0.969)	-0.001 (0.278)	0.000 (0.402)	0.000 (0.787)

Notes: These results are from an OLS regression. The numbers in brackets are p-values.

performance of labour productivity growth of future exporters in the years prior to entry, i.e. from year t-3 to t-2 for firms starting exporting in 2010 and from year t-2 to t-1 for firms starting exporting in 2011, in a regression of the following form:

Table 7 Impact of exporting on employment growth in the 2006-2014 period

	Always exporters	Starters	Stoppers	Company age	Company age^2	Exporter size
	(p-value)	(p-value)	(p-value)	(p-value)	(p-value)	(p-value)
All sectors	0.003 (0.208)	0.033 (0.000)	-0.051 (0.000)	-0.001 (0.000)	0.000 (0.000)	0.000 (0.000)
Agriculture, forestry and fishing	0.026 (0.360)	-0.019 (0.544)	0.067 (0.064)	-0.003 (0.346)	0.000 (0.793)	0.000 (0.145)
Mining and quarrying	-0.059 (0.345)	0.018 (0.885)	-0.795 (0.000)	0.019 (0.030)	0.000 (0.064)	0.001 (0.439)
Manufacturing	-0.001 (0.822)	0.036 (0.000)	-0.051 (0.000)	-0.001 (0.000)	0.000 (0.000)	0.000 (0.000)
Construction	-0.05 (0.069)	0.054 (0.036)	-0.066 (0.017)	-0.003 (0.000)	0.000 (0.000)	0.000 (0.000)
Wholesale and retail trade	0.006 (0.047)	0.029 (0.000)	-0.041 (0.000)	-0.003 (0.000)	0.000 (0.000)	0.000 (0.000)
Accommodation and food service activities	-0.016 (0.648)	0.036 (0.414)	-0.049 (0.176)	0.000 (0.004)	0.000 (0.021)	0.000 (0.685)
Transport and communication	-0.013 (0.200)	0.028 (0.009)	-0.050 (0.001)	-0.003 (0.000)	0.000 (0.000)	0.000 (0.315)
Energy	-0.182 (0.641)	0.086 (0.007)	-0.013 (0.766)	-0.007 (0.012)	0.000 (0.087)	0.000 (0.640)
Financial intermediation activities	-0.01 (0.440)	0.03 (0.006)	-0.11 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Other services	-0.066 (0.157)	0.066 (0.094)	-0.136 (0.005)	-0.003 (0.001)	0.000 (0.068)	0.001 (0.691)

Notes: These results are from an OLS regression. The numbers in brackets are p-values. The sectors of economic activity correspond to NACE Rev. 2 classification (see footnote 6).

$$\Delta \ln LP_{it\text{-}x(x=1\,|\,x=2)} = \alpha + \beta Export_{it(t=2011\,|\,t=2010)} + \gamma Control_{it} + \varepsilon_{it} \quad (5)$$

Here, we find positive but insignificant coefficient on the export dummy; thus there is no strong evidence in favour of the self-selection hypothesis.

To evaluate the learning-by-doing hypothesis, we estimate equation (4). The results point to negative and insignificant effect of export activity on post-entry productivity growth of export starters. Nevertheless, the number of export starters that can be monitored with the dataset available for this study is too small to offer a solid basis for a reliable empirical investigation.[12]

Finally, we investigate the robustness of our basic results in Table 4 to adding lagged productivity and using different estimators.[13] First, we add lagged productivity and report results for OLS with fixed effects. The results are given in Table 8a and suggest that the export premium is 10.5% for all sectors of the economy and still significant for a number of sectors – "manufacturing", "wholesale and retail trade", "accommodation and food service activities" and "financial intermediation activities". Including lagged productivity, however, introduces a bias because of endogeneity. Hence we also report the results of using the Arellano-Bond GMM estimator. The estimated premium for all sectors is lower at 3.9%, suggesting the presence of bias. However, it is still significant. Second, we investigate whether the exporter premium varies along the distribution of labour productivity, using the quantile regression for panel data developed by Powell (2016). The

12 The drastic reduction in the sample size when investigating the two hypotheses is also a feature of the datasets available for the empirical investigation of ex-ante and ex-post productivity premia by the International Study Group on Exports and Productivity (2008).

13 The detailed results of these robustness tests are presented in Gibson and Pavlou (2017).

Table 8a Exporter productivity premium: robustness checks

	All sectors	AG	MQ	M	C	WRT	HR	TC	E	FI	OS
Exporter premium with lagged productivity	10.5	-	-	15.0	-	6.2	7.7	-	-	23.4	-
Exporter premium using Arellano-Bond estimator	3.9										

Note: "AG" = Agriculture, forestry and fishing, "MQ" = Mining and quarrying, "M" = Manufacturing, "C" = Construction, "WRT" = Wholesale and retail trade, "HR" = Accommodation and food service activities (Hotels & Restaurants), "TC" = Transport and communication, "E" = Energy, "FI" = Financial intermediation activities, and "OS" = Other services (see also footnote 6).

Table 8b Impact of exporting on labour productivity: quantile regressions

	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Exporter premia (without instruments)	31.0	16.2	8.3	11.6	10.5	4.1	4.1	44.8	43.3
Exporter premia (with instruments)	49.2	55.3	11.6	31.0	-	-17.3	28.4	11.6	-

Table 9 Impact of exporting on return-on-assets (RoA) in the 2006-2014 period

	Fixed effects equation β (p-value)	Exporter profitability premium
All sectors	0.027 (0.042)	2.8
Agriculture, forestry and fishing	0.357 (0.027)	42.9
Mining and quarrying	-0.542 (0.576)	-
Manufacturing	0.084 (0.000)	8.8
Construction	0.168 (0.074)	-
Wholesale and retail trade	0.028 (0.117)	-
Accommodation and food service activities	0.378 (0.116)	-
Transport and communication	-0.045 (0.423)	-
Energy	-0.559 (0.000)	-
Financial intermediation activities	-0.001 (0.981)	-
Other services	-0.055 (0.793)	-

Notes: β is the estimated regression coefficient from a fixed effects regression of the logarithm of RoA on a dummy variable for exporting firms and year dummies. The numbers in brackets are p-values. The sectors of economic activity correspond to NACE Rev. 2 classification (see footnote 6).

Table 10 Impact of exporting on return-on-assets (RoA) with control variables in the 2006-2014 period

	Fixed effects equation β	Exporter premium 100(expβ-1)	Employ-ment	Employ-ment^2	Company age	Company age^2	Exporter size
	(p-value)		(p-value)	(p-value)	(p-value)	(p-value)	(p-value)
All sectors	0.0003 (0.981)	-	0.032 (0.032)	0.016 (0.000)	-0.003 (0.000)	0.000 (0.000)	0.000 (0.215)
Agriculture, forestry and fishing	0.338 (0.059)	40.3	0.427 (0.219)	-0.086 (0.276)	0.018 (0.539)	-0.001 (0.320)	0.022 (0.425)
Mining and quarrying	-0.395 (0.653)	-	0.335 (0.472)	-0.057 (0.462)	0.112 (0.135)	-0.001 (0.233)	-0.026 (0.024)
Manufacturing	0.032 (0.168)	-	0.087 (0.021)	0.025 (0.001)	-0.007 (0.000)	0.000 (0.001)	-0.001 (0.024)
Construction	0.237 (0.013)	26.7	-0.046 (0.341)	0.019 (0.054)	0.000 (0.974)	0.000 (0.897)	0.000 (0.097)
Wholesale and retail trade	-0.005 (0.808)	-	0.012 (0.639)	0.030 (0.000)	-0.005 (0.000)	0.000 (0.018)	0.000 (0.261)
Accommodation and food service activities	-0.134 (0.627)	-	-0.168 (0.010)	0.053 (0.000)	-0.010 (0.067)	0.000 (0.646)	0.006 (0.001)
Transport and communication	-0.043 (0.458)	-	0.073 (0.190)	-0.013 (0.182)	0.002 (0.469)	0.000 (0.652)	0.000 (0.628)
Energy	-0.499 (0.001)	-	0.180 (0.135)	-0.058 (0.024)	0.010 (0.627)	0.000 (0.768)	0.000 (0.423)
Financial intermediation activities	-0.006 (0.931)	-	0.050 (0.246)	0.004 (0.583)	-0.009 (0.025)	0.000 (0.094)	0.001 (0.002)
Other services	-0.356 (0.333)	-	-0.123 (0.257)	0.037 (0.032)	-0.008 (0.349)	0.000 (0.949)	0.015 (0.194)

Notes: β is the estimated regression coefficient from a fixed effects regression of the logarithm RoA on a dummy variable for exporting firms controlling for the ln number of employees and its squared value, exporter size captured by an interaction term between export status and size, and company's age and company's squared age. We also add year dummies. The numbers in brackets are p-values. The sectors of economic activity correspond to NACE Rev. 2 classification (see footnote 6).

results in Table 8b suggest that the exporter premia do differ across the labour productivity distribution, with premia being particularly high in lower labour productivity firms. These results confirm the general finding that firms are very heterogeneous and that relying on results at the mean could be misleading. The results are in line with Powell and Wagner (2011), who also find the largest premium at the bottom of the labour productivity distribution.

3.2.2 Investigating the exports/profitability relationship

To test the hypothesis that exporters are more profitable than non-exporters, we estimate regression (1) using as dependent variable both earnings before interest and taxes over total assets (RoA) and operating profits over total assets. Table 9 summarises the results for the effect of exporting on RoA using fixed effects and time dummies equation. Exporting has a positive and significant effect on RoA in full sample and in the sectors of "agriculture, forestry and fishing" and "manufacturing". When controlling for firm size, company age and exporter size (see Table 10), the effect of exporting activity is still positive but it is insignificant in the full sample. Taking operating profits as a measure of profitability, the impact of exporting becomes insignificant in full sample and across sectors. These results are in line with much of the literature which finds weaker effects of exporting on profitability.

4 CONCLUSIONS

In this paper, we have used firm-level data to explore performance differences between

exporters and non-exporters in Greece. In line with the findings of the extant literature, being an exporter leads to an advantage over domestically oriented firms for productivity (both level and growth rates), profitability and employment growth.

The exporter productivity premium is estimated at 14% for the whole sample, pointing to a significant productivity advantage for exporting firms which is even stronger in certain sectors of economic activity. The existence of an exporter productivity premium is one of the strongest results in the economics literature. We also find evidence in favour of higher productivity growth for always-exporting firms and starters, while there is a negative, though insignificant, effect for stoppers. The relationship between exporting activity and labour productivity growth weakens as we move up the firm size band; the results point to higher productivity growth for exporting SMEs – and in particular for micro SMEs. Finally, we checked the robustness of these results by including lagged productivity to account for productivity persistence and various estimators to correct for endogeneity and the fact that the premium may vary along the productivity distribution. The exporter productivity premia largely remain positive and significant.

The exporter profitability premium, when profitability is proxied by RoA, is estimated at 2.8% for the whole sample in the reviewed period, and even higher in some sectors of economic activity, lending some support to the hypothesis that exporters can be more profitable than companies serving only their home market.

In terms of policy implications, the productivity differentials between exporters and non-exporters suggest that Greece should continue to promote an environment which encourages high-productivity firms and export-oriented production in order to achieve sustainable growth. Given that productivity differentials are particularly significant for SMEs than for large firms, industrial policies should continue to have a firm-size dimension. Different incentives and support services are needed for SMEs and for large firms, given the differences in importance of productivity differentials between exporters and non-exporters. A recent OECD report (Nassr et al. 2016), discussing the export potential of SMEs in Greece, their possible contribution to strengthening Greece's export performance thereby helping economic growth, suggests policy measures in the areas of finance, regulation, R&D and innovation.

Topics for further research would be to identify the impact of firms' export intensity on productivity growth, should firm-level data on export volume become available, and to better assess the direction of causality of exports and measures of firm performance when a larger number of observations is available to allow such an analysis.

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